XHARIEP EXPORT PROGRAMME (XEP) AGRICULTURAL DEVELOPMENT AND ASSOCIATED INFRASTRUCTURE, FREE STATE PROVINCE

Environmental Impact Assessment Report

DESTEA Reference:
EMS/1(ii),9(i)(ii),19,12(iv),13,15,16/22/06

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PROJECT DETAILS

DESTEA Reference No	:	EMS/1(ii), 9(i)(ii), 19, 12(iv),13,15, 16/22/06
Title	:	Environmental Impact Assessment Process: EIA Report for Xhariep Export Programme (XEP) Agricultural Development, Free State Province
Authors	:	Savannah Environmental (Pty) Ltd Candy Mahlangu Jo-Anne Thomas
Client	:	JN Venter Beleggings Trust
Report Revision	:	Draft EIA Report for Public Review and Comment
Date	:	January 2023

When used as a reference this report should be cited as: Savannah Environmental (2022) Environmental Impact Assessment Report for the Xhariep Export Programme (XEP) Agricultural Development and Associated infrastructure, Free State Province.

PURPOSE OF THE EIA REPORT AND INVITATION TO COMMENT

JN Venter Beleggings Trust has appointed Savannah Environmental as the independent environmental consultant to undertake the Environmental Impact Assessment process for the Xhariep Export Programme (XEP) Agricultural Development, Free State Province. The EIA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations promulgated in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA). This EIA report has been compiled in accordance with Appendix 3 of the EIA Regulations, 2014 (as amended) and consists of the following sections:

- **Chapter 1** provides background to the Xhariep Export Programme (XEP) Agricultural Development and the EIA process.
- **Chapter 2** provides a description of the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure.
- **Chapter 3** provides the site selection information, identified project alternatives.
- **Chapter 4** describes the need and desirability of the agricultural development and the associated infrastructure within the project area.
- **Chapter 5** outlines the relevant applicable regulations for agricultural development and the associated infrastructure in South Africa, and specifically for the proposed site.
- **Chapter 6** outlines the process which was followed during the EIA process.
- **Chapter 7** describes the existing biophysical and socio-economic environment affected by the proposed development.
- **Chapter 8** provides a description and assessment of the potential direct, indirect and cumulative impacts associated with the proposed Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure.
- **Chapter 9** presents the conclusions and recommendations based on the outcomes of the EIA Report.
- **Chapter 10** provides references used in the compilation of the EIA Report.

The EIA Report is available for review from **6 January 2023 – 27 February 2023** on the Savannah Environmental website (https://savannahsa.com/public-documents/other/agricultural-development-and-associated-infrastructure/). All comments received and recorded during the 30-day review and comment period have will be included, considered and addressed within the final EIA report for the consideration of the Free State Department Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA).

Please submit your comments by **6 February 2023** to:
Bregardia Rabbie of **Savannah Environmental** PO Box 148, Sunninghill, 2157 Tel: 011-656-3237 Mobile: 060 978 8396 Fax: 086-684-0547 Email: publicprocess@savannahsa.com

Comments can be made as written submission via fax, post or email.

EXECUTIVE SUMMARY

The project area, with an extent of ~4690 ha has been identified by JN Venter Beleggings Trust as technical feasible area for the development of the proposed Xhariep Export Programme (XEP) Agricultural Development. The development area of ~4276.32ha has been identified within the project area by the Applicant for the development.

Infrastructure associated with the Project will include the following:

- Developmental of center pivot areas (cultivation and irrigation) which is planned to take approximately 2690ha within the project site.
- Two irrigation water storage dams, with a combined surface area of 82ha in extent
- Establishment of an irrigation pipeline network from the irrigation dams to the centre pivot areas.
- A new pump station taking a total surface area of 549m^2.
- A 5MW solar PV facility occupying an area of 10ha.
- A Battery Energy Storage System covering a surface area of 0.36ha

The development area will affect the following properties:

- Farm Diepdraai 754
- Farm Weltevreden 755
- Farm Lemoen-spruit 667
- Portion 1 of the Farm Grootpoort 168

The site is accessible via the R48 road which pass directly through the centre of the proposed site. The R369 links to R48 south-west of the proposed site.

The potential environmental impacts associated with the proposed Xhariep Export Programme (XEP) assessed through the EIA process include:

- Impacts on terrestrial ecology (including flora, Fauna and avifauna)
- Impacts on aquatic ecology
- Impacts on land use, soils
- Impacts on heritage resurces, including archaeology, palaeontology and the cultural landscape.
- Positive and negative social impacts

The environmental sensitivities identified by the relevant specialists for the project site are illustrated in **Figure 3**. The develoment footproot, as assessed, has been overlain with the relevant environmental sensitivities.

Impact on Ecology

The Nama Karoo Biome is acknowledged to not possess a high diversity of flora species, with a total of 57 species, representing 25 families, recorded within the project area during the survey period. Dominant graminoid species, with respect to cover, indicates overgrazing. Nevertheless, the project site supports a

diversity of fauna species including SCC. Five protected species were identified on the project area it is imperative that a Plant Search and Rescue Plan be developed prior to clearing and development.

Based on the fauna components recorded within the project area, the area provides important ecosystem services, particularly with regards to the maintenance of dynamic soil properties, biocontrol of pest species and pollination. The SEI of the project area was determined to vary from 'Very Low' to 'Very High' based on the confirmation of high likelihood of occurrence of fauna SCC, the extent of the area considered and its connectivity to natural areas within the landscape, as well as the low resilience of the vegetation types.

The main expected impacts of the proposed development will be the loss of habitat and mortality of fauna. Based on the outcomes of the SEI determination, the project possesses areas of 'Very High' SEI and 'High' SEI.

The 'High' SEI denotes that "avoidance mitigation wherever possible must be implemented. This includes changes to project infrastructure design to limit the amount of habitat impacted." (SANBI, 2020). Considering that the area has been zoned for agriculture, development may proceed in the 'High' SEI Areas, as long as the 'Very High' SEI areas are avoided and actively managed. Where pivots overlap minor drainage lines (also with Very High SEI), activity adjacent to these system is permissible, albeit only if the remaining channel extent is rehabilitated and actively managed. The dam located within the 'Very High' SEI areas is considered to be acceptable due to the technical requirement for the location of the dam in this area, without requiring additional earthworks and piping. The amount of hectarage lost within that portion of the site is deemed acceptable from an ecological perspective. All of the mitigation measures and Biodiversity Impact Management Actions must be implemented if the proposed development is authorised.

Impact on Aquatic Ecology

The baseline assessment established a single main watercourse with an associated tributary network draining the project area, namely the Lemoenspruit ecosystem. Additionally, numerous ephemeral drainage lines and some wetlands occur in the project area. The Lemoenspruit flows into the Orange River downstream of the project area and due to flood conditions at the time of the survey the Orange River could not be assessed. The ecological assessment of the Lemoenspruit indicated moderate modifications attributed to varying land use, comprising mostly open/ natural land with some agriculture and widespread livestock activities present in the project areas catchment.

Given the findings of this assessment, the Lemoenspruit was classed as moderately modified (class C). The entire drainage network is presented by a well-defined riparian zone consisting of woody vegetation. The soils within the catchment and along the watercourses are highly susceptible to erosion and considered sensitive to any potential anthropogenic activities along these systems which could potentially compromise the ecological integrity of the watercourses.

The directly influenced Lemoenspruit is listed as not protected, and the ecosystem is classified as Endangered. The indirectly affected Orange River system downstream of the project area is listed as poorly protected, and is classified as Critically Endangered. Additionally, Freshwater Priority Areas are assigned to them. The Lemoenspruit catchment serves as an upstream management area to assist in limiting impacts to the downstream Orange River which serves as a Fish Sanctuary area for threatened fish

species such as Largemouth Yellowfish (*Labeobarbus kimberleyensis*). Largemouth Yellowfish are red listed as Near Threatened and are showing population declines due to habitat fragmentation and water quality deterioration. The Lemoenspruit includes an additional species of conservational concern, namely the recently described Orange River Chubbyhead barb (*Enteromius oraniensis*). The species currently has no threatened status and should be conserved through the precautionary principle and be treated as highly threatened. The poorly protected nature of the systems, the high EIS and presence of SCC indicates that strict mitigation measures should be adhered to ensure no further deterioration of the watercourses should the project proceed.

The riparian zones of the lower foothills geoclass Lemoenspruit require a buffer of 100m, and Lemoenspruit tributary network comprising non-perennial systems, ephemeral drainage lines and wetlands require a buffer of 50m. These buffers would ensure adequate ecological integrity maintenance adjacent to the proposed agricultural activities.

The impact assessment considered both direct and indirect impacts to the water resources. According to the layout provided and the delineated riparian zones and applicable buffers, the centre pivots, impoundments (several options), power line and internal pipeline intersect with the water resources posing risk to these receptors. The relocation of the aforementioned infrastructure to avoid sensitive water resources and the prescribed buffer zones (no-go zones) will lower the impacts to these receptors. The relocation of the centre pivots outside of no-go zones would result in an overall reduction in the number of proposed centre pivots, lowering the associated negative ecological impacts expected. Avoidance of no-go zones would lower their impacts and should be considered. Additionally, the project should consider the least number of river crossing structures possible to limit further watercourse disturbance.

The solar area and BESS infrastructure are expected to have no impacts towards local watercourses.

Impacts associated with the proposed infrastructure are related to habitat disturbance and fragmentation, contamination of water quality and alteration of catchment hydrology which cumulatively result in negative ecology impacts within watercourses. The construction and operational phase impacts range from moderate to high, with the majority of impacts being reduced to low and moderate following the implementation of adequate mitigation measures. Due to the nature of the project, the footprint of the proposed agricultural infrastructure has a large, localised impact, while cumulatively the project poses regional water quality impacts and threat to SCC.

It is the specialist's opinion that no fatal flaws have been identified for the proposed activities, and authorisation of the proposed development must be carefully considered. Considerations must take into account the carrying capacity of the local and regional watercourses potentially influenced by the proposed activities and their resilience to future disturbances.

The alternative positioning of infrastructure is preferred due to the avoidance of water resource sensitive areas (no-go zones). The soils within the catchment are prone to erosion and care is required to ensure proposed activities do not exacerbate erosion within the catchment. Monitoring of the aquatic resources is required during construction and operational activities.

Due to the high threat level of water quality deterioration and negative ecological impacts expected, notably from typically used Organophosphates, the project must consider environmentally friendly

alternatives to Organophosphates. This together with the prescribed mitigation must be implemented in totality in order to proceed in a sustainable manner.

A competent ECO must oversee the construction and operational activities, with watercourse areas as a priority. Additional recommendations listed in this report should be considered for this project.

Impact on Soils and Agricultural Potential Sensitive Features

The most sensitive soil forms identified within the assessment corridor is the Oakleaf, Hutton and Augrabies soils. The land capability sensitivities (DAFF, 2017) indicate land capabilities with "Very Low" to "Moderate" sensitivities, which correlates with the findings from the baseline assessment. The area has land capability classes of "III" and "IV" with a climate capability level "C8" associated with harsh conditions. The assessment area is characterised with a land potential class level "L6" for all the soils. The footprint area is associated with non-arable soils, which correspond to the current land use of livestock grazing and irrigated crop production in the area.

The land capability sensitivity (DAFF, 2017) indicates a range of sensitivities expected throughout the project focus area, which predominantly covers "Very Low" to "Low" sensitivities. Some patches are characterised by "Moderate" sensitivities. The area has a "Low" sensitivity based on these land potential classes. The "Very Low to Moderate" sensitivities baseline findings concur with the DAFF, (2017) land potential for the requirements for a compliance statement report only. According to the DEA Screening Tool, (2022), few portions within the assessment area has "High" sensitivity crop fields. Since rainfall is one of the limiting factors for crop production in the assessment area, the agricultural pivot expansion project can increase the land potential without segregation of such agricultural lands or crop fields with high potentials. In the case the landowners of such crop fields are not part of the expansion project, it is the specialist`s recommendation that such high potential crop fields be avoid for the project. In a case relocating of the project is not feasible, the stakeholders should engage with the owners of the crop fields for an appropriate compensation. Thus, the agricultural and pivot expansion project maybe favourably considered as planned.

Impact on Heritage sensitive features, the cultural landscape (incl. archaeology, palaeontology, and cultural landscape)

The development area is underlain by sediments of low, moderate and high palaeontological sensitivity. According to the extract from the Council for GeoScience Map 2924 for Koffiefontein, the area is underlain by Jurassic Dolerite (zero paleontological sensitivity) and Quaternary Sands (moderate and high sensitivity).

Three archaeological observations were identified within the area proposed for pivot development and two of these observations consist of very low density MSA archaeological scatters and the third reflects a corrugated iron shed.

Two burial sites were identified within the development footprint, graded IIIA due to their high levels of social and spiritual significance a no-impact buffer of 100m must be implemented around each of these sites in order to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage. Two burial sites were identified within the development footprint (Observation 009 and 041), graded IIIA due to their high levels of social and spiritual significance. Both of these burial grounds are located within the boundaries of the proposed development footprint and if the development proceeds as intended, it is likely that these burial sites will be negatively impacted. As such, it is recommended that a no-impact buffer of 100m is implemented around each of these sites in order to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The specialist concluded that there is no objection to the proposed development in terms of impacts to archaeological heritage on condition that:

» A no-impact buffer of 100m is implemented around Observations 009 and 041.
» A Chance Fossil Finds Procedure is implemented for the duration of construction activities.
» Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.

Social Impact

Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws, and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings can be made:

» The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focused on the construction of PV facilities and pivot infrastructure (these relate to intrusion and disturbance impacts, safety and security) and could be reduced with the implementation of the mitigation measures proposed.
» Employment opportunities will be created in the construction and operation phases and the impact is rated as positive even if only a small number of individuals will benefit in this regard.
» The proposed project could assist the local economy in creating entrepreneurial development, especially if local businesses could be involved in the provision of general material and services during the construction and operational phases.
» Capacity building and skills training amongst employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.
» The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society.

The proposed Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure is unlikely to result in permanent damaging social impacts and will have a number of positive impacts from a

social and economic perspective at a local and regional level. From a social perspective, it is concluded that the project could be developed subject to the implementation of the recommended mitigation measures, enhancement measures and management actions contained in the report.

Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Xhariep Export Programme (XEP) Agricultural Development throughout all phases of the project life cycle. The main aim for the assessment of cumulative impacts considering the Xhariep Export Programme (XEP) Agricultural Development is to test and determine whether the development will be acceptable within the landscape proposed for the development, and Xhariep Export Programme (XEP) Agricultural Development, Free State Province whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

- There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the Xhariep Export Programme (XEP) Agricultural Development and similar developments within the surrounding area, provided Very High SEI areas are avoided and the recommended mitigation measures are implemented resulting in a moderate residual impact. The cumulative impact is therefore acceptable.
- The footprint of the proposed development has a large, localised impact, while cumulatively the project poses regional water quality impacts and threat to SCC. There will be moderate significant loss of sensitive and significant aquatic features. The cumulative impact is therefore acceptable.
- There will be no unacceptable loss of land capability due to the development of the Xhariep Export Programme (XEP) Agricultural Development and other agricultural development projects within the surrounding areas, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable loss of heritage resources associated with the development of the Xhariep Export Programme (XEP) Agricultural Development. The cumulative impact is therefore acceptable.
- No unacceptable negative cumulative social impacts are expected to occur. Positive cumulative impacts will be of medium significance and are expected to be beneficial at a regional level. The cumulative impact is therefore acceptable.

All cumulative impacts associated with the Xhariep Export Programme (XEP) Agricultural Development will be of a medium or low significance, with impacts of a high significance associated with the visual impacts.

Assessment of No-go Alternative

The "no-development" alternative implies that the project does not proceed thereby maintaining the status quo. Environmental resources' current state is unaltered, therefore, their condition neither improves nor deteriorates. However, the implementation of this project has many benefits as indicated in this section of the report. The "no development" alternative has various negative and possible long-term impacts to the region which includes the local populations continue to suffer from food scarcity and consequently food insecurity due to lack of agricultural produce and a projected reduction in poverty levels. The no-development alternative would not comprise the development of the Xhariep Export Programme and

associated infrastructure across the Free State province and South Africa, but the socio-economic benefits to the Letsemeng Local Municipality and the communities will be lost. The establishment of the proposed project should be developed. However, the enhancement and mitigation measures proposed in this section of the report as well as in other specialist studies for this proposed development should be implemented.

Overall Conclusion & Recommendations

The preferred activity was determined by the applicant for an agricultural development consisting of cultivation of various crops (maize, wheat, soya, and nuts), centre pivot irrigation system, dams for storage irrigation water, solar PV, battery storage to supply energy on the farm, and a pump house and related network of pipelines to supply water to the centre pivot system. The centre pivot system is the preferred technology, because of to how the system efficiently spreads water onto growing crops and minimises the amount of water lost due to the wind and runoff. A technically viable development footprint was proposed by the developer and assessed as part of the EIA process. The assessment of the development footprint within the development area was undertaken by independent specialists and their findings have informed the results of this EIA Report.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level.

The specialist findings from the EIA studies undertaken have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the development area. The developer has designed a project development footprint in response to the identified sensitive environmental features and areas present within the development area. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e., tier 1 of the mitigation hierarchy).

The 'Very High' SEI areas identified through the ecological assessment are to be avoided and must be actively managed. Where pivots overlap minor drainage lines (also with Very High SEI), activity adjacent to these system is permissible, albeit only if the remaining channel extent is rehabilitated and actively managed. The dam located within the 'Very High' SEI areas is considered to be acceptable due to the technical requirement for the location of the dam in this area, without requiring additional earthworks and piping. The amount of hectarage lost within that portion of the site is deemed acceptable from an ecological perspective.

Feedback from the aquatic specialist has indicated the lower foothills of Lemoenspruit requires a buffer of 100m, and Lemoenspruit tributary network comprising non-perennial systems, ephemeral drainage lines and wetlands require a buffer of 50 m to ensure adequate ecological integrity maintenance adjacent to the proposed agricultural activities. The Heritage specialist recommended a no-impact buffer of 100m is implemented around each of burial ground sites to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The impacts that are expected to remain after the avoidance of the sensitive areas have been reduced through the recommendation of specific mitigation measures by the specialists. The minimisation of the significance of the impacts is in line with tier 2 of the mitigation hierarchy.

As detailed in the cost-benefit analysis, the benefits of the Xhariep Export Programme (XEP) Agricultural Development are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the agricultural development. From a social perspective, both positive and negative impacts are expected.

Through the assessment of the development footprint within the development area, it can be concluded that the development of the Xhareip Export Programme (XEP) Agricultural Development will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer, the avoidance of the sensitive environmental features within the development area, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Xhareip Export Programme (XEP) Agricultural Development, is acceptable within the landscape and can reasonably be authorised subject to buffer of 100m on Lemoenspruit and a buffer of 50m on the Lemoenspruit tributary network comprising non-perennial systems, ephemeral drainage lines as well as a 100m is implemented around each of burial ground sites to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

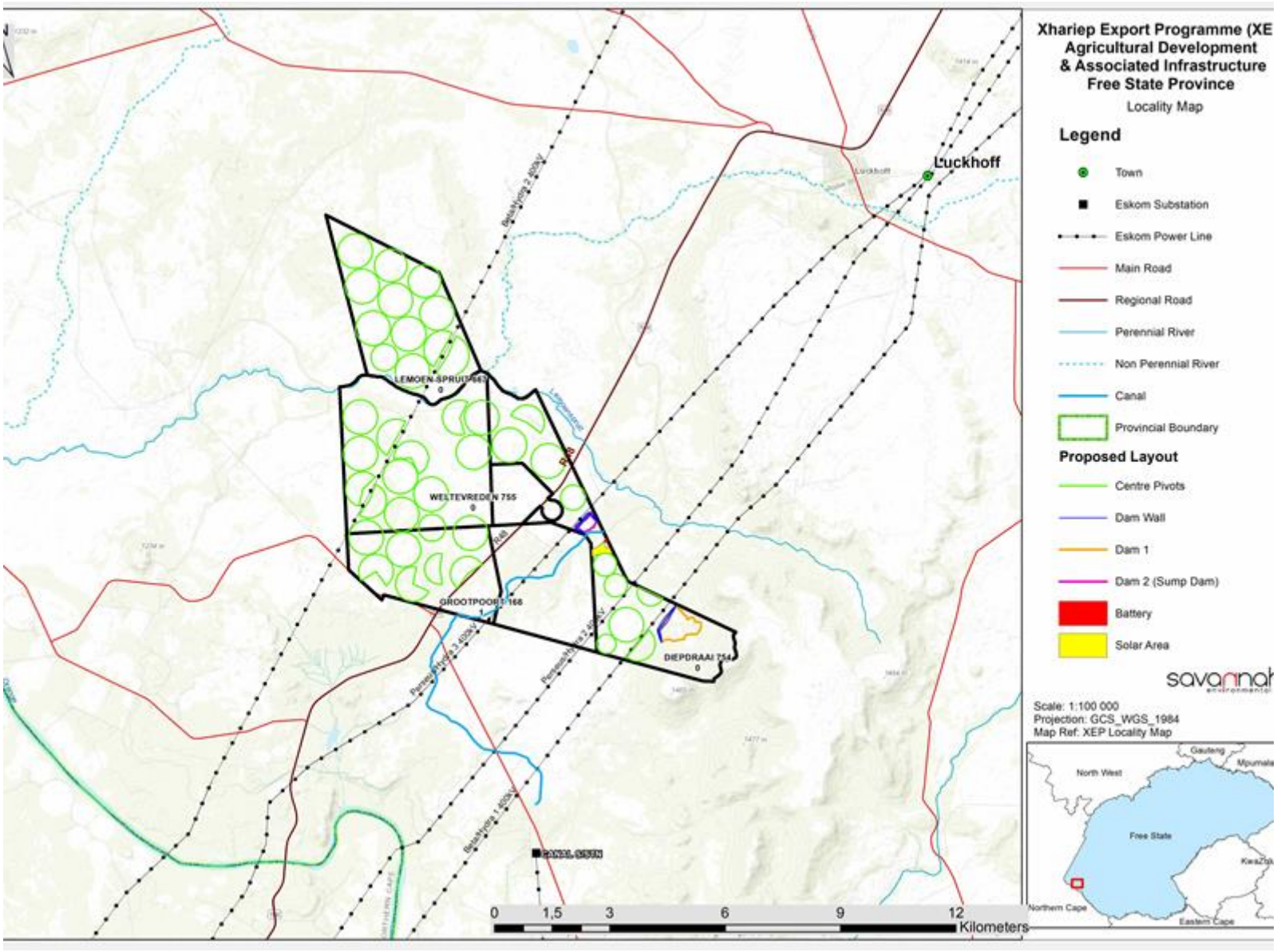

Figure 1: Locality map of the project site within which the Xhariep Export Programme (XEP) Agricultural Development is proposed to be developed

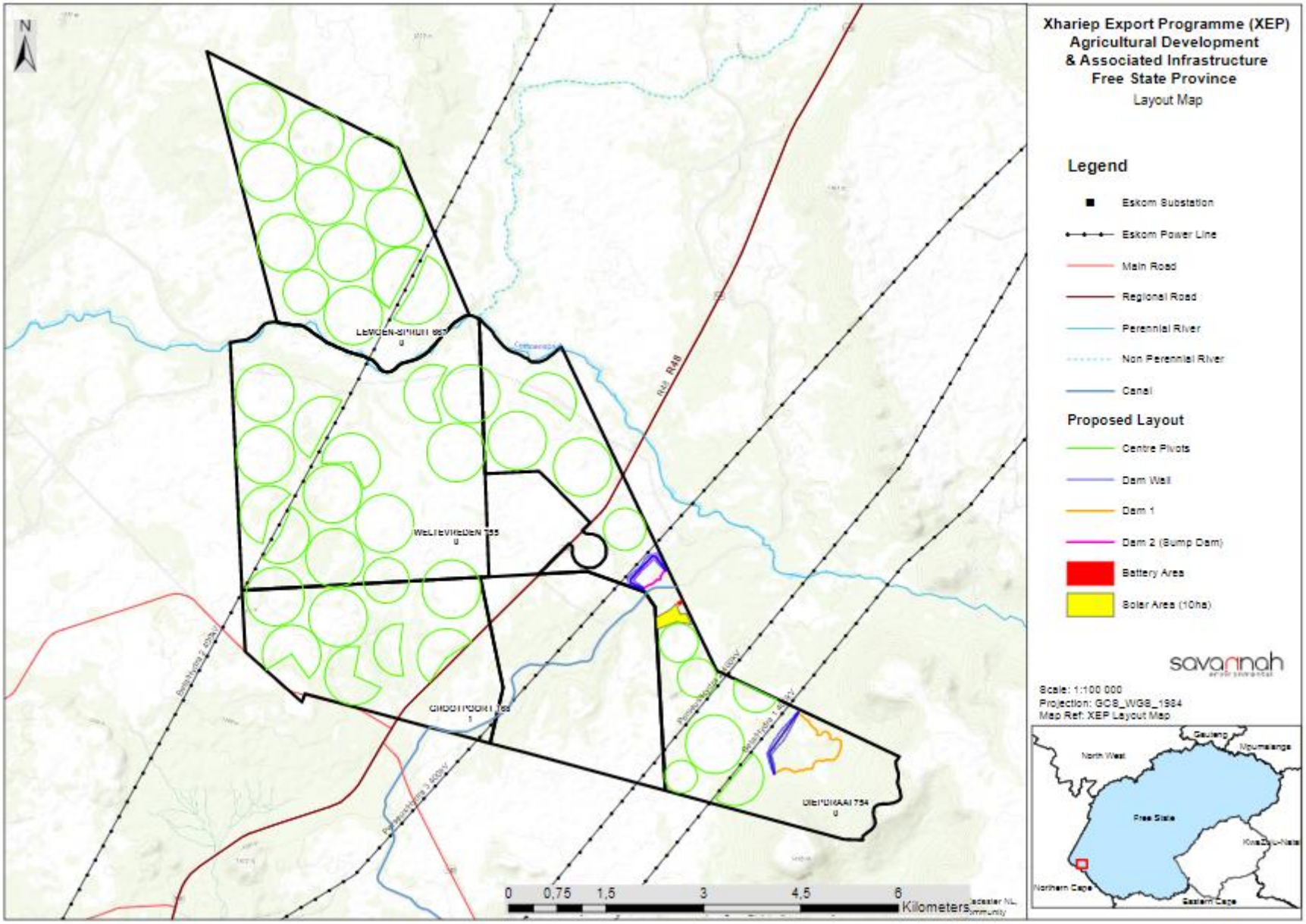

Figure 2: Proposed layout of the Xhariep Export Programme (XEP) Agricultural Development

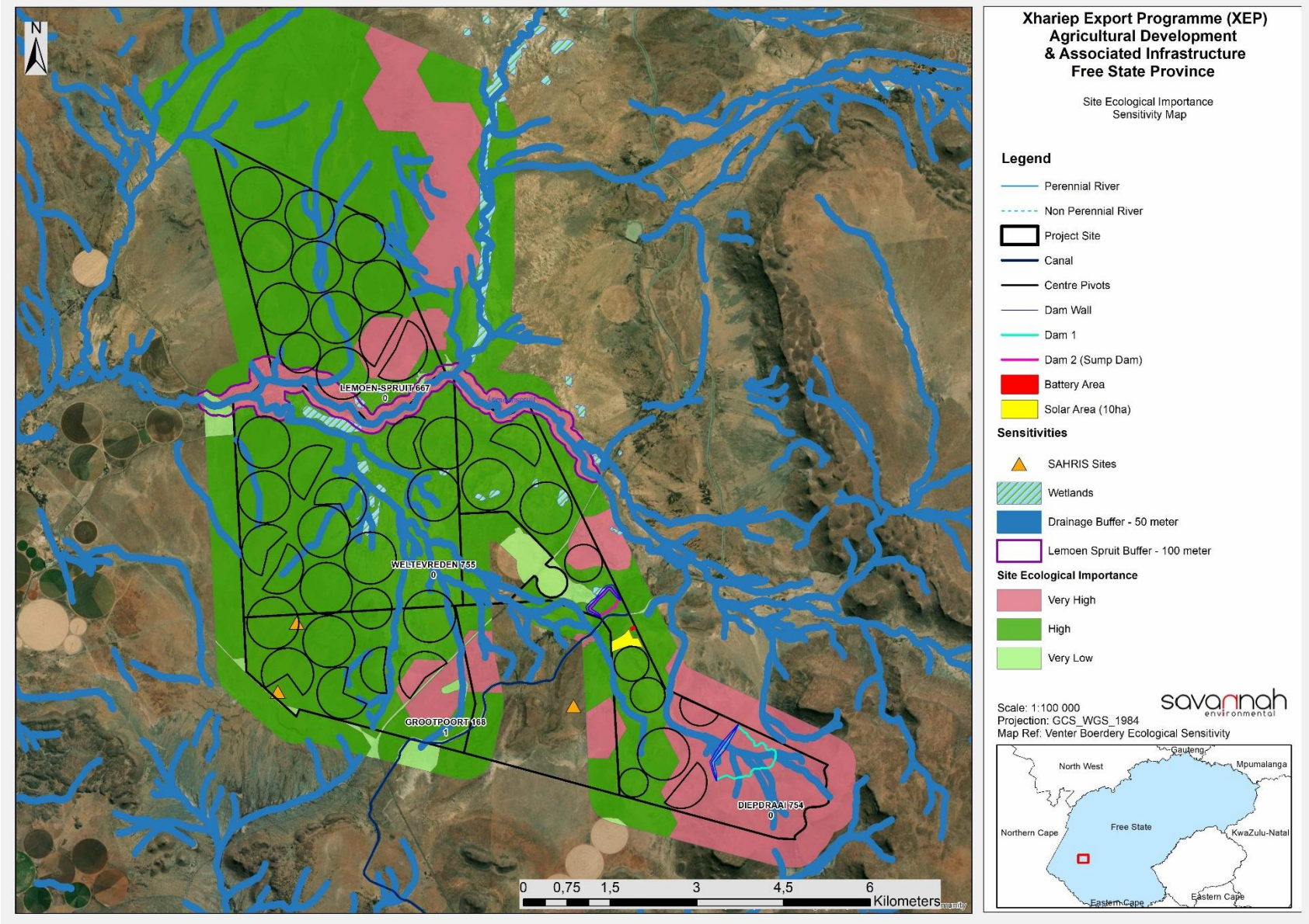

Figure 3: Environmental Sensitivity Map from the results of the for the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Centre Pivot Irrigation: A method of irrigation, in which water is dispersed through a long, segmented arm that revolves about a deep well and covers a circular area from a quarter of a mile to a mile in diameter.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Commercial Operation date: The date after which all testing and commissioning has been completed and is the initiation date to which the seller can start producing electricity for sale (i.e. when the project has been substantially completed).

Commissioning: Commissioning commences once construction is completed. Commissioning covers all activities including testing after all components of the wind turbine are installed.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Crops: A cultivated plant that is grown on a large scale commercially, especially a cereal, fruit, or vegetable.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of

impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method statement: A written submission to the ECO and the site manager (or engineer) by the EPC Contractor in collaboration with his/her EO.

Mitigation hierarchy: The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities

No-go areas: Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, this may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

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APPENDICES LIST

CHAPTER 1 : INTRODUCTION

Savannah Environmental has been appointed by JN Venter Beleggings Trust (Applicant and Landowner) to conduct an Environmental Impact Assessment (EIA) for the proposed Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure on a site located Southwest of Luckhof and Koffiefontein in the Free State Province. The development will take place within a project area of approximately 4690ha in extent across four (4) interlinked properties within the Letsemeng Local Municipality of the Xhariep District Municipality (refer to **Figure 1.1**).

The potential for agricultural development (crop cultivation) on the proposed site is apparent as several commercial agricultural developments are already occupying the neighbouring properties. The soil and climate are suited to crops cultivation, and it is anticipated that the crop yield and quality will be fit for export and domestic distribution.

1.1. Requirement for an Environmental Impact Assessment Process

Section 24 of South Africa's National Environmental Management Act (No. 107 of 1998) (NEMA) pertains to Environmental Authorisations (EA), and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the Competent Authority (CA). The 2014 Environmental Impact Assessment (EIA) Regulations, as amended (GNR 326) published under NEMA prescribe the process to be followed when applying for Environmental Authorisation (EA), while the Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)) contain those activities which may not commence without Environmental Authorisation from the Competent Authorisation.

As the project has the potential to impact on the environment, an Environmental Authorisation (EA) is required from the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) subject to the completion of a full Scoping and Environmental Impact Assessment (S&EIA) process, as prescribed in Regulations 21 and 24 of the 2014 EIA Regulations (GNR 326), as amended. The requirement for EA subject to the completion of a full S&EIA process is triggered by the inclusion of, amongst others, Activity 15 of Listing Notice 2 (GNR 325), namely:

"The clearance of an area of 20 hectares or more of indigenous vegetation."

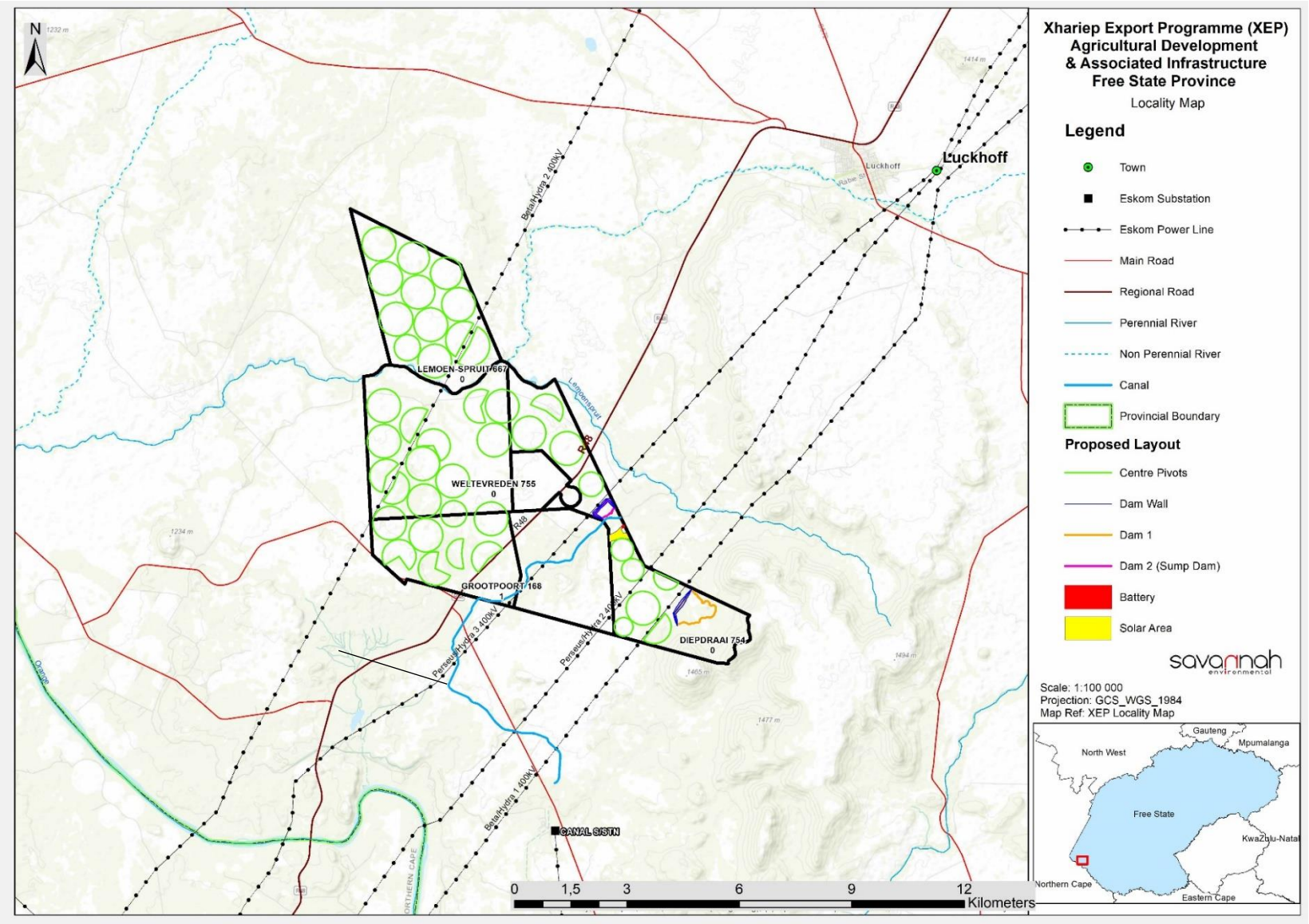


Figure 1.1: Locality map of the project site within which the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure is proposed to be developed (Canal Not part of this development) (refer to **Appendix I** for A3 Map).

1.2. Legal Requirements as per the EIA Regulations, 2014 (as amended) for the undertaking of an Impact Assessment Report

This EIA Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (and amended on 07 April 2017) promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No 107 of 1998). This chapter of the EIA Report includes the following information required in terms of Appendix 3: Scope of Assessment and Content of Environmental Impact Report:

Requirement	Relevant Section
3(1)(a)(i) the details of the EAP who prepared the report and (ii) the expertise of the EAP to carry out scoping procedures; including a curriculum vitae	The details of the EAP and the expertise of the EAP have been included in **section 1.5**. The Curriculum vitae of the Savannah Environmental team have been included as **Appendix A**.
3(1)(b) the location of the activity, including (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties	The location of the project site proposed for the development of the Xhariep Export Programme (XEP) Agricultural Development is included as **Figure 1.1**. The details of the affected properties, including the property names and numbers, as well as the SG-codes are included in **Table 1.1**.
3(1)(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is (i) a linear activity, a description, and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken	The locality of the project site is illustrated on a locality map included as **Figure 1.1**. The centre point co-ordinates of the project site are included in **Table 1.1**.

This draft EIA Report consists of ten chapters, as follows:

- **Chapter 1** provides background to the Xhariep Export Programme (XEP) Agricultural Development and the EIA process.
- **Chapter 2** provides a description of the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure.
- **Chapter 3** provides the site selection information, identified project alternatives.
- **Chapter 4** describes the need and desirability of the agricultural development and the associated infrastructure within the project area.
- **Chapter 5** outlines the relevant applicable regulations for agricultural development and the associated infrastructure in South Africa, and specifically for the proposed site.
- **Chapter 6** outlines the process which was followed during the EIA process.
- **Chapter 7** describes the existing biophysical and socio-economic environment affected by the proposed development.
- **Chapter 8** provides a description and assessment of the potential direct, indirect and cumulative impacts associated with the proposed Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure.
- **Chapter 9** presents the conclusions and recommendations based on the outcomes of the EIA Report.
- **Chapter 10** provides references used in the compilation of the EIA Report.

1.3. Project Overview

JN Venter Beleggings Trust has identified a developable project area with an extent of ~ 4276.32ha as a suitable area for the proposed agricultural development and the associated infrastructure.

The proposed agricultural development will entail the following:

- Developmental of center pivot areas (cultivation and irrigation) which is planned to take approximately 2690ha or more within the project site.
- Two irrigation water storage dams, with a combined surface area of 82ha in extent
- Establishment of internal irrigation pipeline network from the irrigation dams to the centre pivot areas.
- A new pump station taking a total surface area of 549m^2.
- A 5MW solar PV facility occupying an area of 10ha, and an associated overhead power line of ~6.9km in length.
- A Battery Energy Storage System covering a surface area of 0.36ha

The development area will affect the following properties:

- Farm Diepdraai 754
- Farm Weltevreden 755
- Farm Lemoen-spruit 667
- Portion 1 of the Farm Grootpoort 168

During the Scoping Phase, the full extent of the development area was considered by the specialist assessments, with the aim of determining the suitability from an environmental and social perspective and identifying areas that should be avoided in development planning. Based on the specialist assessments undertaken during the Scoping Phase, areas of environmental sensitivity were identified within the development area.

In order to avoid these areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the developer identified a suitable developable area for further assessment. Within this identified development area, a development footprint[1] or development layout has been defined for assessment in the EIA Phase. The proposed site size is larger than what will be used by the proposed development, and this gives the opportunity for the optimal placement of infrastructure, ensuring avoidance of major identified environmental sensitivities or constraints identified through the Scoping and EIA process.

Table 1.1: Detailed description of the Xhariep Export Programme (XEP) Agricultural Development project area

Province	Free State Province
District Municipality	Xhariep District Municipality
Local Municipality	Letsemeng Local Municipality
Ward Number (s)	Ward 1

1 The development footprint is the defined area (located within the development area) where the proposed infrastructure is planned to be developed. This is the actual footprint of the development, and the area which would be disturbed.

Nearest town(s)	Luckhof (~13km north- east)
Affected Properties: Farm name(s), number(s) and portion numbers	(i) Farm Diepdraai 754 (ii) Farm Weltevreden 755 (iii) Farm Lemoen-spruit 667 (iv) Portion 1 of the Grootpoort 168
SG 21 Digit Code (s)	» F01100000000066700000 - Farm Lemoen- spruit 667 » F01100000000075500000 - Farm Weltevreden 755 » F01100000000075400000 - Portion 3 of Farm Diepdraai 754 » F01100000000016800001 – Portion 1 of the Farm Grootpoort
Current zoning	Agriculture
Site Coordinates (centre of project area)	29°50'26.38"S; 24°41'59.10"E

1.4. Overview of the Environmental Impact Assessment (EIA) Process

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues and allows for the resolution of the issues reported on in the Scoping and EIA reports as well as dialogue with interested and affected parties (I&APs).

The EIA process comprises of two (2) phases (i.e., Scoping and Impact Assessment) and involves the identification and assessment of potential environmental impacts through the undertaking of independent specialist studies, as well as public participation. The processes followed in these two phases are as follows (refer to **Figure 1.2**):

» The **Scoping Phase** includes the identification of potential issues associated with the project through a desktop study (considering existing information), limited field work and consultation with interested and affected parties and key stakeholders. This phase considers the broader project site in order to identify and delineate any environmental fatal flaws, no-go and / or sensitive areas. Following a public review period of the Scoping report, this phase culminates in the submission of a final Scoping Report and Plan of Study for the EIA to the Competent Authority for consideration and acceptance. The Scoping Report was accepted, and the Plan of Study approved by the DESTEA on 10 August 2022.

» The **EIA Phase** involves a detailed assessment of the potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint within the project area and includes detailed specialist investigations as well as public consultation. Following a public review period of the EIA Report, this phase culminates in the submission of a final EIA Report and an Environmental Management Programme (EMPr), including recommendations of practical and achievable mitigation and management measures, to the Competent Authority for final review and decision-making.

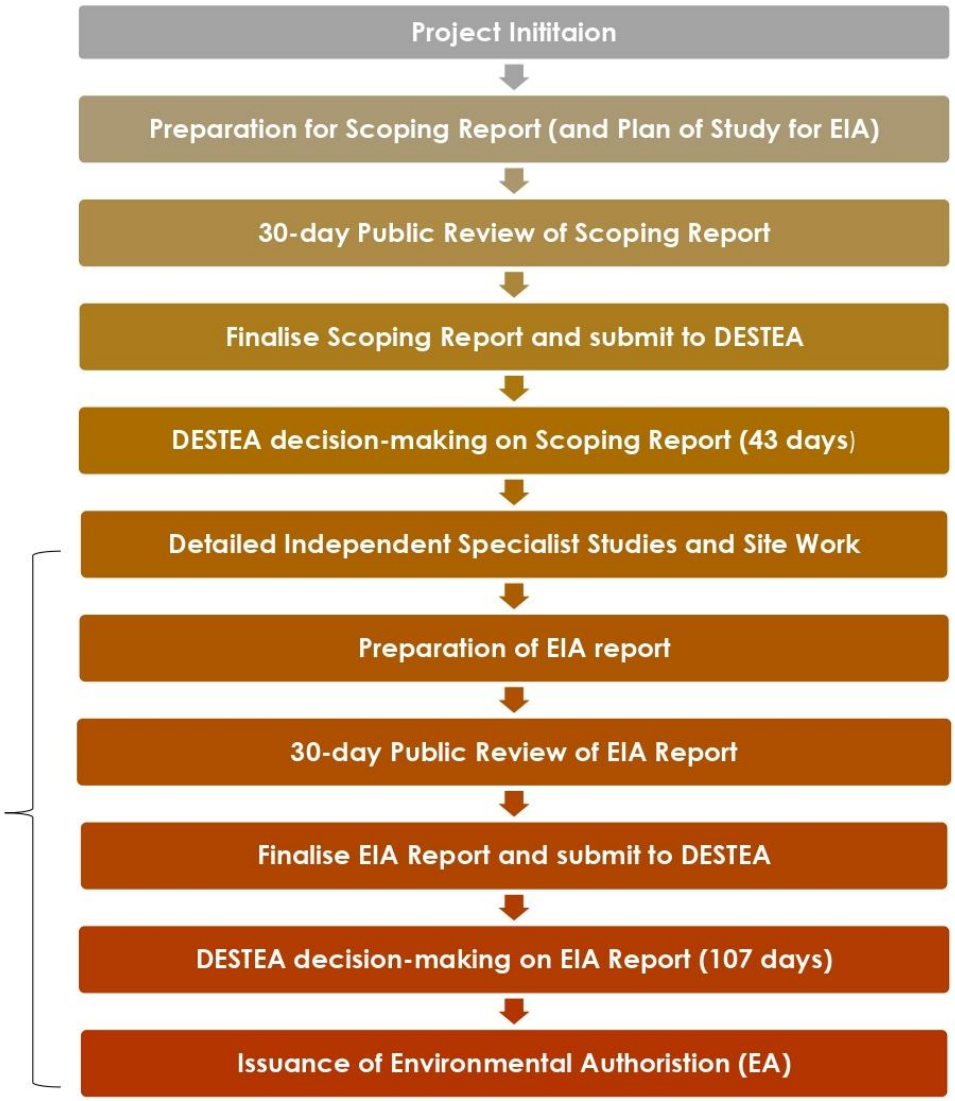


Figure 1.2: Regulated timeframe of an Environmental Impact Assessment (EIA) Process

1.5. Details of Environmental Assessment Practitioner and Expertise to conduct the S&EIA Process

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326), JN Venter Beleggings Trust has appointed Savannah Environmental (Pty) Ltd as the independent Environmental Assessment consultant responsible for managing the Application for EA and supporting Scoping and Environmental Impact Assessment (S&EIA) process; inclusive of comprehensive, independent specialist studies. The application for EA and S&EIA process will be managed in accordance with the requirements of NEMA, the 2014 EIA Regulations (GNR 326), and all other relevant applicable legislation.

Neither Savannah Environmental nor any of its specialists are subsidiaries or are affiliated to the applicant. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed development.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment, and planning to ensure compliance and evaluate the risk of development, and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team have considerable experience in environmental management and have been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa over the past 16 years. The Savannah Environmental project team includes:

» **Candy Mahlangu**, the principal author of this EIA Report and holds a BA Degree in Environmental Management. Candy has 6 years of experience in the environmental management field. Her key focus is on undertaking environmental impact assessments, environmental permitting and authorisations, compliance auditing, water use licensing, public participation, environmental education, and environmental management programmes.

» **Jo-Anne Thomas**, the Project Manager on this project, is a registered EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA - 2019/726) and is a registered Environmental Scientist South African Council for Natural Scientific Professions as a Professional Natural Scientist (400024/00). She provides technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, Environmental Impact Assessment studies, environmental auditing and monitoring, environmental permitting, public participation, Environmental Management Plans and Programmes, environmental policy, strategy and guideline formulation, and integrated environmental management. Her key focus is on integration of the specialist environmental studies and findings into larger engineering-based projects, strategic assessment, and providing practical and achievable environmental management solutions and mitigation measures. Responsibilities for environmental studies include project management (including client and authority liaison and management of specialist teams); review and manipulation of data; identification and assessment of potential negative environmental impacts and benefits; review of specialist studies; and the identification of mitigation measures.

» **Nicolene Venter** is a Board Member of the IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.

In order to adequate identify and assess potential environmental impacts associated with the proposed Xhariep Export Programme (XEP) Agricultural Development, the following specialist sub-consultants have provided input into this draft EIA Report:

Specialist	Area of Expertise
Jan Jacobs of The Biodiversity Company	Biodiversity Impact Assessment
Andrew Husted and Ivan Baker of The Biodiversity Company	Aquatic Baseline & Impact Assessment
Matthew Mamera of The Biodiversity Company	Soil and Agricultural Assessment

Specialist	Area of Expertise
Jenna Lavin of CTS Heritage	Heritage Impact Assessment (including Archaeology and Palaeontology)
Nondumiso Bulunga and Molatela Ledwaba of Savannah Environmental and External Peer Review by Tony Barbour	Social Impact Study

Appendix A includes the curriculum vitae for the environmental assessment practitioners from Savannah Environmental and the specialist consultants.

CHAPTER 2 : PROJECT DESCRIPTION

This chapter provides an overview of the Xhariep Export Programme (XEP) Agricultural Development and details the project scope which includes the planning/design, construction, operation, and decommissioning activities required for the development. It must be noted that the project description presented in this Chapter may change to some extent based on the outcomes and recommendations of detailed engineering and other technical studies, the findings and recommendations of the EIA and supporting specialist studies, and any licencing, permitting, and legislative requirements.

2.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of an Environmental Impact Assessment Report

This chapter of the EIA Report includes the following information required in terms of the EIA Regulations, 2014, as amended - Appendix 3: Scope of Assessment and Content of the Environmental Impact Assessment Report:

Requirement	Relevant Section
3(1)(b) the location of the activity including (i) the 21-digit Surveyor General code of each cadastral land parcel, (ii) where available the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	The location of the proposed project is detailed in Chapter 1, **Table 1.1**, as well as **section 2.2.1** below.
3(1)(d)(ii) a description of the scope of the proposed activity, including a description of the activities to be undertaken including associated structures and infrastructure	A description of the activities to be undertaken with the development of project is included in **Table 2.1** and **Table 2.2**.

2.2 Nature and Extent of the Xhariep Export Programme (XEP) Agricultural Development

The Applicant, JN Venter Beleggings Trust, is proposing to develop the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure on a site located south-west of Luckhof in the Free State Province. The development will take place on a site of ~4690ha in extent across four (4) interlinked properties within the Letsemeng Local Municipality of the Xhariep District Municipality. The proposed project is in line with the surrounding land-use in the area. The potential for the proposed crop cultivation (i.e. maize, wheat, soya and possibly peanuts) is apparent as many commercial cultivation developments already occupy the general location. The soil and climate are suited to the proposed crop cultivation, and as a result the proposed development is anticipated to yield high volumes of quality crops for export and domestic distribution.

A Water use licence to abstract a maximum volume of 16 000 000 m^3/a, surface water from the Orange River via the Vanderkloof cannel within the Orange Water Management Area, for irrigation has been issued by the Department of Water Sanitation (DWS) for the proposed development. This will allow JN Venter Beleggings Trust to be able to irrigate the proposed cultivation crops which will be planted in rotation within the broader properties. To ensure sufficient and efficient irrigation is practiced, a centre pivot irrigation system is proposed for the irrigation of the cultivated areas and a pipeline network is

proposed to take water from the proposed dams within the site to the various centre pivot areas. (Refer to **Appendix O** for the Water Use Licence).

In order to provide a sustainable power supply for the development, JN Venter Beleggings Trust proposes a 5MW solar PV area. A battery system will be used to store any additional power generated by the Solar PV energy facility for use and as a backup when the PV facility is not operational.

Figure 2: Typical centre pivot irrigation farming (source https://en.wikipedia.org/wiki/Center-pivot_irrigation#/media/File:PivotIrrigationOnCotton.jpg).

2.2.1. Overview of the Project Site

The project is to be developed across four (4) interlinked properties (farm portions) located approximately 7km south-west of Luckhof in the Free State Province. The area falls within Ward 01 of the Letsemeng Local Municipality within Xhariep District Municipality of the Free State Province. The full extent of the project area (i.e., ~4690ha), located within the various properties has been considered within this EIA process, within which the Xhariep Export Programme (XEP) Agricultural Development will be appropriately located from a technical and environmental sensitivity perspective.

The development area includes the following four (4) affected properties:

- Portion 3 of Farm Diepdraai 754
- Farm Weltevreden 755
- Farm Lemoen- spruit 667
- Portion 1 of the Farm Grootpoort 168

The site is accessible via the R48 road which passes directly through the centre of the proposed site. (Refer to **Figure 2.1**).

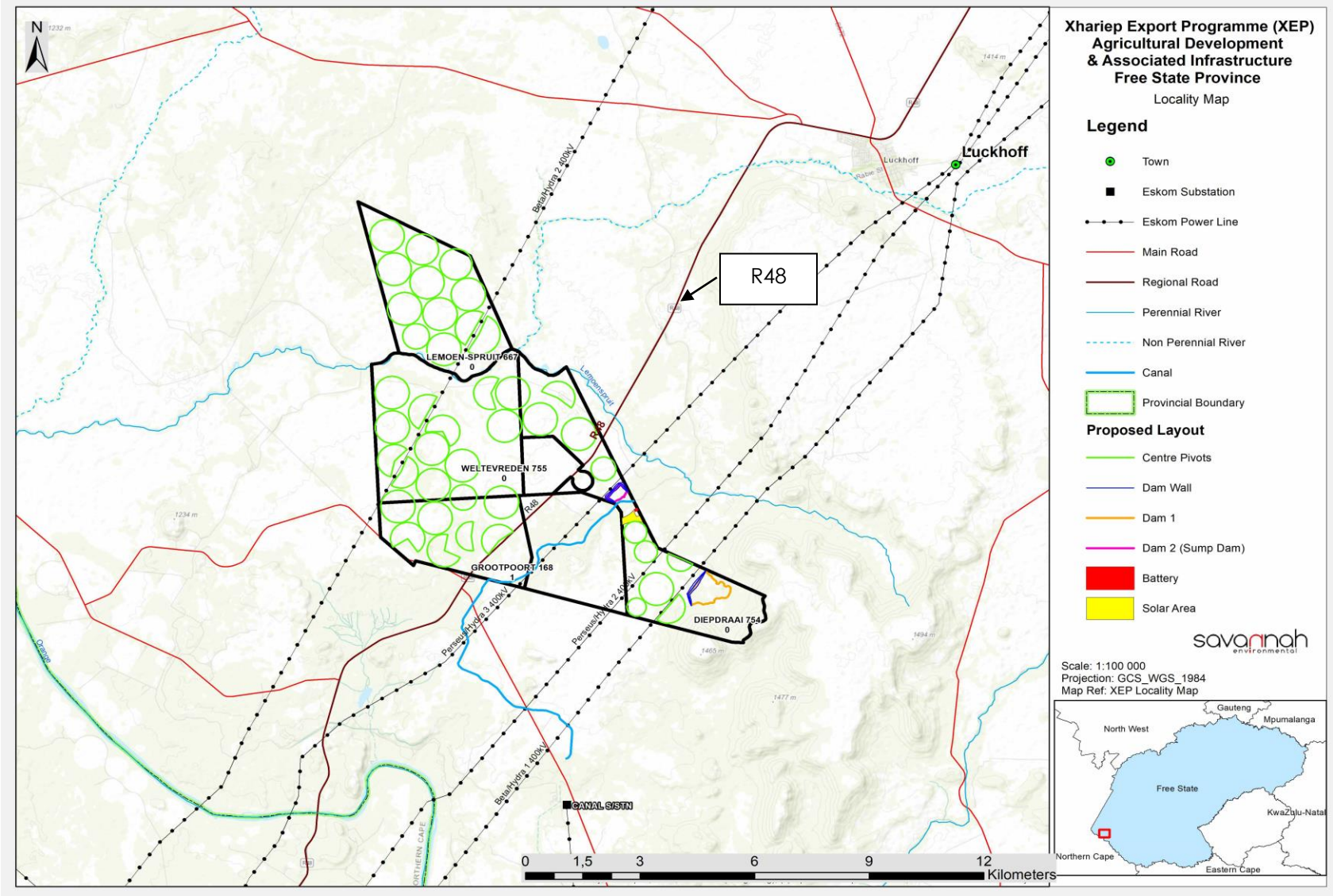


Figure 2.1: Location of the R48 in relation to the Xhariep Export Programme (XEP) Agricultural Development

2.2.2. Components of the Xhariep Export Programme (XEP) Agricultural Development

The project area is proposed to accommodate the agricultural development (cultivation), as well as most of the associated infrastructure, which is required for such development, and this will include:

- Development of centre pivot areas (cultivation and irrigation) which is planned to take approximately 2690ha or more within the project site.
- Two irrigation water storage dams, with a combined surface area of 82ha in extent.
- Establishment of an internal irrigation pipeline network from the irrigation dams to the centre pivot areas.
- A new pump station taking a total surface area of 549m^2.
- A 5MW solar PV facility occupying an area of 10ha.
- A Battery Energy Storage System covering a surface area of 0.36ha.

A summary of the details and dimensions of the planned infrastructure associated with the project is provided in **Table 2.1.**

Table 2.1: Details or dimensions of typical infrastructure required for the agricultural development

Infrastructure	Footprint and dimensions
Total extent of the development	~4276.32ha
Centre pivot (Cultivation and irrigation system)	2690ha
Irrigation pipeline network	Internal irrigation pipeline network to take water from the dams to the various centre pivot areas for irrigation purposes
Dams for irrigation water	» Dam 1 – Diepkloof (Diepdraai) » Dam 2 – (Sump) **See below for the dam dimensions**
A pump station	One pump station covering a total surface area of 549m^2
5MW Solar PV facility	» 10ha surface area with three alternative sites being considered
Battery	A battery energy storage system to store additional power generated by the PV Facility covering an area of 0.36ha

Table 2.1a: Dimensions of the dams

Dam	Maximum wall height	Wall volume	Capacity	Water Area	Development footprint
Dam 1 – (Diepdraai)	17m	503250m^3	3.1 million m^3	58 ha	63 ha
Dam 2 – (Sump):	14m	426000m^3	1.0 million m^3	14 ha	19 ha

Table 2.2 below provides details regarding the requirements and the activities to be undertaken during the Xhariep Export Programme (XEP) agriculture development phases (i.e., construction phase, operation phase and decommissioning phase).

2.2.3 Project Development Phases Associated with the Xhariep Export Programme (XEP)Agricultural Development

Table 2.2: Details of the Xhariep Export Programme (XEP) agricultural project development phases (i.e., construction, operation, and decommissioning)

Construction Phase	
Requirements	» Environmental Authorisation from the DESTEA » Construction period is expected to be 24 months » No on-site labour camps. Employees to be accommodated in the nearby towns such as Luckhof and Koffiefontein, to be transported to and from site on a daily basis. » Overnight on-site worker presence (if any) would be limited to security staff. » Waste removal and sanitation will be undertaken by a sub-contractor, where possible. Waste containers, including containers for hazardous waste, will be located at easily accessible location on site when construction activities are undertaken. » Electricity required for construction activities will be generated by a generator. » Create construction employment opportunities. » Services required during the development process, such as rental of chemical toilets, plant hire, etc. to be sourced from the local area, i.e. from within approximately 50km (where possible) of the site, in order to support the local economy. » Water required during the construction phase (for dust control during the ploughing phase) will be sourced from the canal and water for consumption by the workers will be municipality water.
Activities to be undertaken	
Conduct surveys prior to construction	» Including, but not limited to, site survey and confirmation of the development footprint, and survey to determine and confirm the locations of all associated infrastructure.
Establishment of internal farm roads around the site	» Internal farm roads within the site will be established at the commencement of construction. » Existing access roads will be utilised, where possible, to minimise impact.
Undertake site preparation	» Clearance of vegetation at the footprint of each proposed development activity. » Soil preparation for ploughing, earthworks for the dams and pipeline trench digging. » Stripping of topsoil to be stockpiled, backfilled, removed from site and/or spread on site. » To be undertaken in a systematic manner to reduce the risk of exposed ground being subjected erosion.
Establishment of laydown areas on site	» A laydown area for the storage of water pipes, pivot components, PV components, battery system components, construction equipment and construction/ farm machinery. » The laydown will also accommodate equipment and materials associated with the construction of the dams, pipeline, BESS, cementing of centre pivot areas, pump station and Solar PV facility.
Construct foundation	» Excavations of the dam basins and pipeline route to be undertaken mechanically. » Concrete foundation and slabs will be constructed to support a pivot irrigation system, pump house, support the PV panels structures, and the battery energy storage system.
Transport of components and equipment to and within the site	» Civil engineering construction equipment to be brought to the site for the civil works (e.g., excavators, trucks, ploughing tractors, graders, compaction equipment, cement trucks, etc.). » Specialised construction and lifting equipment to be transported to site to erect the centre pivot irrigation system, solar panels and the battery storage system. » Components for the establishment of the agriculture associated infrastructures to be transported to site. » Transportation will take place via the R48 road that give access to the site and the

	dedicated access/haul road to the laydown areas.
Undertake site rehabilitation	» Commence with rehabilitation efforts in areas outside of the areas required for operation once construction completed in an area, and all construction equipment is removed. » On commissioning, access points to the site not required during the operation phase will be closed and prepared for rehabilitation.
Operation Phase	
Requirements	» Duration for the agricultural development and associated infrastructure will be 20-25 years. » Requirements for security and maintenance of the project. » Employment opportunities relating mainly to ploughing and harvesting activities.
Activities to be undertaken	
Operation and Maintenance	» Soil erosion from the bare areas (fallow lands) and within the crop areas may lead to siltation and sedimentation of watercourses, implement erosion control measures. » Application of pesticides / herbicides must be limited to the cultivated areas, and measures must be taken to limit drift of chemicals into surrounding natural areas and surface water. » Disposal of waste products (e.g., fertilizer, oils) in accordance with relevant waste management legislation.
Decommissioning Phase	
Requirements	» Decommissioning of the Xhariep Export Programme (XEP) Agricultural Development or any infrastructure at the end of its economic life. » Apply security measures and ensure that the specifications of the Occupational Health and Safety Act (1993) are adhered to. » Decommissioning activities to comply with the EMPr and legislation relevant at the time.
Activities to be undertaken	
Site preparation	» Confirming the integrity of site access to accommodate the required equipment to be used (if any required) » Preparation of the site (e.g., laydown areas and construction platform). » Mobilisation of construction equipment and machinery.
Disassemble and infrastructure	» Relevant machinery required for disassembling of the centre pivots, solar panels, battery storage system or emptying of the dams. » Components to be reused, recycled, or disposed of in accordance with regulatory requirements. » Cables and water pipes will be excavated and removed, as may be required » General rubble resulting from demolition of structures (e.g., cement slaps) be used as fill at nearby development sites (if any), or otherwise disposed of at a licensed landfill site.
Components to be disposed of or recycled	» Centre pivot components » Regarding the foundation body and sub-base of the structures the concrete will undergo crushing and be used as combined base/wearing course » Solar panels

CHAPTER 3 : CONSIDERATION OF ALTERNATIVES

This Chapter provides an overview of the various alternatives considered for the Xhariep Export Programme (XEP) agricultural development and associated infrastructure as required in terms of the EIA Regulations.

3.1 Legal Requirements as per the EIA Regulations, 2014 (as amended) for the undertaking of an Impact Assessment Report

This chapter of the EIA Report includes the following information required in terms of Appendix 3: Content of the Environmental Impact Assessment Report:

Requirement	Relevant Section
3(1)(h)(i) details of the alternative considered	The details of all alternatives considered as part of the Xhariep Export Programmes (XEP) Agricultural Development and associated infrastructures are included in **sections 3.3.1 – 3.3.5**.
3(1)(h)(ix) the outcome of the site selection matrix	The site selection process followed by the developer in order to identify the preferred project site and development area is described in **section 3.3.1**.
3(1)(h)(x) if no alternatives, including alternative locations for the activity were investigation, the motivation for not considering such	Where no alternatives have been considered, motivation has been included. This is included in **section 3.3**.

3.2 Alternatives Considered

In accordance with the requirements of Appendix 3 of the Environmental Impact Assessment (EIA) Regulations (GNR 326) as amended, reasonable and feasible alternatives including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered.

3.2.1. Consideration of Fundamentally Different Alternatives

Fundamentally different alternatives are usually assessed at a strategic level and, as a result, project specific EIAs are therefore limited in scope and ability to address fundamentally different alternatives. The developer identified agricultural development using centre pivot irrigation as the preferred irrigation technology solution. For this agricultural development, it is recommended that the development take place within a similar land usage whereby there are other similar activities going on in the area. Other land uses were not chosen for the proposed project because it is not going to be best fit and the anticipated success of the project was not deemed viable in any other area/land uses.

3.2.2. Consideration of Incrementally Different Alternatives

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to the proposed activities, means different ways of meeting the general purposes and requirements of the activities, which may include alternatives for:

» The property on which, or location where the activity is proposed to be undertaken.

- The type of activity to be undertaken.
- The design or layout of the activity.
- The technology to be used in the activity.
- The operational aspects of the activity.

In addition, the option of not implementing the activity (i.e., the "do-nothing" alternative) must also be considered.

The sections below describe the incrementally different alternatives being considered as part of the Xhariep Export Programme (XEP) Agricultural Development. Where no alternative is being considered, a motivation has been provided as required by the EIA Regulations, 2014 (as amended).

3.3. Project Alternatives under Consideration for the Xhariep Export Programme (XEP) Agricultural Development and Associated Infrastructure

3.3.1. Property or Location Alternatives

One preferred project site of approximately 4276.32ha in extent (extending through across four (4) properties) has been identified for the development of the Xhariep Agricultural Development considering criteria such as, water availability, land availability, topographical consideration, and environmental features. The developable project area of ~4690ha in extent has been identified within the broader project site and will span across the 4 affected properties as one project to accommodate all the proposed associated infrastructures. A project layout within this development area has been provided by the Applicant and has been assessed in this EIA Report.

The selection of the affected properties was based on the following:

- **Land Availability:** To develop the proposed agricultural development with the associated infrastructure to support the development, sufficient space is required. The proposed development is proposed to take place across four (4) interlinked properties owned by the Applicant. The combination of the affected properties has an extent of ~4276.32 ha, which was considered by the developer as sufficient for the development of the agricultural development. Much of the proposed development area has already been transformed by grazing. A preferred development site of ~4690ha within this larger project area has been identified for the location of the agricultural development and the associated infrastructures. A development footprint within the development area for the placement of each of the proposed development activities will be identified and assessed as part of the EIA Phase considering environmental constraints and sensitivities.

- Land Use, Geographical and Topographical Considerations: The character of the greater area surrounding the project site can be described as a rural, Northern Upper Karoo landscape characterised by livestock and crop farming. There are a number of farms located in the vicinity of the site in the south-west of the proposed site. Most of the farming activities are taking place along the Orange River. The land use identified within the greater area surrounding the project site (i.e. cultivation) is in line with the proposed agricultural development. The agricultural potential of the soils on the site further supports the feasibility of the proposed development.

The topography of the affected properties is characterised by a moderately flat to undulating landscape interspaced with areas of high elevation in the form of hills, koppies, ridges and/or mountains. A range of located hilly/mountainous topography with high elevations can be found to the south-east and north- east of the site respectively. This serves as physical constraints to cultivate certain parts of the affected properties. Thus, the proposed developable site is located on a topography which permits the proposed development and establishment of the supporting infrastructure.

» Site access: Access to the project site is via the R48 road which passes through the centre point of the project site.

» Water availability: The Vanderkloof cannel is located between the dams where surface water will be abstracted from the Orange River within the Orange River Water Management Area, for irrigation. It is not anticipated that more water abstraction allocation will be required, the existing water allocation authorised by the Department of Water and Sanitation is considered sufficient.

3.3.2. Design and Layout Alternatives

The larger area identified by the Applicant has been considered in this EIA Report. Alternative locations of the irrigation dams and PV facility have been considered.

Following the confirmation of the JN Venter Beleggings Trust preferred project site as being technically feasible for the proposed Xhariep Export Programme (XEP) Agricultural Development. The developer commenced with the scoping assessment of the site to evaluate the main constraints and opportunities and determine whether or not there are any fatal flaws or significant no-go areas within the site that might compromise or limit the development of the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure. The scoping process included specialist investigations of a broader area based on desktop studies and where possible, field assessments.

The purpose of this phase of the project was to identify sensitive and no-go areas, as well as to determine appropriate buffers to be considered within the development of the project layout. The sensitivity spatial data as compiled by the specialist team during the Scoping Phase for the project site was provided to the applicant to inform the layout to be assessed within the EIA Phase of the process.

Through integration of the specialist sensitivity data obtained, based on field-survey and desktop studies, as well as consideration of technical aspects, the developer designed the layout to avoid areas and features of high environmental sensitivity. Where avoidance was not possible, appropriate mitigation and management measures (based on recommendations from the various environmental specialists) have been proposed for implementation during the construction and operation of the proposed development. This has resulted in the consideration of a development footprint as part of the EIA process which is designated to be environmentally appropriate as far as possible.

An overall environmental sensitivity map has been provided in order to illustrate the sensitive environmental features located within the project site which needs to be considered and, in some instances completely avoided by the development footprint (refer to Chapter 8).

3.3.3. Activity Alternatives

JN Venter Beleggings Trust is considering agricultural development consisting of cultivation of various crops (maize, wheat, soya, and nuts), centre pivot irrigation system, dams for storage irrigation water, solar PV, battery storage to supply energy on the farm, and a pump house and related network of pipelines to supply water to the centre pivot system. Only the proposed agricultural development and all the supporting infrastructures are considered in the ambit of this EIA. The project proposal is furthermore in line with surrounding land use, which comprises of existing cultivated land and associated infrastructure.

3.3.4. Technology Alternatives

Only the use of a centre pivot irrigation system is considered due to how such a system efficiently spreads water onto growing crops. Centre pivots deliver water as close to the ground as possible and minimises the amount of water lost due to the wind and runoff. The centre pivot irrigation system is considered the most efficient technology given the magnitude of the proposed agricultural development proposed by the Applicant.

With the challenges associated with power supply in South Africa, the use of solar energy generated on site is considered to be the most suitable renewable energy technology for this proposed development, based on the site location, ambient conditions and renewable energy resource availability. The operating hours of the PV facility can be effectively extended through the inclusion of a Battery Energy Storage System (BESS).

Inclusion of the storage irrigation dams is very important for the agricultural development as it will enable availability of irrigation water at the times when the canal is closed for maintenance. The Sump Dam needs to be below the canal for gravity feed from the canal into the dam. The Sump Dam is partially for storage as well as buffer storage while water can be pumped to the Large Dam which will serve as primary storage. The position of the large dam is placed at the highest area so that the largest possible area can be irrigated under gravity pressure to avoid additional pumping(electricity) cost.

The standard methodology for an off-stream balancing dam of the proposed sizes is an earthfill structure established through cut and fill.

No further technology alternatives are investigated.

3.3.5. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing and operating the Xhariep Export Programme (XEP) agricultural development and supporting infrastructure. Should this alternative be selected, there would be no environmental impacts or benefits as a result of construction and operation activities associated with the agricultural development facility. The 'do-nothing' alternative will therefore likely result in minimising the cumulative impact on the land, although it is expected that pressure to develop the site for agricultural purposes will be actively pursued due to the potential of the land for such activities and the surrounding land uses. The 'do-nothing' alternative has been assessed as part of this draft EIA Phase. (Refer to **Chapter 8** of this EIA Report).

CHAPTER 4 : NEED AND DESIRABILITY

Appendix 3 of the 2014 EIA Regulations (GNR 326) requires that an EIA Report includes a motivation for the need and desirability of the proposed development, including the need and desirability of the activity in the context of the preferred location. The need and desirability of the development needs to consider whether it is the right time and the right place for locating the type of land-use/activity being proposed. The need and desirability of a proposed development is, therefore, associated with the wise use of land, and should be able to respond to the question such as, but not limited to, what the most sustainable use of the land may be.

Legal Requirements as per the EIA Regulations, 2014 (as amended) for the undertaking of an Impact Assessment Report

This chapter of the EIA Report includes the following information required in terms of Appendix 3: Content of the Environmental Impact Assessment Report:

Requirement	Relevant Section
3(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	The need and desirability for the development of the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure is included and discussed within this chapter. The need and desirability for the development of the agricultural development has been considered from a regional and site-specific perspective.

4.2. Motivation, Need and Desirability of the project

The agricultural sector is dominating the Free State province landscape and the Xhariep District Municipality in which the proposed site is located is characterized by extensive agricultural activities such as the cultivation of various crops. About 40% of the total national white maize production is mainly used for human consumption, and 38% of yellow maize, mainly used for animal feed, is produced in the Free State. In addition, soybean, sorghum, sunflower, and wheat are cultivated in the Free State, where farmers also specialise in seed production (Agmip Impacts Explorer information access: https://agmip-ie.wenr.wur.nl/web/guest/free-state-s.-africa). The mission of the Free State Department of Agriculture and Rural Development is to leverage available resources and technologies to optimise productivity and accelerate economic growth in the agriculture sector. The proposed project aims to contribute towards this goal and to play a role in job creation and food security within the Province and South Africa as a whole.

The proposed agricultural development is in line with the surrounding land use and that of the province. The potential for the proposed crops (maize, wheat, soy, and peanuts) to be cultivated on the site by the Applicant is apparent as many large-scale commercial agricultural developments exist within the province and the local region. The soil and climate in the area are suited for crop cultivation and are anticipated to yield a high volume of quality crops for export and domestic distribution.

The Xhariep District Municipality remains one of the poorest municipalities in the province and having this agricultural development in the area is likely to contribute to job opportunities and growth in the local economy of the municipality by increasing the disposable income of community members working on the farm. Growth is expected to occur and is likely to contribute to local economic development, as the workers are likely to spend most of their disposable income at local businesses. The associated infrastructures will also ensure that the agricultural development succeeds by ensuring that irrigation water is always available in the dams and that electricity is always available for use when it is required from the proposed solar PV facility and associated BESS.

4.3. Motivation for selected preferred alternatives for the infrastructure

In general, the placement of each proposed aspect of agricultural infrastructure as detailed in Chapter 2 is strongly dependent on several factors including climatic conditions (for the proposed crop cultivation and solar irradiation levels for the proposed solar PV), land capability, topography of the irrigation dams and cultivation sites), and the accessibility to the site.

The properties affected by the proposed development are all owned by the Applicant, who wishes to expand the existing cultivation in the area. The land is therefore available for the proposed activity. In terms of water supply, the small dam (Sump Dam) needs to be below the canal for gravity feed from the canal into the dam. The Sump Dam is partially for storage as well as buffer storage while water can be pumped to the Large Dam which will serve as primary storage. The position of the large dam is placed at the highest area so that the largest possible area can be irrigated under gravity pressure to avoid additional pumping (electricity) cost.

The preferred positions for the placement of the proposed irrigation dams, was selected due to their ability to accommodate the desired storage capacity of these dams and their proximity to the abstraction point (i.e. the canal), and the centre pivot sites where the water will be required for irrigation. Also, the natural topography favours the construction of dam embankments here as suitable dam foundation conditions are found in the preferred sites as identified by the Applicant.

4.4. Conclusion

Taking into consideration the land capability and availability, access to site, the current land use of the project site and development area, the development of the Xhariep Export Programme (XEP)Agricultural Development is considered to be desirable at the proposed site.

CHAPTER 5 : POLICY AND LEGISLATIVE CONTEXT

This Chapter provides an overview of the policy and legislative context within which the proposed development of Xhariep Export Programme (XEP) Agricultural Development is required. It identifies environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment processes which may be applicable to or have bearing on the proposed project.

5.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of an Impact Assessment Report

This chapter of the EIA Report includes the following information required in terms of the EIA Regulation, 2014 - Appendix 3: Content of Environmental Impact Assessment Report:

Requirement	Relevant Section
3(e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.	Chapter 5, as a whole, provides an overview of the policy and legislative context which is considered to be associated with the agricultural development. The regulatory and planning context has been considered at national, provincial and local levels.

5.1.1. The Strategic Plan for South African Agriculture, 2001

The pivot of agriculture in sustainable development in South Africa is the Strategic Plan for South African Agriculture, which was adopted by government, and organized agriculture. The strategic goal of the sector plan is: "*to generate equitable access and participation in a globally competitive, profitable and sustainable agricultural sector contributing to a better life for all*." The Strategic Plan for South African Agriculture is aimed at addressing key problems and challenges facing the sector through three core strategies: Enhance equitable access and participation in the agricultural sector; Improve global competitiveness and profitability; and ensure sustainable resource management. With reference to the strategic plan for agriculture, the Applicant proposes the development of pivot agriculture.

5.1.2. Agricultural Policy

The development of agriculture in South Africa is often viewed solely as the technical advance, in this century particularly, of large-scale commercial farming specialising in crop and animal production according to the prevailing natural resources and climatic conditions and taking advantage of both abundant low-cost labour and opportunities for mechanisation. The proponents of this view believe that agriculture can only contribute to the economy through a concentrated production structure such as the one currently existing. Accordingly, they believe that smaller and medium-scale agriculture, based upon diversified production, family labour and lower technologies, has little to offer in terms of aggregate production and incomes from farming.

The current dominance of the modern large-scale and technically successful farming model must be seen in the context of a century of policy measures which seriously distorted agricultural development in South Africa. This dominant model has some undeniable advantages, but in a country with high unemployment and food insecurity, it has serious limitations. In future, both efficiency and equity will call for a much greater diversity of farm sizes and technology in the sector, with large-scale commercial farming coexisting with small and medium-scale production.

National Policy and Planning Context

Any project which contributes positively towards the objectives mentioned within national policies could be considered strategically important for the country. A review of the national policy environment suggests that the agricultural development is considered integral to contributing towards social upliftment and economic development, even if only limited in extent.

A brief review of the most relevant national legislation and policies is provided in table format (**Table 5.1**) below. This considers both planning policy and relevant legislation under which environmental permitting may be applicable for the project.

Table 5.1: Relevant national legislation and policies for the Xhariep Export Programme - Agricultural Development and associated infrastructure

Relevant legislation or policy	Relevance to the proposed project
Constitution of the Republic of South Africa, 1996	Section 24 of the Constitution pertains specifically to the environment. It states that Everyone has the right to an environment that is not harmful to their health or well-being, and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. The Constitution outlines the need to promote social and economic development. Section 24 of the Constitution therefore requires that development be conducted in such a manner that it does not infringe on an individual's environmental rights, health, or well-being. This is especially significant for previously disadvantaged individuals who are most at risk to environmental impacts.
National Environmental Management Act (No. 107 of 1998) (NEMA)	The NEMA is South Africa's key piece of environmental legislation and sets the framework for environmental management in South Africa. The NEMA is founded on the principle that everyone has the right to an environment that is not harmful to their health or well-being as contained within the Bill of Rights. The national environmental management principles state that the social, economic, and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed, and evaluated, and decisions must be appropriate in the light of such consideration and assessment. The need for responsible and informed decision-making by government on the acceptability of environmental impacts is therefore enshrined within the NEMA. The EIA Regulations, 2014 (as amended) published in terms of Chapter 5 of

Relevant legislation or policy	Relevance to the proposed project
	NEMA include listed activities which require authorisation prior to commencement. This EIA process being undertaken for the EXP Agricultural Development includes an assessment of potential environmental impacts associated with the proposed project, and the EIA Report is submitted to the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) for decision-making.
National Forests Act (Act No. 84 of 1998)	According to this Act, the Minister may declare a tree, group of trees, woodlands or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'. Lists of these areas and trees already declared by the Minister of Forestry are available at http:// http://www.lawsofsouthafrica.up.ac.za/index.php/current-legislation An ecological assessment has been undertaken for the project and there are no protected trees that will require a permit.
National Environmental Management: Biodiversity Act (Act 10 of 2004)	Identifies that all people and organizations should act with due care to conserve and avoid negative impacts on biodiversity, and to use biological resources sustainably, equitably and efficiently. Biodiversity thus refers to the life-support systems and natural resources upon which we depend. NEM:BA was used to inform the potential for activities triggered by Listing Notice 3 (R. 324) in the 2014 NEMA Regulations as amended. In terms of the Free State Biodiversity Sector Plan (2016) the proposed development overlaps with Critical Biodiversity Area 1 (CBA1), Critical Biodiversity Area 2 (CBA2), Ecological Support Area 1 (ESA1) and Ecological Support Area 2 (ESA2) features.
Conservation of Agricultural Resource Act, 1983 (Act No 43 of 1983)	The purpose of the Conservation of Agricultural Resources Act No. 43 of 1983 (CARA) is to provide for control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants. The Act sets out measures to prevent the spread of alien vegetation. The legislation includes a list of alien and invasive species and the required measures to be taken in relation to these. The Act also provides for the regulation of control over the utilisation of agricultural resources in SA in order to promote the conservation of soil, water and vegetation (including wetlands). In accordance with the Act, authorisation is required to: i) drain or cultivate any vlei, marsh or water sponge; ii) cultivate any land within the flood area of a water course or within 10 m outside the flood-area of a water course; iii) divert run-off from a water course, or iv) burn veld, including wetland vegetation.

Relevant legislation or policy	Relevance to the proposed project
	Regulation GNR 1048 of 24 May 1984 (as amended): makes provision for the control of land through various measures, such as measures relating to the cultivation of virgin soil, the prevention of soil erosion, the prevention of the disturbance of natural flow patterns and run-off, prevention of bush encroachment and makes provision for the restoration of land resources. The Department of Agriculture, Land Reform & Rural Development issued a cultivation permit for the proposed development to cultivate 2690ha of virgin soil. Refer to **Appendix O**.
Water National Act (Act No 36 of 1998)	Water use is controlled by the National Water Act (Act no 36 of 1998) (NWA) and the enforcing authority is Department of Water Affairs (DWA). The NWA recognises that water is a scarce resource in South Africa and its provisions are aimed at achieving sustainable use of water to the benefit of all users. The provisions of the Act are thus aimed at discouraging pollution and waste of water resources. Section 21 includes water uses which require authorisation. This includes impeding on watercourses and wetlands, development within 500m of a wetland, and abstraction and storage of water. The Applicant has received a Water Use Authorisation (WUA) for the abstraction and storage of water. A WUA will be required to impede on and develop within 500m of wetlands present in the area.
National Environmental Management Waste Act (Act 59 of 2008)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by- » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of this Act (GN 921), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in; » any other way rendered unlit for the safe storage of waste; » Adequate measures are taken to prevent accidental spillage or leaking; » The waste cannot be blown away; » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented. GNR 921 of November 2013 details Listed Activities which require a Waste Management License (WML). No listed activities are applicable to the project and therefore no WML is applicable.
National Heritage Resources Act No 25 of 1999 (Act No 25 of 1999 as amended)	No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

Relevant legislation or policy	Relevance to the proposed project
	Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as- a. the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length; b. the construction of a bridge or similar structure exceeding 50m in length; c. any development or other activity which will change the character of a site i. exceeding 5 000 m^2 in extent; or ii. involving three or more existing erven or subdivisions thereof; or iii. involving three or more erven or divisions thereof which have been consolidated within the past five years; or iv. the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; d. (d) the re-zoning of a site exceeding 10 000 m^2 in extent; or e. (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority. In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed development, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the South African Heritage Resources Agency (SAHRA) Permit Regulations (GNR 668). A heritage impact assessment has been undertaken for the proposed development. xx Two burial sites were identified within the development footprint, graded IIIA due to the high level of social and spiritual signification. 100m buffer is recommended for no impact.
National Development Plan 2030 (2012)	The National Development Plan (NDP) 2030 is a plan prepared by the National Planning Commission in consultation with the South African public which is aimed at eliminating poverty and reducing inequality by 2030. In terms of the Energy Sector's role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes: » Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. » Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households. » Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change.

Relevant legislation or policy	Relevance to the proposed project
	The NDP aims to provide a supportive environment for growth and development, while promoting a more labour-absorbing economy. The proposed project would contribute towards these aims through the creation of employment opportunities and economic development.
National Energy Act (No.34 of 2008)	The Electricity Regulation Act of 2006, replaced the Electricity Act (No. 41 of 1987), as amended, except for Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry. The Act establishes a national regulatory framework for the electricity supply industry and introduces the National Energy Regulator (NERSA) as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licences and registration as the manner in which the generation, transmission, distribution, trading, and import and export of electricity are regulated. Schedule 2 of the Electricity Regulation Act provides for exemptions from the obligation in the Act to apply for (and hold) a licence from National Energy Regulator (NERSA). In terms of this schedule, the threshold for distributed generation was raised to 100MW on 10 June 2021. Project developers proposing projects up to 100MW are exempted from applying for a license but are required to register with NERSA and comply with the relevant grid code(s)[2].

Provincial Policies

This section provides a brief review of the most relevant provincial policies. The proposed Xhariep Export Programme - Agricultural Development and associated infrastructure is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

A brief review of the most relevant provincial policies is provided in table format (**Table 5.2**) below.

Table 5.2: Relevant provincial policies for the Xhariep Export Programme - Agricultural Development and associated infrastructure

Relevant policy	Relevance to the proposed project
Free State Provincial Growth and Development Strategy (FSGDS) (2005 – 2014)	The overarching goal of the Free State Growth and Development Strategy (FSGDS) is to align the provincial and national policies and programmes and to guide development in terms of effective and efficient management and governance to achieve growth and development. The strategy is a living document that uses the latest business planning and evaluation tools in order to maximise the effect of all spending. Based on the social and economic development challenges of the province, the Strategy identifies a few primary objectives, including stimulating economic development and developing and enhancing the infrastructure for economic growth and social development, poverty alleviation through human and social development, ensuring a safe and secure environment for all and the promotion of effective and efficient governance and administration. The development of the agricultural and infrastructure development supports the overall

[2] President Ramaphosa announced in July 2022 that government will remove the licensing threshold for embedded generation completely

Relevant policy	Relevance to the proposed project
	objective of stimulating economic development and infrastructure investment towards growth and social development, by contributing to the energy mix, supply and infrastructure of the province. The development of the facility will also contribute (albeit limited) to the alleviation of poverty through the creation of direct and indirect employment opportunities and well as skills development
Free State Provincial Growth and Development Strategy (FSGDS), Revised October 2007	The revised FSGDS refers to specific imperatives which sets the tone and pace for shared growth and development in the Province. These include: » The need to effectively use scarce resources within the Province, whilst addressing the real causes of development challenges. » The need to accelerate service delivery based on a common provincial development agenda as the basis for provincial strategic direction. » The need to identify investment opportunities and provide an environment of certainty critical for private-sector investment. » The need to promote intergovernmental coordination between the three spheres of government. » The need to facilitate the implementation of the People's Contract within the Province. » The need to provide a common vision as the basis for common action amongst all stakeholders, both inside and outside government. » The need to provide a framework for budgets, implementation, performance management and spatial development. The development of the agricultural and infrastructure development will assist with the need to effectively use scare resources and the need to identify investment opportunities, including private sector-investment. The development of a solar facility reduces the need to make use of non-renewable resources for the generation of electricity and opens up the Province to further future solar energy development.
Free State Provincial Spatial Development Framework (PSDF) - Executive Summary (Inception Report)	The Free State PSDF is a provincial spatial and strategic planning policy that responds to and complies with, in particular, the National Development Plan Vision 2030 and the National Spatial Development Perspective (NSDP). The latter encourages all spheres of government to prepare spatial development plans and frameworks (such as the PSDF) that promote a developmental state in accordance with the principles of global sustainability as is advocated by, among others, the South African Constitution and the enabling legislation. The Free State Provincial Growth and Development Strategy states that sustainable economic development is the only effective means by which the most significant challenge of the Free State, namely poverty, can be addressed. The PSDF gives practical effect to sustainable development, which is defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. The PSDF is prepared in accordance with bioregional planning principles that were adapted to suit the site-specific requirements of the Free State. It incorporates and complies with the relevant protocols, conventions, agreements, legislation and policy at all applicable levels of planning, ranging from the international to the local. The agricultural and infrastructure development will contribute to sustainable and economic development goals of the Free State PSDF, once completed and formally adopted.
Free State Green Economy Strategy (2014)	This green economy strategy for Free State Province (FSGES) was developed in alignment with the national green economy strategy elaborated in the National Green Economy Framework and Green Economy Accord, as well the Free State Provincial Growth and Development

Relevant policy	Relevance to the proposed project
	Strategy. The development process was spearheaded by the Department of Economic Development, Tourism and Environmental Affairs (DETEA). The objective was to develop a green economy strategy to assist the province to, amongst others, improve environmental quality and economic growth, and to develop green industries and energy efficiency within the province. The agricultural and infrastructure development will contribute to the aim of energy efficiency and green industry whilst promoting economic growth, and is therefore consistent with this strategy.
Free State Investment Prospectus (2019	The Premier of the Free State considers providing access to individual investors' to accurate and pertinent information makes it easier for investors to glean investor ready opportunities that are currently available in the Free State. Opportunity of the development of renewable energy is considered in the key sectors overview. The prospectus states that opportunities are opening up in the Province for the energy sector, including renewable energy. Rezoning for the development of multiple solar energy facilities has already been undertaken in the province. Considering the future opportunities available for the development of renewable energy facilities (including solar PV facilities) the development of the agricultural and infrastructure development is considered to be in-line with the Investment Prospectus of the Province.

CHAPTER 6 : APPROACH TO UNDERTAKING THE EIA PHASE

In terms of the EIA Regulations of December 2014 (as amended) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of Xhariep Export Programme (XEP) Agricultural Development triggers listed activities requiring Environmental Authorisation (EA). The application for EA is required to be supported by a Scoping & Environmental Impact Assessment (S&EIA) process based on the extent of the development site and the amount of vegetation clearance required for the establishment of this development and associated infrastructure, triggering activities in Listing Notice 2 (GNR 325).

An EIA process refers to the process undertaken in accordance with the requirements of the relevant EIA Regulations (the 2014 EIA Regulations (GNR 326), as amended), which involves the identification and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project or activity. The EIA process comprises two main phases: i.e. **Scoping** and **EIA Phase**, and is illustrated in **Figure 6.1.** Public Participation forms an important component of the process and is undertaken throughout both phases.

Figure 6.1: The Phases of an Environmental Impact Assessment (EIA) Process

Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of an Impact Assessment Report

This chapter includes the following information required in terms of Appendix 3: Content of Environmental Impact Assessment Report:

Requirement	Relevant Section
3(d)(i) a description of scoping of the proposed activity, including all listed and specified activity triggered and being applied for and (ii) a description of the activities to be undertaken, including associated structures and infrastructure.	All listed activities triggered and applied for are included in **section 6.2**.
3(h)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting	The public participation process followed throughout the EIA process for the Xhariep Export Programme is included in **section 6.4.2** and copies of the supporting documents and

Requirement	Relevant Section
documents and inputs.	inputs are included in **Appendix C**.
3(h)(iii) a summary of the issues raised by interested and affected parties, and indication of the manner in which the issues were incorporated, or the reasons for not including them.	All comments received from the commencement of the EIA Process, are included in the Comments and Responses Report in **Appendix C9**. Notes of meetings held are included in **Appendix C8**. All comments raised during the 30-day review and comment period of the EIA Report and through on-going consultation with I&APs will be included and responded to as part of the C&RR (**Appendix C9**) to be submitted as part of the final EIA Report to the DESTEA for decision-making.
3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives are included in **Section 6.5.3**.
3(p) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	The assumptions and limitations of the EIA process being undertaken for the proposed development are included in **section 6.7**.

Relevant Legislative permitting Requirements

Legislative permitting requirements applicable to Xhariep Export Programme (XEP) Agricultural Development, as considered within this EIA process, are described below.

6.2.1. National Environmental Management Act (No. 107 of 1998)

NEMA (No. 107 of 1998) is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed and reported on to the Competent Authority (the decision-maker) charged by NEMA with granting of the relevant Environmental Authorisation (EA). For this agricultural development the Free State Department of Small Business Development, Tourism and Environmental Affairs (DESTEA) has been determined to be the Competent Authority.

The need to comply with the requirements of the EIA Regulations published under NEMA ensures that developers are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the Competent Authority with sufficient information in order for an informed decision to be taken regarding the Application for EA.

The EIA process being conducted for the Xhariep Export Programme (XEP) agricultural development is being undertaken in accordance with Section 24(5) of the NEMA, which defines the procedure to be followed in applying for the EA, and requires that the potential consequences for, or impacts of, listed or specified activities on the environment to be considered, investigated, assessed, and reported on to the competent authority. Listed Activities are activities identified in terms of Section 24 of the NEMA which are

likely to have a detrimental subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or a full Scoping and EIA).

Table 6.2 below, details the listed activities in terms of the EIA Regulations, 2014 (as amended) that apply to the Xhariep Export Programme Agricultural Development, and for which an application for Environmental Authorisation has been submitted to the DESTEA. The table also includes a description of the specific project activities that relate to the applicable listed activities.

Table 6.2: Listed activities identified in terms of the Listing Notices (GNR 327, 325 and 324)

Relevant Regulation	Activity number	Description of the activity as set out in the EIA Regulations, 2014 as amended	*Relevance Xhariep Export Programme (XEP) Agricultural Development and Associated infrastructure*
Listing Notice 1- GN R327	1	The construction of facilities or infrastructure for the generation of electricity from a renewable resource where. (ii) The output is 10 megawatts or less, but the total extent of the facility covers an area in excess of 1ha;	It is proposed that a 9ha solar PV facility with output of 5MW will be established.
	12	The development of (i) Dam or weir , where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) Infrastructure or structures with a physical footprint of 100 squares metres or more. Where such development occurs – (a) Within a watercouse	The Applicant proposes the establishment of two (2) main irrigation dams which will cover more than 10m^2 surface area each. Dam 1: (Diepdraai) with surface area of 63ha Dam 2: (Sump) with surface area of 19ha
	19	The infilling or depositing of any material of more than 10m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10m^3 from a watercourse [with certain exclusions that are not applicable to this project].	Material (mainly soil, sand and rock) will be excavated, moved and deposited within the watercourse for the proposed instream dam with 63ha surface area.
Listing Notice 3 – GN R325	14	The development of i) Dam or weir , where the dam or weir, including infrastructure and water surface area, exceeds 10 square metres; or ii) Infrastructure or structures with a physical footprint of 10 squares metres or more. Where such development occurs – (a) Within a watercourse B Free State	The Applicant proposes the establishment of two (2) main irrigation dams which will cover more than 10m^2 surface area each. Dam 1: (Diepkloof) with surface area of 63ha Dam 2: (Sump) with surface area of 19ha

Relevant Regulation	Activity number	Description of the activity as set out in the EIA Regulations, 2014 as amended	*Relevance Xhariep Export Programme (XEP) Agricultural Development and Associated infrastructure*
		i. Outside urban areas (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	
Listing Notice 2 – GN R325	13	The physical alteration of virgin soil to agriculture, or afforestation for the commercial tree, timber or wood production of 100 hectares or more.	Approximately 2154ha or more within the 2690ha project area is proposed for cultivation of commercial crops such as Maize, wheat, soy and possibly peanuts.
	15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	It is expected that vegetation clearance of up to 2690ha in extent will take place for the cultivation sites and establishment of the proposed supporting infrastructures for the agricultural development.
	16	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high- water mark of the dam covers an area of 10 hectares or more.	Two irrigation water storage dams with a combined surface area of 82ha in extent.
Listing Notice 3 – GN R 324	12	The clearance of an area of 300 square metres or more of indigenous vegetation B Free State (ii) Within critical biodiversity areas identified in bioregional plans;	It is expected that vegetation clearance of up to 2690ha in extent will take place for the cultivation sites and establishment of the proposed supporting infrastructures for the agricultural development. Parts of the site fall within CBAs.
	14	The development of i) Dam or weir , where the dam or weir, including infrastructure and water surface area, exceeds 10 square metres; or ii) Infrastructure or structures with a physical footprint of 10 squares metres or more.	The Applicant proposes the establishment of two (2) main irrigation dams which will cover more than 10m2 surface area each. Dam 1: (Diepkloof) with surface area of 63ha Dam 2: (Sump) with surface area of 19ha

6.2.2. National Water Act (No. 36 of 1998) NWA

In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all water uses must be licensed with the Competent Authority (i.e., the Department of Water and Sanitation (DWS) or the relevant Catchment Management Agency (CMA)). Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

The Applicant has been authorised by the Department of Water and Sanitation to abstract a maximum volume of 16 000 000m^3/a surface water from the Orange River via the Vanderkloof cannel within the Orange Water Management Area, for irrigation (Section 21a water use). The licence also authorises the construction of two dams for storage purposes (Section 21b water use). (Refer to **Appendix L** for the Water Use Licence).

Table 6.3 contains Water Uses associated with the proposed project and identified in terms of the NWA which require either in the form of a General Authorisation (GA), or in the form of a Water Use License (WUL). The table also includes a description of those project activities which relate to the applicable Water Uses.

Table 6.3: List of Water Uses published under Section 21 of NWA, as amended

Section	Description of the Water Use	Relevance to the project
21 (b)	Storage of water	The storage of water in the proposed dams, one off stream dam and one instream dam. The Applicant already has section 21(b) water use, however the capacity is lower than that being proposed.
21 (c)	Impeding or diverting the flow of water in a watercourse.	Construction of the instream dam and the establishment of internal irrigation pipeline network which cross over the non-perennial watercourses from the dam to various centre pivot areas. In addition, development would be within 500m of a wetland.
21(i)	Altering the beds, banks, course, or characteristics of a watercourse.	Construction of the instream dam and the establishment of internal irrigation pipeline network which cross over the non-perennial watercourses from the dam to various centre pivot areas. In addition, development would be within 500m of a wetland.

6.2.3. National Heritage Resource Act (No. 25 of 1999) (NHRA)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) provides an integrated system which allows for the management of national heritage resources, and to empower civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities which potentially require the undertaking of a Heritage Impact Assessment.

Section 38: Heritage Resources Management

1) *Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –*
   a. *the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
   b. *the construction of a bridge or similar structure exceeding 50m in length;*
   c. *any development or other activity which will change the character of a site –*
      i. *exceeding 5 000m² in extent; or*
      ii. *involving three or more existing erven or subdivisions thereof; or*
      iii. *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
      iv. *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority.*

Must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations

of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed development, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the South African Heritage Resources Agency (SAHRA) Permit Regulations (GNR 668).

6.2.4. Conservation of Agricultural of Resources Act, 1983 (Act No 43 of 1983)

The purpose of the Conservation of Agricultural Resources Act No. 43 of 1983 (CARA) is to provide for control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of soil, water sources and the vegetation and the combating of weeds and invader plants.

The applicant has been authorised to cultivate on virgin land. The cultivation permit is included in **Appendix M**.

6.3 Overview of the Scoping Phase

The final Scoping Report was submitted to DESTEA on 15 July 2022 and subsequently accepted on 10 August 2022 documented the evaluation of potential environmental impacts of the proposed Xhariep Export Programme (XEP) Agricultural Development. The Scoping Phase was conducted in accordance with the requirements of the 2014 EIA Regulations (GNR 326), as amended, and therefore aims to:

- Identify and evaluate potential environmental (biophysical and social) impacts and benefits of all phases of the proposed development (including design, construction, operation and decommissioning) within the broader project site and development area through a review of existing baseline data, including specialist studies which were undertaken within the project area.
- Identify potentially sensitive environmental features and areas within the broader project site and development area to inform the preliminary design process of the agricultural development and the associated infrastructure.
- Define the scope of studies to be undertaken during the EIA process.
- Provide the authorities with sufficient information in order to make a decision regarding the scope of issues to be addressed in the EIA Phase, as well as regarding the scope and extent of specialist studies that will be required to be undertaken.

With this context, the objectives of the Scoping Phase were to, through a consultative process:

- Identify policies and legislation relevant to the project.
- Motivate the need and desirability of the proposed project, including the need and desirability of the activity in the context of the preferred project location.
- Identify and confirm feasible alternatives for the project.
- Identify and described potential impacts associated with the undertaking of the identified activities and proposed technology.
- Identify areas of high sensitivity to be avoided by the development footprint within the development area.
- Identify preferred areas for the development in the form of a development footprint within areas associated with low to medium environmental sensitivity within the development area through a

desktop level scoping process and on-going consultative process. The development footprint and proposed facility layout are assessed within this EIA Report.
» Identify and list key issues associated with the project to be addressed during the EIA Phase through further detailed study and ground-truthing.
» Agree on the level of assessment, including the methodology to be applied, the expertise required, and the extent of further consultation to be undertaken in the EIA Phase of the process, with the aim of determining the extent of impacts associated with the activities through the life cycle of the project (i.e., construction, operation, and decommissioning).
» Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Key tasks undertaken within the Scoping Phase include:

» Consultation with relevant decision-making and regulating authorities (Provincial and Local levels).
» Submission of the completed Application for EA to the competent authority (DESTEA) in terms of Regulations 5 and 16 of the 2014 EIA Regulations (GNR 326).
» Undertaking a public participation in accordance with Chapter 6 of GNR326, and the Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project.
» Undertaking of independent specialist studies in accordance with Appendix 6 of the EIA Regulations, 2014 (GNR326), as amended, and the requirements of the Specialist Protocols published in Regulation GNR 320, issued 20 March 2020 and GNR 1150 of 30 October 2020, where relevant, as well as other relevant guidelines.
» Preparation of a Scoping Report and Plan of Study for EIA in accordance with the requirements of Appendix 2 of the 2014 EIA Regulations (GNR 326).
» Preparation of a Comments and Response (C&R) Report detailing all comments raised by I&APs and responses provided as part of the Scoping Phase.
» Submission of a Final Scoping Report, including a Plan of Study for the EIA, to DESTEA for review and acceptance on 10 August 2022.

Table 6.4 provides a summary of the public participation process undertaken during the Scoping Phase.

Table 6.4: Summary of the Public Participation Process (during the Scoping Phase)

Activity	Date
Announcement of the EIA process in one local newspaper: » Volksblad Nuus (English Advertisement)	**03 June 2022**
Distribution of the BID, process notification letters and stakeholder reply form announcing the EIA process and inviting I&APs to register on the project database. The BID and electronic reply form was also made available on the online stakeholder engagement platform.	**03 June 2022**
Placement of site notices at the project site.	**26 May 2022**
Announcement of the availability of the Scoping Report for a 30-day review and comment period, including details on how to access the Scoping Report via the online stakeholder engagement platform, in one local newspaper, i.e. Volksblad Nuus (English advertisement)	**3 June 2022 to 4 July 2022**
Distribution of notification letters announcing the availability of the Scoping Report for a 30-day review and comment period. These letters were	**26 May 2022**

Activity	Date
distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	
30-day review and comment period of the Scoping Report	**3 June 2022 to 4 July 2022**
On-going consultant (i.e. telephone liaison; email communication) with all I&APs.	Throughout the EIA process

Acceptance of the Scoping Report and Approval of the Plan of Study for the EIA Phase was received on 10 August 2022, making the start of the EIA phase (refer to **Appendix B**).

6.4 Overview of the EIA Phase

As per the EIA Regulations (GNR 326), the objectives of the EIA Phase are to, through a consultative process:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context.
- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted Scoping Report.
- Identify the location of the development footprint within the approved site as contemplated in the accepted Scoping Report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment.
- Determine the:
  - Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
  - Degree to which these impacts:
    - Can be reversed;
    - May cause irreplaceable loss of resources; and
    - Can be avoided, managed or mitigated.
- Identify the most ideal development footprint for the activity within the development area as contemplated in the accepted Scoping Report based on the lowest level of environmental sensitivity identified during the assessment.
- Identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted Scoping Report through the life of the activity.
- Identify suitable measures to avoid, manage or mitigate identified impacts.
- Identify residual risks that need to be managed and monitored.

This EIA Report assesses potential positive and negative, direct, indirect, and cumulative impacts associated with all phases of the project life cycle including pre-construction, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

The following subsections outline the activities within the EIA process that have been undertaken to date.

6.4.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)

Based on the nature of the development, the DESTEA has been determined as the competent authority. As the project is an agricultural development, the Department of Agriculture and Rural Development (DARD, Free State office) is the commenting authority for the project and through their office, a recommendation letter will be written to the National Department of Agriculture, Land Reform and Rural Development (DALRRD) in Pretoria where a Delegate to the National Minister will give formal consent if the Department supports the application.

Consultation with these authorities is being undertaken throughout the Scoping Phase and has continued throughout the EIA process. To date, this consultation has included the following:

- Pre- application meeting was undertaken on **26 April 2022** (Refer to **Appendix B for the notes of the meeting**).
- Submission of the Application for Environmental Authorisation to the DESTEA via courier on **3 June 2022**.
- Submission of the final Scoping Report on **15 July 2022**.
- Receipt of acceptance of the Scoping Report and approval of the Plan of Study for the EIA Phase on **10 August 2022**.
- Receipt of an extension of the regulated timeframes for the EIA process on **25 October 2022**.

The following steps are to be undertaken as part of the EIA Phase of the process:

- Make the draft EIA Report available for a 30-day public review and comment period from **06 January to 06 February 2023**.
- Notification and consultation with stakeholders, I&APs and Organs of State that may have jurisdiction over the project, including provincial and local government departments.
- Incorporating comments received during the 30-day public review and comment period into the final EIA Report.
- Submission of the final EIA to DESTEA for decision making.

The submissions, as listed above, were undertaken electronically, as required by the DESTEA. A record of all authority correspondence undertaken prior to and within the EIA Phase is included in **Appendix B**, **Appendix C5** and **Appendix C6**.

6.4.2. Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GN R326) (as amended). The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326) (as amended) and is being followed for this proposed project.

The sharing of information forms the basis of the public participation process and offers the opportunity for I&APs to become actively involved in the EIA process from the outset. The public participation process is designed to provide sufficient and accessible information to I&APs in an objective manner. The public

participation process affords I&APs opportunities to provide input into and receive information regarding the EIA process in the following ways:

- During the **Scoping Phase**:
  - identify issues of concern and suggestions for enhanced benefits.
  - Verify that their issues have been recorded.
  - Assist in identifying reasonable alternatives.
  - Contribute relevant local information and knowledge to the environmental assessment.

- During the **EIA Phase**:
  - contribute relevant local information and knowledge to the environmental assessment;
  - verify that issues have been considered in the environmental investigations as far as possible as identified within the Scoping Phase; and
  - comment on the findings of the environmental assessments.

- During the **decision-making phase**:
  - to advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The following sections detail the tasks undertaken as part of part of the public participation process within the EIA Phase.

i. Advertisement and Notifications

The availability of the EIA Report for review and comment was announced to relevant Organs of State, potentially affected and adjacent landowners, tenants and occupiers, and general public via the following:

- Notification letter distributed to all registered parties advising them of the availability of the Draft EIA Report for review on comments on **06 January 2023**.
- An advertisement announcing the availability of and inviting comment on the Draft EIA Report in the Volksblad online Newspaper **06 January 2023**. A copy of the newspaper advert as sent to the newspaper and the advert tear sheet are included in **Appendix C3** of the EIA report. This advert:
- The draft EIA Report was made available for review by I&APs for a 30-day review and comment period from **06 January 2023 to 06 February 2023**. The EIA Report is available on the Savannah Environmental website (https://savannahsa.com/public-documents/other/agricultural-development-and-associated-infrastructure/) and all the registered I&APs have been notified of the availability on **06 January 2023**. I&APs have been encouraged to view the EIA Report and submit written comment. The EIA Report has been circulated to Organs of State via electronic transfer (Dropbox, WeTransfer, etc), or CD and/or hardcopy as per individual request. The evidence of distribution of the draft EIA Report for public and authority review and comment will be included in the Final EIA Report, which will be submitted to the DESTEA (Refer to **Appendix C4** and **Appendix C5**).

ii. Public Involvement and Consultant

In order to accommodate the varying needs of stakeholders and I&APs within the surrounding area, as well as capture their views, comments, issues and concerns regarding the project, various opportunities

have been and will continue to be provided to I&APs to note their comments and issues. I&APs are being consulted through the following means:

Table 6.5: Public involvement for Xhariep Export Programme (XEP) Agricultural Development (during EIA Phase)

Activity	Date
Advertising of the availability of the EIA Report for a 30-day review and comment period in the Volksblad Nuus (English Advertisement).	06 January 2023
Distribution of notification letters announcing the available of the draft EIA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners), registered I&APs and key stakeholder groups.	06 January 2023 – 06 February 2023
On-going consultation (i.e. telephone liaison; e-mail communication, meetings) with all I&APs.	Throughout the EIA process

I&APs registered on the database have been notified by means of a notification letter of the release of the draft EIA Report for a 30-day review and comment period, invited to provide comment on the draft EIA Report, and informed of the manner in which, and timeframe within which such comment must be made. The report has been made available in soft copies to I&APs on the Savannah Environmental website (i.e. online stakeholder engagement platform) (https://savannahsa.com/public-documents/other/agricultural-development-and-associated-infrastructure/). Hard copy reports and/or CD copies can be made available on request.

A notification letter to all registered parties was distributed prior to commencement of the 30-day review and comment period, on **Friday, 06 January 2023**. Where I&APs are not able to provide written comments (including SMS and WhatsApp), other means of consultation, such as telephonic discussions and discussions at the information session to be held in the project area will be used. All comments raised as part of the discussions and written comments submitted during the 30-day review and comment period will be recorded and included in **Appendix C7** of the EIA Report.

iii. Identification and Recording of Comments

Comments raised by I&APs to date have been included into a Comment and Responses (C&R) Report, which is included in **Appendix C9** of this EIA Report. The C&R Report includes detailed responses from members of the EIA project team and/or the project proponent to the issues and comments raised. The C&R Report will be updated with all comments received during the 30-day review and comment period of the EIA Report and will be included as **Appendix C9** I the Final EIA Report submitted to DESTEA for decision making.

Notes of all the telephonic discussions and meetings to be conducted during the 30-day review and comment period of the EIA Report will be included in **Appendix C8** of the Final EIA Report.

Outcomes of the DFFE Web-Based Screening Tool

In terms of GN R960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended), the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulations 19 and 21 of the EIA Regulations.

The requirement for the submission of a Screening Report (included as **Appendix Q** of the EIA Report) for Xhariep Export Programme (XEP) Agricultural Development is applicable as it triggers Regulation 19 of the EIA Regulations, 2014, as amended. **Table 6.6** provides a summary of the specialist assessments identified in terms of the screening tool and responses to each assessment from the project team considering the development area under consideration.

Table 6.6: Sensitivity ratings from the DFFE's web-based online Screening Tool associated with the development of the Xhariep Export Programme (XEP) Agricultural Development.

Specialist Assessment	Sensitivity Rating as per the screening Tool (relating to the need for the study)	Project Team Response
Agricultural Assessment	Very high	A Soil, Land Use and Agriculture Impact Assessment is included in this EIA Report as **Appendix F**.
Animal Species Assessment	High	A Biodiversity Impact Assessment (including flora and fauna) has been undertaken for proposed development and is included as **Appendix D** of the EIA Report.
Aquatic Biodiversity Assessment	Very High	An Aquatic Baseline Impact Assessment & Soil and Agricultural Potential Impact Assessment Report has been included as part of this EIA and is included as **Appendix E & F.**
Archaeological and Cultural Heritage Assessment	Low	A Heritage Impact Assessment (including an assessment of Palaeontological resources) has been undertaken for the proposed development and is included in this EIA as **Appendix G**.
Civil Aviation Assessment	Low	The Civil Aviation Authority will be consulted throughout the EIA process to obtain comment.
Defence Assessment	Low	The project site is not located within close proximity of any military base.
Palaeontology Assessment	High	A Heritage Impact Assessment (including an assessment of Palaeontological resources) has been undertaken for the proposed development and is included in this EIA as **Appendix G**.
Plants Species Assessment	Medium	A Biodiversity Impact Assessment (including flora and fauna) has been undertaken for proposed development and is included as **Appendix D** of the EIA Report.
Terrestrial Biodiversity Assessment	Very high	A Biodiversity Impact Assessment (including flora and fauna) has been undertaken for proposed development and is included as **Appendix D** of the EIA Report.

Assessment of Issues identified through the EIA Process

Based on the outcomes of the Scoping Phase evaluation of the project, the following issues were identified as requiring detailed assessment. The specialist consultants involved in the assessment of these impacts indicated in **Table 6.7** below.

Table 6.7: Specialist studies undertaken as part of the EIA Phase.

Specialist	Specialist Study	Appendix
Jan Jacobs of The Biodiversity Company	Biodiversity Impact Assessment	Appendix D
Andrew Husted and Ivan Baker of The Biodiversity Company	Aquatic Baseline & Impact Assessment	Appendix E
Matthew Mamera of The Biodiversity Company	Soil and Agricultural Assessment	Appendix F
Jenna Lavin of CTS Heritage	Heritage Impact Assessment (including Archaeology and Palaeontology)	Appendix G
Nondumiso Bulunga with External Peer Review by Tony Barbour	Social Impact Study	Appendix H

Specialist studies considered direct and indirect environmental impact associated with the development of all components of the facility. Identified impacts are assessed in terms of the following criteria:

- The ***nature***, a description of what causes the impact, what will be affected and how it will be affected.
- The ***extent***, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional or national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0-1 years) – assigned a score of 1
  - The lifetime of the impact will be of a short duration (2-5 years) – assigned a score of 2
  - Medium-term (5-15 years) – assigned a score of 3
  - Long term (> 15 years) assigned a score of 4
  - Permanent – assigned a score of 5
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment
  - 2 is minor and will not result in an impact on processes
  - 4 is low and will cause a slight impact on processes
  - 6 is moderate and will result in processes continuing but in a modified
  - 8 is high (processes are altered to the extent that they temporarily cease)
  - 10 is very high and results in complete destruction of patterns and permanent cessation processes
- The **probability** of occurenc, which describes the likelihood of the impact actualing occuring. Probabiltiy is estimated on a scale, and a score assigned:
  - Assigned a score of 2 1-5, where 1 is very improbbable (probably will not happen)
  - Assigned a score of 2 is improbable (some possiblitiy, but low likelihood)
  - Assigned a score of 3 is probable (distinct possibilty)
  - Assigned a score of 4 is highly propable (most likely)
  - Assigned a score of 5 definite (impact will occur regardless of any prevention measures)
- The **significance**, which is determined through a synthesis of the characteristic described above (refer formula below) and can be assessed as low, medium, or high.

- The **status**, which is decribed as either positive, negative or neutral
- The degree to which the impact can be reversed
- The degree to which the impact may cause irreplaceable loss of resources
- The degree to which the impact can be mitigated

The **significance** is determined by combing the criteria in the following formula:

S= (E+D+M) P; where

S= Significance weighting
E= Extent
D= Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
- **60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

Specialist studies also considered cumulative impacts associated with similar developments in the area or region of the proposed project. The purpose of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e., whether the addition of the proposed project in the area will increase the impact). In this regard, specialist studies considered whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

A conclusion regarding whether the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area is included in the respective specialist reports.

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the requirements of NEMA and the 2014 EIA Regulations (GNR 326)), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr) that includes all the mitigation measures recommended by the specialists for the management of significant impacts is included as **Appendix I** to this EIA Report

Assumptions and Limitations of the EIA Process

The following assumptions and limitations are applicable to the EIA process of Xhariep Export Programme (XEP) Agricultural Development:

- All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
- It is assumed that the development area for the project by the developer represents a technically suitable site for the establishment of agriculture development and associated infrastructure.
- The development footprint (the area that will be affected by the project) will include the footprint for the agricultural development and associated infrastructure (i.e., centre pivot irrigation system, water pipelines, solar PV facility, overhead power line, dams, and the BESS).
- Conclusions of the specialist studies undertaken, and this overall impact assessment assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset in accordance with the relevant recommendations made.

Refer to the specialist studies contained in **Appendices D – H** for limitations specific to the independent specialist studies.

CHAPTER 7: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This chapter provides a description of the local environment within which the project is proposed. This information is provided in order to assist the reader in understanding the possible effects of the project on the environment within which it is proposed to be developed. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, Xhariep Export Programme (XEP) Agricultural Development have been described.

7.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of an Impact Assessment Report

This chapter includes the following information required in terms of Appendix 3: Content of an Environmental Impact Assessment report:

Requirement	Relevant Section
3(1)(g)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	The environmental attributes associated with the development of Xhariep Export Programme (XEP) Agricultural Development is included as a whole within this chapter. The environmental attributes that are assessed within this chapter includes the following: » The regional setting of the broader study area indicates the geographical aspects associated with Xhariep Export Programme Agricultural Development. This is included in **Section 7.2**. » The climatic conditions for the proposed project area have been included in **Section 7.3**. » The biophysical characteristics of the project site and the surrounding areas are included in **Section 7.4**. The characteristics considered are topography and terrain, geology, soils and agricultural potential and the ecological profile which includes the vegetation patterns, listed plant species, critical biodiversity areas and broad-scale processes, freshwater resources, terrestrial fauna, and avifauna. » The heritage and cultural aspects (including archaeology, cultural landscape and palaeontology) has been included in **Section 7.5**. » The social and socio-economic characteristics associated with the broader study area and the project site has been included in **Section 7.2**

A more detailed description of each aspect of the affected environment is included within the specialist Reports contained within **Appendices D - G**

7.2. Regional Setting

The Free State is located in the geographical centre of South Africa, bordered by the Northern Cape, Eastern Cape, North West, Mpumalanga, KwaZulu-Natal and Gauteng provinces, as well as Lesotho. The Free State is a rural province of farmland, mountains, goldfields and widely dispersed towns. Although the Free State is the third-largest province in South Africa, it has the second-smallest population and the second-lowest population density. It covers an area of 129 825km² and has a population of 2 834 714 – 5.1% of the national population. Its capital is Bloemfontein, which is South Africa's judicial capital. Other important towns include Welkom, Kroonstad, Sasolburg and Bethlehem.

The economy is dominated by agriculture, mining and manufacturing. Known as the 'breadbasket' of South Africa, about 90% of the province is under cultivation for crop production. It produces approximately

34% of the total maize production of South Africa, 37% of wheat, 53% of sorghum, 33% of potatoes, 18% of red meat, 30% of groundnuts and 15% of wool. The province is the world's fifth-largest gold producer, with mining the major employer. It is a leader in the chemicals industry, being home to the giant synthetic-fuels company, Sasol.

The Free State agricultural sector, just like the national agricultural sector, comprises of crop production, animal production, horticulture, dairy farming, game farming, aquaculture, fruit production and agro processing. Approximately 14.5% of South Africa's commercial farming takes place in the province. This sector is critical to the well-being of the province, both as the provider of food and a major employer. Major crops are maize, soybeans, wheat, sorghum, sunflowers, potatoes, groundnuts and wool. The province also accounts for 90% of cherry production in South Africa.

About 40% of the country's potato yield comes from the high-lying areas of the Free State. The province produces about 100,000 tons of vegetables and 40,000 tons of fruit each year. The main vegetable is asparagus, both green and white varieties. Counter seasonality to Europe, the primary SA export market for horticultural and floricultural products, is a competitive advantage. The temperate climate in the Eastern Free State lends itself to production of deciduous fruits such as apples, berries, cherries, peaches, plums and apricots.

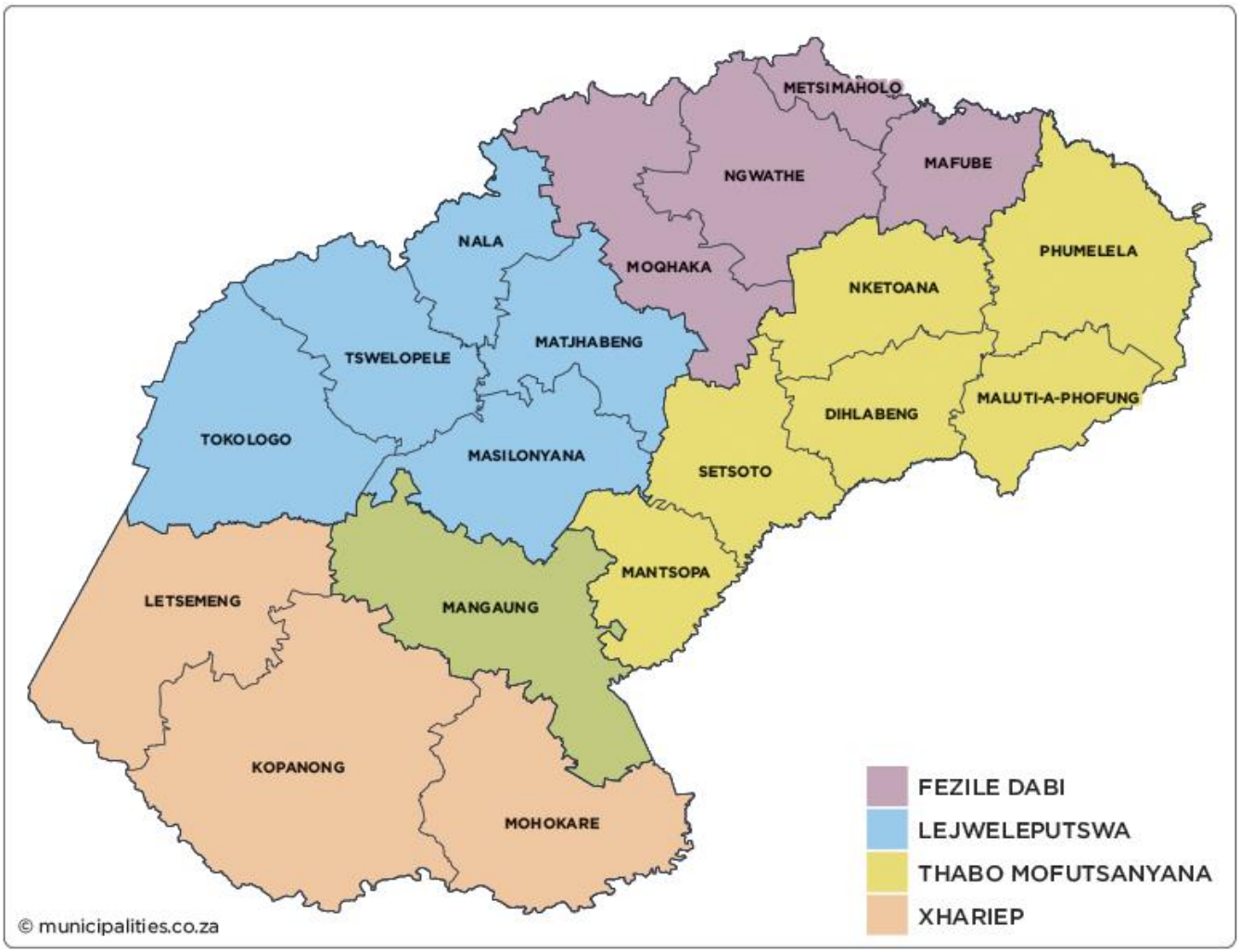


Figure 7.1: District municipalities and local municipalities of Free State Province (Source: Municipalities of South Africa)

The Xhariep District Municipality is a Category C municipality situated in the southern part of the Free State. It is bordered by the Mangaung Metro to the north, Eastern Cape to the south, Lesotho to the east, and Northern Cape to the west. It is the largest district in the province, making up just more than a third of its geographical area. It is comprised of three local municipalities: Letsemeng, Kopanong and Mohokare, which include 21 towns (refer to Figure 7.2). Its administrative headquarters are in Trompsburg, which lies 125km south of Bloemfontein. The towns in this district boast abundant natural resources such as water and agricultural land. The largest dam in South Africa is situated at the southern tip of the district. Three national roads (N1 – Gauteng to Cape Town, N6 – Eastern Cape to Bloemfontein and N8 – Bloemfontein to Kimberley) pass through this area.

Agriculture contributed 15.1% in 2019. The agricultural sector's share of the district dropped from 18.1% in 2008 to 16.4% in 2017. The district comprises of extensive agriculture at 74 %, that is used for livestock farming, especially sheep and cattle to produce wool and meat. Intensive agriculture in the Xhariep District makes up 21% of the main land uses

Figure 7.2: Local Municipalities of the Xhariep DM (Source: Municipalities of South Africa)

The project site for the establishment of the Xhariep Export XEP Agricultural Development and associated infrastructure is located within the Letsemeng Local Municipality. The Letsemeng Local Municipality is a Category B municipality situated in the south-western Free State Province within the Xhariep District. It is bordered in the north by the Lejweleputswa District, in the south by Kopanong, in the east by the Mangaung Metro, and in the west by the Northern Cape Province. It is one of three municipalities in the

district and measures 10 192 kilometers in surface area and comprises of five towns; Koffiefontein (which is the head office), Petrusburg, Jacobsdal, Oppermansgronde and Luckhof. The socio-economic growth of the municipality is centred on agriculture. The municipal area also has mining activities, with diamond minerals being the major natural resource that helps with employment creation.

Areas surrounding the project site are generally natural with most of the farms (cultivations) taking place along the orange river. The site is located approximately 7km southwest of the Luckhof which is indicated as a town that serves as a general agricultural service Centre in the Letsemeng Local Municipality Draft IDP (2021/2022).

The socio-economic profile of the Letsemeng Local Municipality is shown in the **Table 7.1** overleaf. In order to provide context against which the Letsemeng local Municipality's socio-economic profile can be compared, the socio-economic profiles of the Xhariep DM, Free State Province, and South Africa as a whole have also been considered.

Table 7.1: Baseline description of the socio-economic characteristics of the area within which the Xhariep Export Programme - Agricultural Development and associated infrastructure

Location characteristics
» The project is proposed within the Free State Province, which is the third-largest province in South Africa and has the second-smallest population and the second lowest population density. » The project is proposed within the Letsemeng LM of the Xhariep DM. » The Letsemeng LM is approximately 9 826km² in extent, whilst Xhariep is 34 250km² in extent.
Population characteristics
» According to the Statistics SA Letsemeng had a population growth per annum of 0.82%. the total population is 40 444 which is about one-third of the figure in Xhariep (125,884). » From the StatsSA in 2016 it shows that males were more than females in age group 15-34, 35-64 and females were more than males in age groups 1-14,65+ (adults) » Males have the highest portion, particularly the highest portion are the males in the youth between 15-34. » For every 100 (ages 15-64) the dependency ratio in 2016 was 111.8 whilst in 2011 it was 105.7. » The growth rate according to 2011 census data is -1.04% (between 2001-2011)
Economic, education and household characteristics
» In terms of houses/brick structures on a separate stand dominate by far in all urban areas (83%0 » Second largest number of households type is shacks (14%) » The vast majority live in dwellings that are fully paid off (66%); 12% occupy their dwellings rent free and 11% rent through a private individual. » There is 36.6% rate on employment which is about the same as the rate in Xhariep 36.47%. » Discouraged work-seeker is about 7% (1,745), other not economically active is 46% (11,518), unemployed 10,5% (2,624). » The annual income average is R15 000 which is about the same as the amount in Xhariep (R15 000) » Those that earn between R10k – R20K is about 31% (the highest). » 57.6% have completed Grade 9 or higher which is about the same as rate in Xhariep (56.38%) » 31.9% completed matric or higher which is about the same rate in Xhariep 31.7%. » Employment for those between 15-17 years is about R7 500 an average annual income of employed about the same as the amount in Xhariep R1 500. » 14% of children between 15 and 17 are in the labour force which is a little higher than the rate in Xhariep (13.28%).
Services
» 78.3% are getting water from a regional or local service provider which is about 90 percent of the rate in Xhariep (85.7%). » Those with piped water inside the house is 47.1% (18,875); piped water inside yard is 46.1% (18,455); borehole in

yard 2.2% (869; borehole outside yard is 1.8% (710) and other is 2.8% (1,136).
» 2.4% have no access to electricity which is about three quarters of rate in Xhariep (3.23%)
» Those with in-house prepaid meter is 79.2% (31,728); in-house conventional meter is 13.3% (5,324); other source (no paying for) is 3.1% (1,234); no access to electricity is about 2.4% (942) whilst on other is 2% (816)
» 87.2% have access to flush or chemical toilets a little less than rate in Xhariep (90.4%).
» 1.4% have no access to any toilets which is about half the rate in Xhariep 2.73%.
» 61.1% are getting refuse disposal from a local authority, private company or community members about 80 percent of the rate in Xhariep (75.22%).

7.3. Climatic Conditions

This region's climate is characterised by rainfall peaks in autumn (March). Mean Annual Precipitation (MAP) ranges from about 190 mm in the west to 400 mm in the northeast. Mean maximum and minimum monthly temperatures for Britstown are 37.9°C and -3.6°C for January and July, respectively. Corresponding values are 37.1°C and -4.8°C for De Aar and 39.0°C and -2.3°C for Kareekloof (northwest of Strydenburg) (Mucina and Rutherford, 2006).

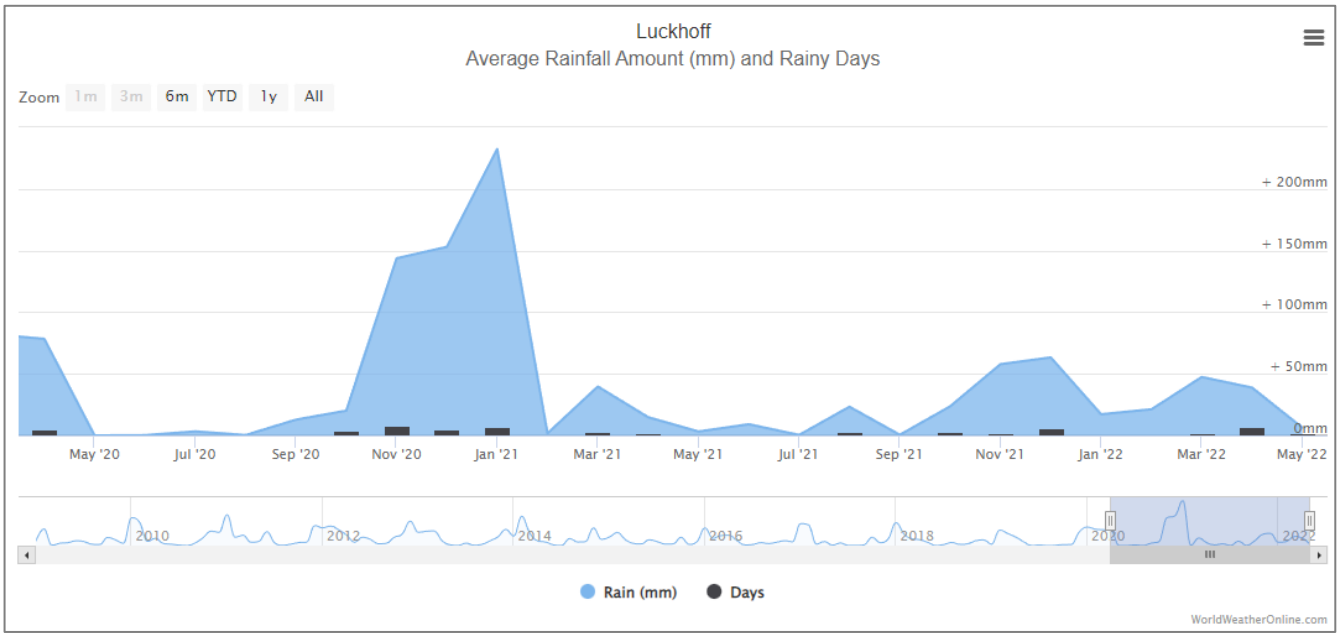


Figure 7.3: Climate for the Luckoff area (WWO, 2022)

7.4. Biophysical Characteristics of the Study Area and Development Area

The following section provides an overview and description of the biophysical characteristics of the study area and has been informed by specialist studies (**Appendix D-H**) undertaken for this EIA Report.

7.4.1. Topographical profile

The slope percentage of the project area has been calculated and is illustrated in **Figure 7.4**. Most of the project area is characterised by a slope percentage between 0 and 5%, with some smaller patches within the project area characterised by a slope percentage 5% to 15%. This illustration indicates a non-uniform topography in scattered areas the majority of the area being characterised by a gentle slope. The DEM of the project area indicates an elevation of 1689 to 746 Metres Above Sea Level (MASL).

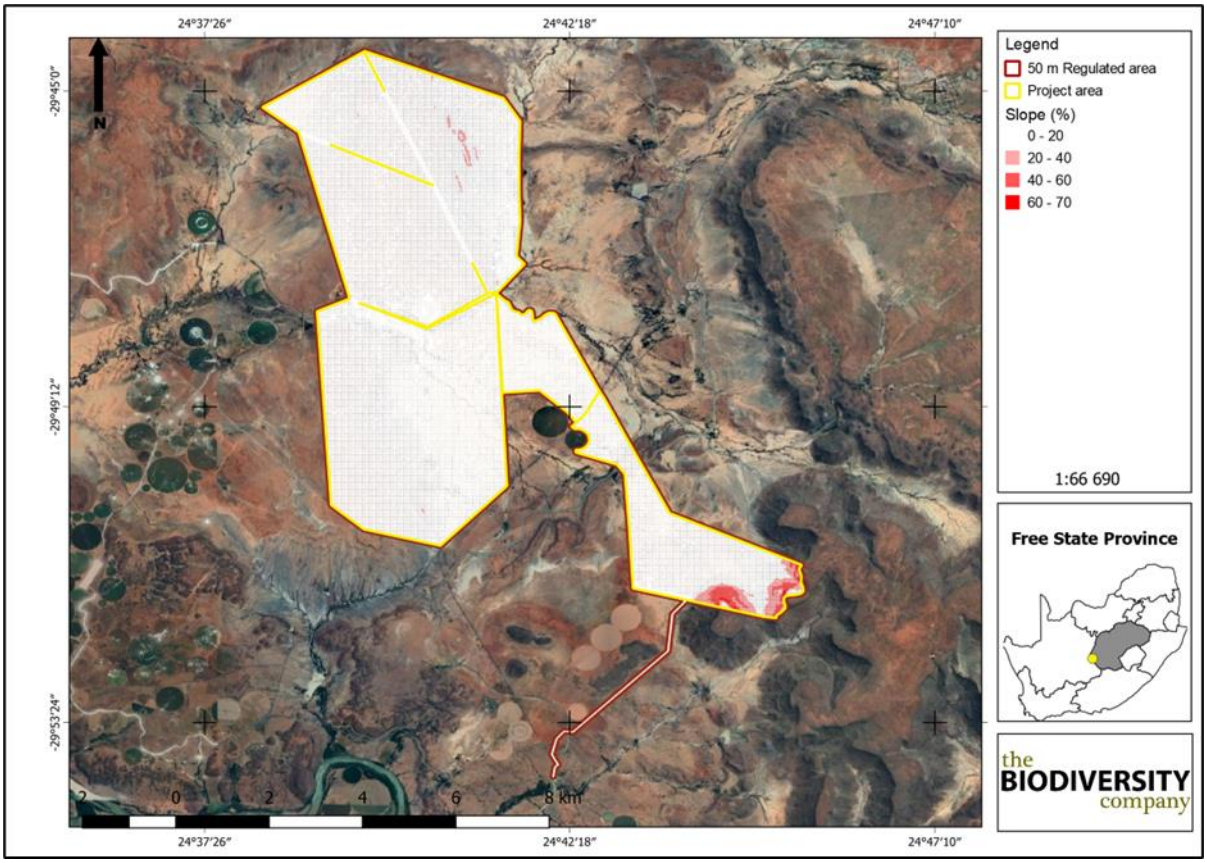


Figure 7.4: The slope percentage calculated for the project area

7.4.2. Soil and Geology

The project area is commonly dominated with the Hutton, Valsrivier and Glenrosa soil forms (**see Figure 7.5**). In the terrain soils associated with the presence of lime or carbonates also occur. The soil profiles characterised with high carbonate subsurface horizons which were identified within the development area includes the Addo, Augrabies and Plooysburg soil forms. The area has few profiles that are saturated for long periods with surface water such as the Katspruit soil form. Most of the identified soils are freely drained due to their apedal weak structure which can be suitable for irrigation purposes. Limitations in water drainage is usually common in duplex soils with higher clay contents in the subsurface horizons that can restrict profile flows. Such soils require proper drainage systems to increase their productive.

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Ae 278, Ag 150, Ag 151, Da 24, Da 103 and Ib207 land types (see **Figures 7.6, 7.7, 7.8, 7.9, 7.10, 7.11**). The Da land type is characterised by prismacutanic and/or pedocutanic horizons with the possibility of red apedal B-horizons occurring. The Ae land type consists of red, yellow apedal soils which are freely drained. The soils tend to have a high base status and is deeper than 300 mm.

The Ag land type is characterised by freely drained Red or Yellow-Brown Apedal soils with red soils being dominant. These soils are characterised by a high base status and is likely to be less than 300 mm deep. The Fb land type consists of Glenrosa and/or Mispah soil forms with the possibility of other soils occurring throughout. Lime is generally present within the entire landscape.

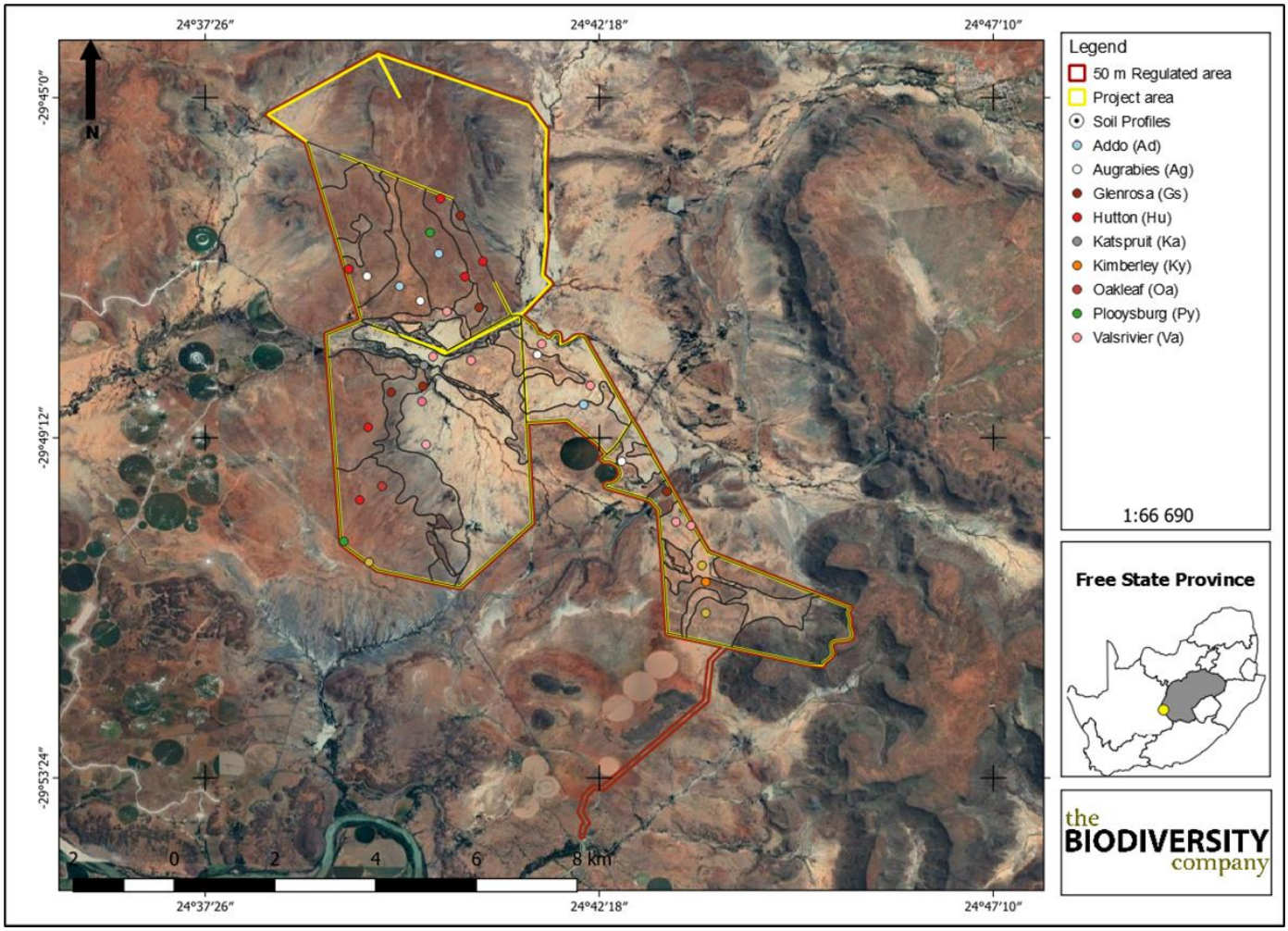


Figure 7.5: Map of soil forms identified within the project area and classified following the Soil Classification Walking Group (1991)

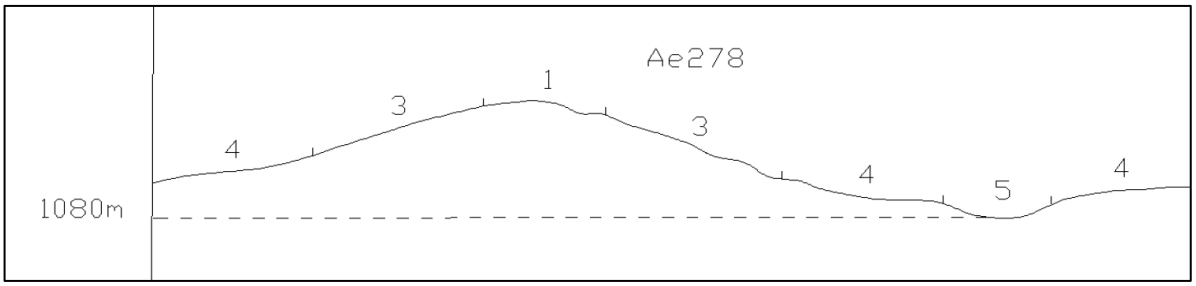


Figure 7.6: Illustration of land type Ae 278 terrain unit (Land Type Survey Staff, 1972 - 2006)

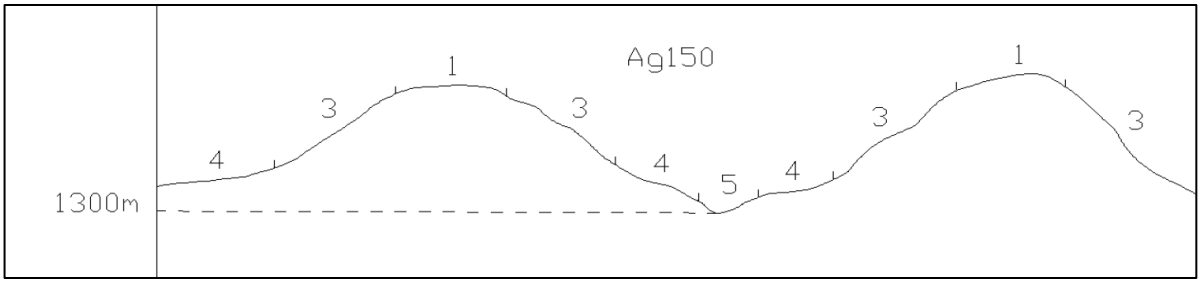


Figure 7.7: Illustration of land type Ag 150 terrain unit (Land Type Survey Staff, 1972 - 2006)

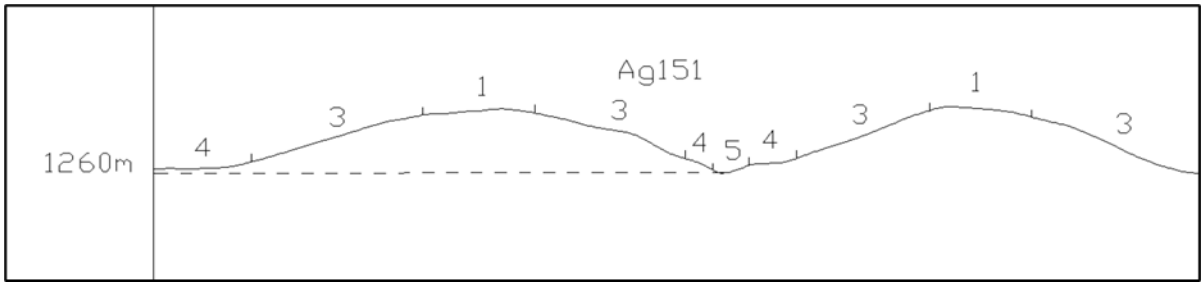


Figure 7.8: Illustration of land type Ag 151 terrain unit (Land Type Survey Staff, 1972 - 2006)

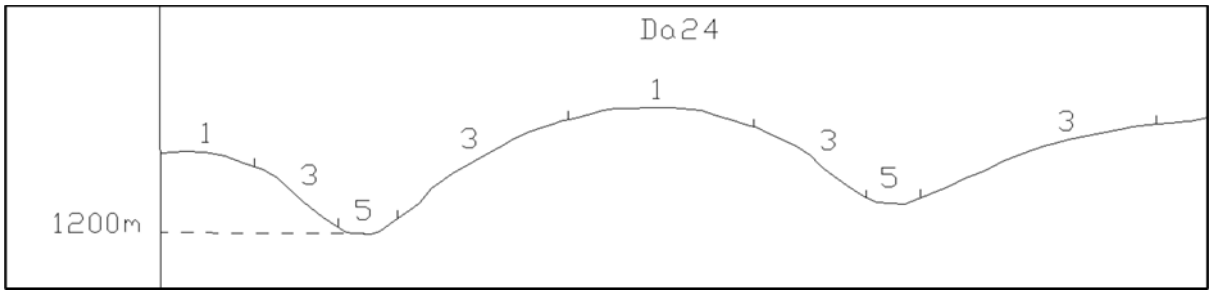


Figure 7.9: Illustration of land type Da 24 terrain unit (Land Type Survey Staff, 1972 - 2006)

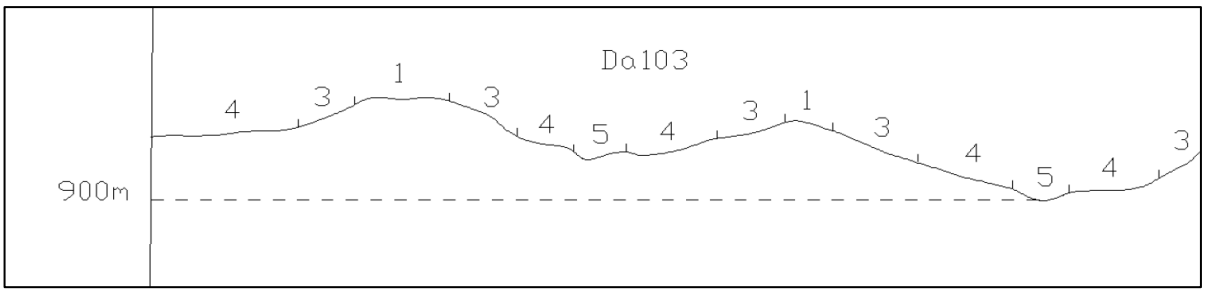


Figure 7.10: Illustration of land type Da 103 terrain unit (Land Type Survey Staff, 1972 - 2006)

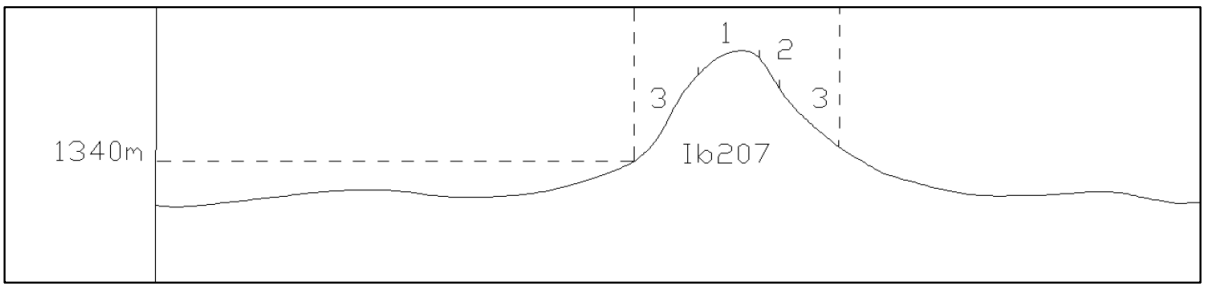


Figure 7.11: Illustration of land type Ib 207 terrain unit (Land Type Survey Staff, 1972 - 2006)

7.4.3. Land Capability and Agricultural Potential

The land capability sensitivity (DAFF, 2017) indicates a range of sensitivities expected throughout the project focus area, which predominantly covers "Very Low" to "Low" sensitivities. Some patches are characterised by "Moderate" sensitivities. The area has a "Low" sensitivity based on these land potential classes. The "Very Low to Moderate" sensitivities baseline findings concur with the DAFF, (2017) land potential for the requirements for a compliance statement report only.

According to the DEA Screening Tool, (2022), some portions within the project area have "High" sensitivity crop fields. Since rainfall is one of the limiting factors for crop production in the assessment area, the

agricultural pivot expansion project can increase the land potential without segregation of such agricultural lands or crop fields with high potentials.

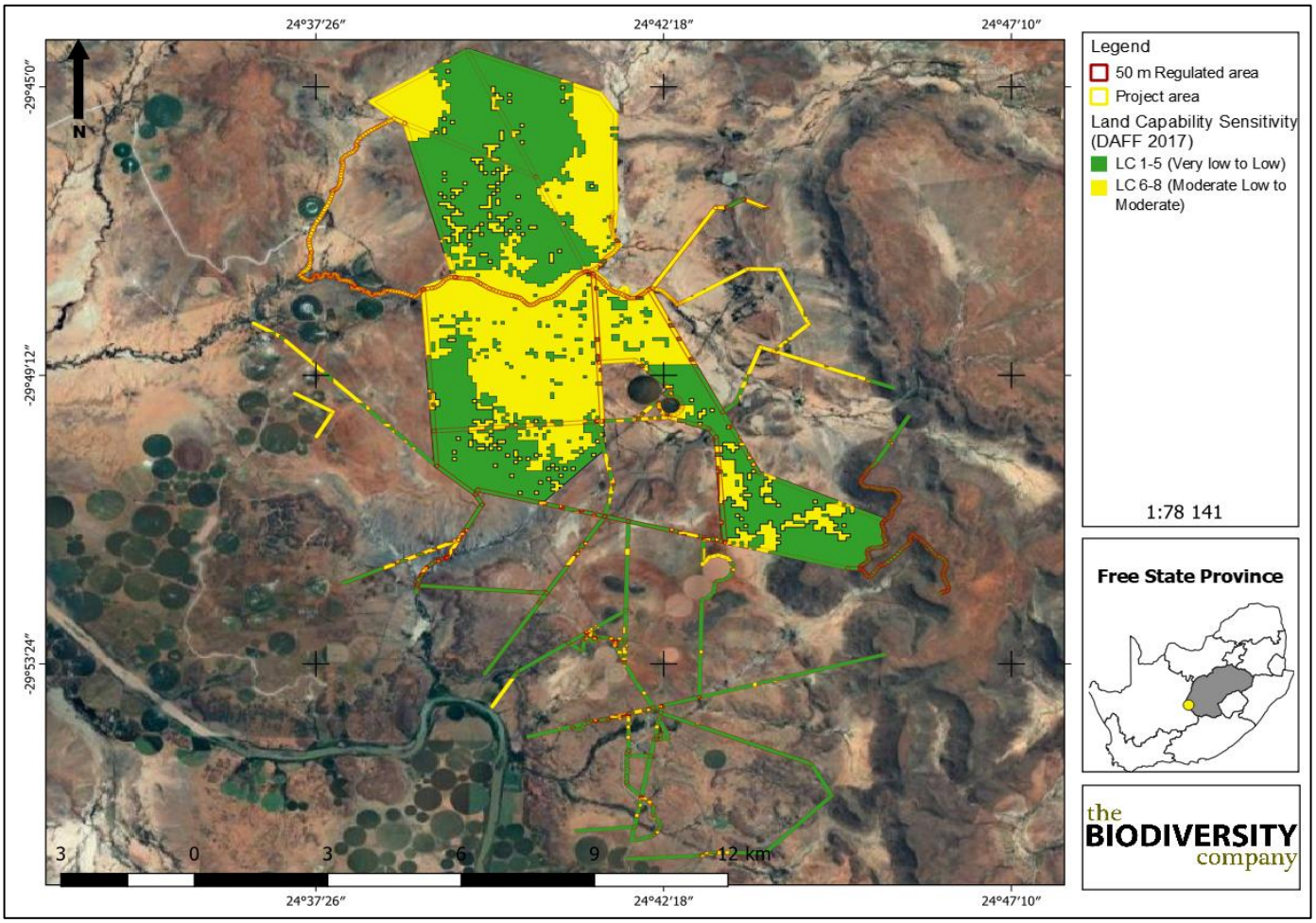


Figure 7.12: Land capability sensitivity (DAFF, 2017)

7.4.4. Land Use

The area surrounding the proposed project site consists of predominantly natural vegetation (bushveld) on the right bank, and extensive agricultural activities of the left bank of the Orange River. At a desktop level, the Orange River is considered largely modified, predominantly due to serious instream habitat modifications, modified flows, and physicochemical modifications.

7.4.5. Ecological Profile of the Study Area and the Development Area

i. Flora Assessment

a) Vegetation Type

The project area is located within the Nama Karoo Biome, which is a large, landlocked region on the central plateau of the western half of South Africa and extends into south-eastern Namibia. This is an arid biome with the majority of the river systems being non-perennial. Apart from the Orange River and the few permanent streams in the southwest that originate in higher-rainfall neighbouring areas, the limited number

of perennial streams that originate in the Nama-Karoo are restricted to the more mesic east. The low precipitation is unreliable (coefficient of variation of annual rainfall up to 40%) and droughts are unpredictable and prolonged. The unpredictable rainfall impedes the dominance of leaf succulents and is too dry in summer for dominance by perennial grasses alone, and the soils are generally too shallow, and the rainfall is too low for trees. Unlike other biomes of southern Africa, local endemism is very low and consequently, the Nama-Karoo Biome does not contain any centre of endemism. Despite relatively low floristic diversity, the Nama-Karoo vegetation has a high diversity of plant life forms. These include co-occurring ephemerals, annuals, geophytes, C3 and C4 grasses, succulents, deciduous and evergreen chamaephytes and trees. This is probably a consequence of an ecotonal and climatically unstable nature of the region.

Scattered rocky hills, mesas and inselbergs are distinctive features of an otherwise relatively homogeneous landscape. These features are either capped by or wholly comprised of dolerite, which is a fine- to medium-grained dark, intrusive igneous rock. The surrounding plains and lowland habitats are dominated by shale and sandstone, which is a fine- to medium-grained sedimentary rock. Due to their structure, these features provide greater heterogeneity in habitat and microclimate than the surrounding plains and therefore, support higher species richness and diversity (Petersen et al, 2020). Species richness and relative cover of the varying plant growth forms are driven by gradients of a combination soil, environmental and climatic parameters.

On a fine-scale vegetation type, the project area overlaps with three vegetation types, mainly the Northern Upper Karoo, followed by the Besemkaree Koppies Shrubland and marginally with the Xhariep Karroid Grassland (**Figure 7.13**).

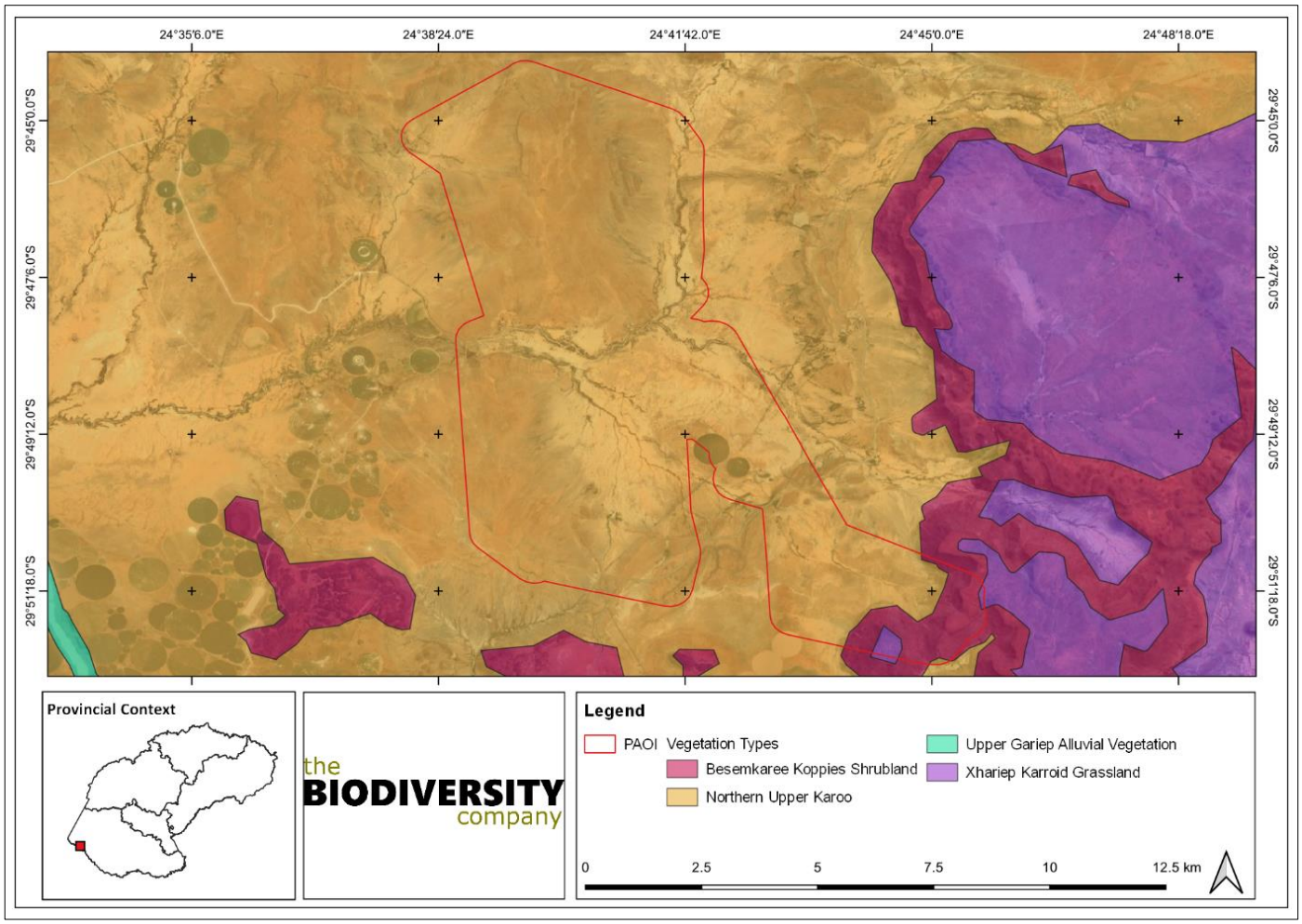


Figure 7.13: Map illustrating the vegetation type associated with the project area

Northern Upper Karoo

Northern Upper Karoo is restricted to the Northern Cape and Free State Provinces, specifically in the northern regions of the Upper Karoo plateau from Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. In the north, it is bordered by the towns of Niekerkshoop, Douglas and Petrusburg and in the south by Carnarvon, Pampoenpoort and De Aar. Additionally, there are a few patches in Griqualand West. Altitude varies mostly from 1000 m to 1500 m (Mucina & Rutherford, 2006).

Its main vegetation feature is a shrubland dominated by dwarf karoo shrubs, grasses and *Senegalia mellifera* subsp. *detinens* and some other low trees (especially on sandy soils in the northern parts and vicinity of the Orange River). In terms of landscape features, it is flat to gently sloping, with isolated hills of Upper Karoo Hardeveld in the south and Vaalbos Rocky Shrubland in the northeast and with many interspersed pans (Mucina & Rutherford, 2006).

Important Plant Taxa in Northern Upper Karoo

Based on Mucina and Rutherford's (2006) vegetation classification, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant) or are prominent

in the landscape within a particular vegetation type. They note that the following species are important taxa in the Northern Upper Karoo vegetation type:

- **Small Trees:** *Senegalia mellifera* subsp. *detinens*, *Boscia albitrunca*.
- **Tall Shrubs:** *Lycium cinereum*, *L. horridum*, *L. oxycarpum*, *L. schizocalyx*, *Rhigozum trichotomum*.
- **Low Shrubs:** *Chrysocoma ciliata*, *Gnidia polycephala*, *Pentzia calcarea*, *P. globosa*, *P. incana*, *P. spinescens*, *Rosenia humilis*, *Amphiglossa triflora*, *Aptosimum marlothii*, *A. spinescens*, *Asparagus glaucus*, *Barleria rigida*, *Berkheya annectens*, *Eriocephalus ericoides* subsp. *ericoides*, *E. glandulosus*, *E. spinescens*, *Euryops asparagoides*, *Felicia muricata*, *Helichrysum lucilioides*, *Hermannia spinosa*, *Leucas capensis*, *Limeum aethiopicum*, *Melolobium candicans*, *Microloma armatum*, *Osteospermum leptolobum*, *O. spinescens*, *Pegolettia retrofracta*, *Pentzia lanata*, *Phyllanthus maderaspatensis*, *Plinthus karooicus*, *Pteronia glauca*, *P. sordida*, *Selago geniculata*, *S. saxatilis*, *Tetragonia arbuscula*, *Zygophyllum lichtensteinianum*.
- **Succulent Shrubs:** *Hertia pallens*, *Salsola calluna*, *S. glabrescens*, *S. rabieana*, *S. tuberculata*, *Zygophyllum flexuosum*.
- **Semiparasitic Shrub:** *Thesium hystrix*.
- **Herbs:** *Chamaesyce inaequilatera*, *Convolvulus sagittatus*, *Dicoma capensis*, *Gazania krebsiana*, *Hermannia comosa*, *Indigofera alternans*, *Lessertia pauciflora*, *Radyera urens*, *Sesamum capense*, *Sutera pinnatifida*, *Tribulus terrestris*, *Vahlia capensis*.
- **Succulent Herb:** *Psilocaulon coriarium*.
- **Geophytic Herb:** *Moraea pallida*.
- **Graminoids:** *Aristida adscensionis*, *A. congesta*, *A. diffusa*, *Enneapogon desvauxii*, *Eragrostis lehmanniana*, *E. obtusa*, *E. truncata*, *Sporobolus fimbriatus*, *Stipagrostis obtusa, Eragrostis bicolor*, *E. porosa*, *Fingerhuthia africana*, *Heteropogon contortus*, *Stipagrostis ciliata*, *Themeda triandra*, *Tragus berteronianus*, *T. koelerioides*, *T. racemosus*.

Conservation Status

The conservation target is 21%, with none being conserved in statutory conservation areas and about 4% has already been cleared for cultivation (the highest proportion of any type in the Nama-Karoo) or irreversibly transformed by building of dams (*Houwater, Kalkfontein and Smart Syndicate Dams*). *Prosopis glandulosa*, one of the 12 agriculturally most important invasive alien plants in South Africa, is widely distributed in this vegetation type. Erosion ranges from very low to moderate.

Besemkaree Koppies Shrubland

Besemkaree Koppies Shrubland is restricted to the Northern Cape, Free State and Eastern Cape Provinces. Within these provinces, it can be found on plains of Eastern Upper Karoo (between Richmond and Middelburg in the south and the Orange River) and within dry grasslands of the southern and central Free State. Additionally, there are also extensive dolerite-dominated landscapes along the upper Orange River that belong to this unit as well. It extends northwards to around Fauresmith in the northwest and to the Wepener District in the northeast. Altitude varies from 1120m to 1680m (Mucina & Rutherford, 2006).

In terms of vegetation and landscape features, this vegetation type is characterised by slopes of koppies, butts and tafelbergs covered with two-layered karroid shrublands. The lower closed-canopy layer is dominated by dwarf small-leaved shrubs and, especially in precipitation-rich years, also by abundant grasses, while the upper loose canopy layer is dominated by tall shrubs, including several *Rhus* species,

Euclea crispa subsp. *ovata*, *Diospyros austro-africana* and *Olea europaea* subsp. *africana* (Mucina & Rutherford, 2006).

Important Plant Taxa in Besemkaree Koppies Shrubland

Mucina and Rutherford (2006) note that the following species are important taxa in the Besemkaree Koppies Shrubland:

- **Small Trees:** *Cussonia paniculata*, *Ziziphus mucronata*.
- **Tall Shrubs:** *Diospyros austro-africana*, *Euclea crispa* subsp. *ovata*, *Olea europaea* subsp. *africana*, *Rhus burchellii*, *R. ciliata*, *R. erosa*, *Buddleja saligna*, *Diospyros lycioides* subsp. *lycioides*, *Ehretia rigida*, *Grewia occidentalis*, *Gymnosporia polyacantha*, *Tarchonanthus minor*.
- **Low Shrubs:** *Asparagus suaveolens*, *Chrysocoma ciliata*, *Amphiglossa triflora*, *Aptosimum elongatum*, *Asparagus striatus*, *Diospyros pallens*, *Eriocephalus ericoides*, *E. spinescens*, *Euryops empetrifolius*, *Felicia filifolia* subsp. *filifolia*, *F. muricata*, *Helichrysum dregeanum*, *H. lucilioides*, *Hermannia multiflora*, *H. vestita*, *Lantana rugosa*, *Limeum aethiopicum*, *Lycium cinereum*, *Melolobium candicans*, *M. microphyllum*, *Nenax microphylla*, *Pegolettia retrofracta*, *Pentzia globosa*, *Rhigozum obovatum*, *Selago saxatilis*, *Stachys linearis*, *S. rugosa*, *Sutera halimifolia*, *Wahlenbergia albens*.
- **Succulent Shrubs:** *Aloe broomii*, *Chasmatophyllum musculinum*, *C. verdoorniae*, *Cotyledon orbiculata* var. *dactylopsis*, *Pachypodium succulentum*.
- **Graminoids:** *Aristida adscensionis*, *A. congesta*, *A. diffusa*, *Cenchrus ciliaris*, *Cymbopogon caesius*, *Cynodon incompletus*, *Digitaria eriantha*, *Eragrostis curvula*, *E. lehmanniana*, *Heteropogon contortus*, *Setaria lindenbergiana*, *Themeda triandra*, *Tragus koelerioides*, *Cymbopogon pospischilii*, *Enneapogon scoparius*, *Eragrostis chloromelas*, *E. obtusa*, *Eustachys paspaloides*, *Fingerhuthia africana*, *Hyparrhenia hirta*, *Sporobolus fimbriatus*.
- **Herbs:** *Convolvulus sagittatus*, *Dianthus caespitosus* subsp. *caespitosus*, *Gazania krebsiana* subsp. *krebsiana*, *Hibiscus pusillus*, *Indigofera alternans*, *I. rhytidocarpa*, *Lepidium africanum* subsp. *africanum*, *Pollichia campestris*.
- **Herbaceous Climber:** *Argyrolobium lanceolatum*.
- **Geophytic Herbs:** *Albuca setosa*, *Asplenium cordatum*, *Cheilanthes bergiana*, *C. eckloniana*, *Freesia andersoniae*, *Haemanthus humilis* subsp. *humilis*, *Oxalis depressa*, *Pellaea calomelanos*.
- **Succulent Herbs:** *Aloe grandidentata*, *Crassula nudicaulis*, *Duvalia caespitosa*, *Euphorbia pulvinata*, *Huernia piersii*, *Stapelia grandiflora*, *S. olivacea*, *Tridentea gemmiflora*.

Conservation Status

The conservation target is 28% and about 5% statutorily conserved in the Rolfontein, Tussen Die Riviere, Oviston, Gariep Dam, Caledon and Kalkfontein Dam Nature Reserves. Additionally, there is a small patch that is protected in the private Vulture Conservation Area. About 3% of the area has been transformed due to dams building. Erosion varies from low to high (Mucina & Rutherford, 2006).

Xhariep Karroid Grassland

The Xhariep Karroid Grassland is found in the Free State Province and very slightly into the Northern Cape Province: Southern regions including the vicinity of Luckhoff (west), Edenburg (north), Gariep Dam (south) and Smithfield (east). Altitude 1 260–1 560 m.

In terms of vegetation and landscape features, it consists of extensive, even or slightly undulating bottomland flats forming a matrix of large landscape patches interrupted by high dolerite sills, koppies and conspicuous ring dykes (bearing Gh 4 Besemkaree Koppies Shrubland) and supporting low- to medium-height, open grassland intermingled with small patches of dwarf karroid shrubs.

Important Plant Taxa in Xhariep Karroid Grassland

Mucina and Rutherford (2006) note that the following species are important taxa in the Xhariep Karroid Grassland:

- **Low Shrubs:** *Chrysocoma ciliate*, *Eriocephalus ericoides*, *E. spinescens, Felicia filifolia subsp. filifolia , F. muricata , Pentzia globosa , P. incana, Amphiglossa triflora, Aptosimum elongatum, Atriplex semibaccata var. appendiculata, Berkheya annectens, Gnidia polycephala, Helichrysum asperum var. albidulum, H. dregeanum, H. lucilioides, Lycium cinereum, Melolobium candicans, Nenax microphylla, Oligomeris dregeana, Osteospermum spinescens, Rosenia humilis, Selago saxatilis, Wahlenbergia albens, W. nodosa.*
- **Succulent Shrubs:** *Euphorbia clavarioides var. clavarioides, Hertia pallens, Ruschia hamata, R. rigida, Salsola calluna, S. glabrescens.*
- **Graminoids:** *Aristida adscensionis, A. canescens, A. congesta, Chloris virgata, Cynodon incompletus, Eragrostis chloromelas, E. lehmanniana, E. obtusa, Fingerhuthia africana, Panicum coloratum, P. stapfianum, Themeda triandra, Tragus koelerioides, Aristida diffusa, Cymbopogon pospischilii, Digitaria eriantha, Eragrostis curvula, Sporobolus fimbriatus.*
- **Herbs:** *Gazania krebsiana subsp. krebsiana, Convolvulus boedeckerianus, Dimorphotheca zeyheri, Hermannia coccocarpa, Indigofera alternans, Lepidium africanum subsp. africanum, Lessertia pauciflora, Rumex lanceolatus, Salvia stenophylla, Selago densiflora.*
- **Herbaceous Climber:** *Argyrolobium lanceolatum*.
- **Geophytic Herbs:** *Moraea pallida, Oxalis depressa*
- **Succulent Herbs:** *Tripteris aghillana var. integrifolia*.

Conservation Status
Target 24%. About 2.5% statutorily conserved in Gariep Dam, Tussen Die Riviere, Kalkfontein Dam, Oviston, Wurasdam and Rolfontein Nature Reserves. Some 4% already transformed by cultivation and dam-building (Bethulie, Gariep, Kalkfontein, Straussfontein and Tierpoort Dams). This dry grassland is prone to encroachment of low, unpalatable karroid shrubs when exposed to heavy grazing. Erosion moderate (71%) and low (19%).

ii. Flora Assessent

a) **Indigenous Flora**

A total of 57 species, representing 25 families were recorded within the project area during the survey period (**Table 7.2**). Six of these species are endemic to South Africa, accounting for 11% of the total number of recorded species. None of the species recorded are regarded as SCC. Nevertheless, five species are protected by legislation and if granted authorisation, it is imperative that a Plant Search and Rescue Plan be developed prior to clearing and development. A permit from the relevant authority, Department of Economic Development, Tourism and Environmental Affairs must be obtained to remove and relocate individuals of these species to surrounding natural areas. The locations of the protected flora

species are illustrated in **Figure 7.14** below. N.B. due to time constraints not all of the individuals were geotagged and the extent of occurrence of these species is considerably under-represented in the map. This is especially pertaining to the calcrete outcrop within which *Titanopsis calcarea* was ubiquitous.

Table 7.2: Summary of indigenous flora recorded within the Xhariep Export Programme Agricultural Development project area during the survey period. **Protected species are highlighted in bold**.

Family	Species Name	Growth Form	Conservation Status	Endemism
Acanthaceae	*Justicia divaricate*	Herb	LC	
Aizoaceae	*Aizoon canariense*	Succulent herb	LC	
Aizoaceae	*Malephora smithii*	Succulent herb	LC	Endemic
Aizoaceae	*Ruschia spinosa*	Succulent herb	LC	
Aizoaceae	***Titanopsis calcarea***	**Succulent herb**	**LC**	**Endemic**
Amaranthaceae	*Salsola aphylla*	Succulent herb	LC	
Anacardiaceae	*Searsia burchellii*	Small tree	LC	
Anacardiaceae	*Searsia lancea*	Tree	LC	
Apocynaceae	*Gomphocarpus fruticosus*	Herb	LC	
Asparagaceae	*Asparagus cooperi*	Herb	LC	
Asparagaceae	*Eriospermum sp.*	Geophytic herb		
Asphodelaceae	***Aloe claviflora***	**Succulent herb**	**LC**	
Asteraceae	*Berkheya multijuga*	Herb	LC	
Asteraceae	*Cineraria lyratiformis*	Herb	LC	
Asteraceae	*Crassothonna patula*	Succulent herb	LC	Endemic
Asteraceae	*Felicia filifolia subsp. filifolia*	Herb	LC	
Asteraceae	*Helichrysum luteoalbum*	Herb	LC	
Asteraceae	*Kleinia longiflora*	Succulent herb	LC	
Asteraceae	*Pentzia globosa*	Herb	LC	
Asteraceae	*Tarchonanthus camphoratus*	Small tree	LC	
Bignoniaceae	*Rhigozum trichotomum*	Small tree	LC	
Brassicaceae	*Heliophila minima*	Succulent herb	LC	
Colchicaceae	***Colchicum melanthoides***	**Geophytic herb**	**LC**	
Cyperaceae	*Afroscirpoides dioeca*	Graminoid	NE	
Cyperaceae	*Cyperus sp.*	Graminoid		
Cyperaceae	*Isolepis sp.*	Graminoid		
Euphorbiaceae	***Euphorbia crassipes***	**Succulent herb**	**LC**	
Fabaceae	*Lotononis laxa*	Herb	LC	
Fabaceae	*Melolobium microphyllum*	Herbaceous shrub	LC	
Fabaceae	*Senegalia mellifera* subsp. *Detinens*	Small tree	LC	
Fabaceae	*Vachellia karoo*	Small tree	LC	
Geraniaceae	*Pelargonium* sp.	Succulent herb		
Iridaceae	***Moraea polystachya***	**Geophytic herb**	**LC**	

Family	Species Name	Growth Form	Conservation Status	Endemism
Oxalidaceae	*Oxalis sp.*	Geophytic herb		
Poaceae	*Aristida adscensionis*	Graminoid	LC	
Poaceae	*Aristida congesta subsp. Barbicollis*	Graminoid	LC	
Poaceae	*Aristida congesta subsp. Congesta*	Graminoid	LC	
Poaceae	*Chloris virgata*	Graminoid	LC	
Poaceae	*Digitaria eriantha*	Graminoid	LC	
Poaceae	*Enneapogon scoparius*	Graminoid	LC	
Poaceae	*Eragrostis capensis*	Graminoid	LC	
Poaceae	*Eragrostis lehmanniana var. lehmanniana*	Graminoid	LC	
Poaceae	*Eragrostis superba*	Graminoid	LC	
Poaceae	*Hyparrhenia hirta*	Graminoid	LC	
Poaceae	*Stipagrostis obtusa*	Graminoid	LC	
Poaceae	*Themeda triandra*	Graminoid	LC	
Polygalaceae	*Polygala pungens*	Succulent herb	LC	Endemic
Ranunculaceae	*Clematis brachiata*	Herbaceous climber	LC	
Rhamnaceae	*Ziziphus mucronata subsp. Mucronate*	Large tree	LC	
Santalaceae	*Viscum continuum*	Semiparasitic epiphyte	LC	Endemic
Santalaceae	*Viscum rotundifolium*	Semiparasitic epiphyte	LC	
Scrophulariaceae	*Diclis petiolaris*	Herb	LC	
Scrophulariaceae	*Nemesia rupicola*	Herb	LC	
Solanaceae	*Lycium cinereum*	Woody shrub	LC	
Solanaceae	*Lycium hirsutum*	Small tree	LC	
Zygophyllaceae	*Sisyndite spartea*	Succulent herb	LC	
Zygophyllaceae	*Zygophyllum incrustatum*	Small tree	LC	Endemic

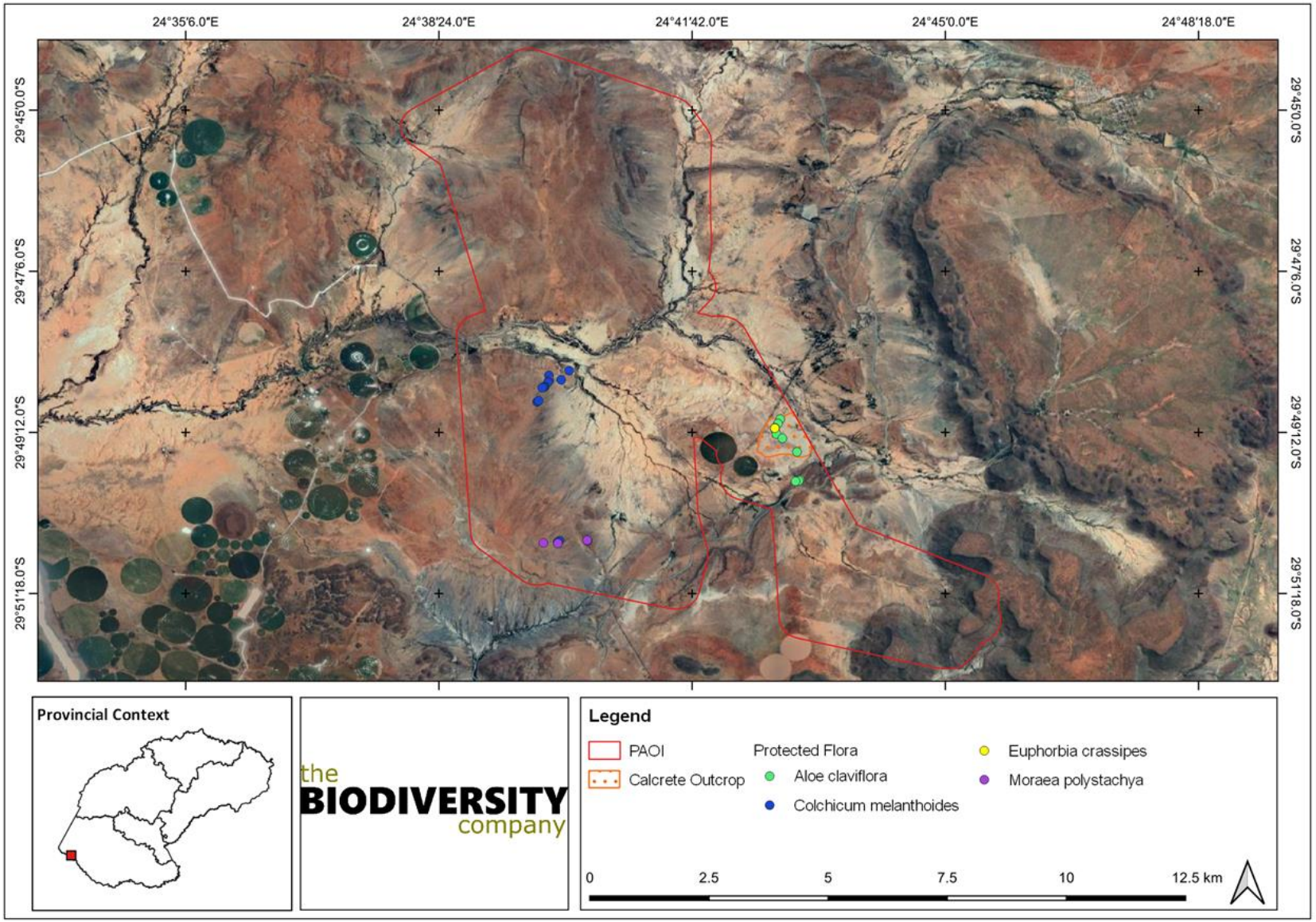


Figure 7.14: Map illustrating the location of protected flora within the proposed Xhariep Export Programme Agricultural Development project area

iii. Avifauna

Fifty (51) species, representing 31 families of indigenous avifauna were recorded within the project area during the survey period (**Table 7.3**). This accounts for approximately 26% of the species expected to occur within the project area. Based on the variation of the habitat structure within the project area, a high diversity of species is expected with more species likely to be recorded with additional surveys. *Aquila rapax rapax* (Southern Tawny Eagle) and *Ardeotis kori kori* (Southern Kori Bustard) are listed as SCC on a regional and global scale, and *Falco biarmicus* (Lanner Falcon) is listed as a SCC on a regional scale.

Aquila rapax is listed as VU on a global scale (BirdLife International, 2021) and EN on a regional scale (Taylor *et al*, 2015). This is a widespread raptor occurring over large areas of Sub-Saharan Africa, with isolated populations in North Africa, the Middle East and South Asia, albeit the African population is now becoming increasingly dependent on protected areas (BirdLife International, 2021). The species occupies dry open habitats from sea level to 3000 m and will occupy both woodland and wooded savannah. *Aquila rapax rapax* predates on mammals, birds, reptiles, insects, and occasionally fish and amphibians. It will also regularly consume carrion and pirate other raptors' prey. The African population is estimated at 73 860 pairs with a severely declining population at a rate of decline as > 60% over the past 50 years within South Africa, Lesotho and eSwatini. The main threats are secondary poisoning, direct persecution and collisions with powerlines (BirdLife International, 2021).

Ardeotis kori is listed as NT on a regional and global scale (BirdLife International, 2016c). This species has a large but disjunct range in sub-Saharan Africa, occurring from Ethiopia and Somalia south to Tanzania, and from southern Angola and Zimbabwe south to South Africa. The species occupies flat, arid, mostly open country such as grassland, karoo, bushveld, thornveld, scrubland and savanna but also including modified habitats such as wheat fields and firebreaks. The diet includes a wide range of plants and animals including insects, reptiles, small rodents, birds, carrion, seeds, berries and roots. It is largely sedentary but does undertake local movements. The global population size has not been quantified, but the population in South Africa has been estimated at 2 000-5 000 birds individuals (BirdLife International, 2016c). A major threat is collision with overhead power lines, but the causes of population declines and range losses in many parts of the distribution are unknown. These have been hypothesised to include persecution, rangeland degradation and bush encroachment.

Falco biarmicus (Lanner Falcon) is listed as LC on a global scale (BirdLife International, 2016d) but VU on a regional scale. They may occur in groups up to 20 individuals or individually. Their diet is mainly composed of small birds such as pigeons and francolins. Threats include trapping, persecution, pesticide use and habitat loss.

Table 7.3: Summary of avifauna species recorded within the proposed Xhariep Export Programme Agricultural Development project area during the survey period. Species of conservation concern are highlighted in bold. EN = Endangered, LC = Least Concern, NT = Near Threatened and VU = Vulnerable

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Accipitridae	***Aquila rapax rapax***	**Southern Tawny Eagle**	**EN**	**VU**
Accipitridae	*Elanus caeruleus caeruleus*	African Black-shouldered Kite	LC	LC
Accipitridae	*Melierax canorus canorus*	Southern Pale Chanting Goshawk	LC	LC
Alaudidae	*Calendulauda africanoides africanoides*	Fawn-coloured Lark	LC	LC

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Alaudidae	*Chersomanes albofasciata albofasciata*	Central Spike-heeled Lark	LC	LC
Alaudidae	*Mirafra fasciolata*	Eastern Clapper Lark	LC	LC
Anatidae	*Tadorna cana*	South African Shelduck	LC	LC
Ardeidae	*Ardea melanocephala*	Black-headed Heron	LC	LC
Cisticolidae	*Cisticola juncidis terrestris*	Southern African Zitting Cisticola	LC	LC
Cisticolidae	*Malcorus pectoralis*	Rufous-eared Warbler	LC	LC
Cisticolidae	*Prinia flavicans flavicans*	Black-chested Prinia	LC	LC
Coliidae	*Colius colius*	White-backed Mousebird	LC	LC
Coliidae	*Urocolius indicus*	Red-faced Mousebird	LC	LC
Columbidae	*Spilopelia senegalensis*	Laughing Dove	LC	LC
Columbidae	*Streptopelia capicola*	Cape Turtle Dove	LC	LC
Columbidae	*Streptopelia semitorquata*	Red-eyed Dove	LC	LC
Emberizidae	*Emberiza capensis cinnamomea*	Karoo Cape Bunting	LC	LC
Estrildidae	*Amadina erythrocephala*	Red-headed Finch	LC	LC
Estrildidae	*Lagonosticta senegala rendalli*	Red-billed Firefinch	LC	LC
Falconidae	***Falco biarmicus***	**Lanner Falcon**	**VU**	**LC**
Falconidae	*Falco rupicolus*	Rock Kestrel	LC	LC
Glareolidae	*Smutsornis africanus*	Double-banded Courser	LC	LC
Hirundinidae	*Ptyonoprogne fuligula*	Rock Martin	LC	LC
Laniidae	*Lanius collaris collaris*	Southern Fiscal	LC	LC
Lybiidae	*Tricholaema leucomelas*	Acacia Pied Barbet	LC	LC
Malaconotidae	*Tchagra australis*	Brown-crowned Tchagra	LC	LC
Malaconotidae	*Telophorus zeylonus zeylonus*	Southern Bokmakierie	LC	LC
Meropidae	*Merops bullockoides*	White-fronted Bee-eater	LC	LC
Motacillidae	*Motacilla capensis*	Cape Wagtail	LC	LC
Muscicapidae	*Cercotrichas coryphoeus coryphoeus*	Common Karoo Scrub Robin	LC	LC
Muscicapidae	*Cercotrichas paena*	Kalahari Scrub Robin	LC	LC
Muscicapidae	*Cossypha caffra caffa*	Southern Cape Robin-Chat	LC	LC
Muscicapidae	*Myrmecocichla formicivora*	Ant-eating Chat	LC	LC
Muscicapidae	*Oenanthe familiaris*	Familiar Chat	LC	LC
Muscicapidae	*Turdus smithi*	Karoo Thrush	LC	LC
Nectariniidae	*Cinnyris fuscus fuscus*	Common Dusky Sunbird	LC	LC
Numididae	*Numida meleagris*	Helmeted Guineafowl	LC	LC
Otididae	***Ardeotis kori kori***	**Southern Kori Bustard**	**NT**	**NT**
Otididae	*Eupodotis afraoides afraoides*	South African Black Korhaan	LC	LC
Passeridae	*Plocepasser mahali*	White-browed Sparrow-Weaver	LC	LC
Phoeniculidae	*Rhinopomastus cyanomelas*	Common Scimitarbill	LC	LC

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Ploceidae	*Ploceus velatus*	Southern Masked Weaver	LC	LC
Ploceidae	*Quelea quelea lathamii*	South African Red-billed Quelea	LC	LC
Ploceidae	*Sporopipes squamifrons*	Scaly-feathered Weaver	LC	LC
Pycnonotidae	*Pycnonotus nigricans*	African Red-eyed Bulbul	LC	LC
Remizidae	*Anthoscopus minutus*	Southern Penduline Tit	LC	LC
Scopidae	*Scopus umbretta umbretta*	Common Hamerkop	LC	LC
Strigidae	*Tyto alba affinis*	African Barn Owl	LC	LC
Sturnidae	*Lamprotornis nitens*	Cape Starling	LC	LC
Sylviidae	*Curruca subcoerulea subcoerulea*	Chestnut-vented Warbler	LC	LC
Threskiornithidae	*Bostrychia hagedash*	Hadeda Ibis	LC	LC

iv. Mammals

Seventeen (17) mammal species were recorded during the survey based on either direct observation, capture of specimens by passive sampling techniques or the presence of visual tracks and signs. This accounts for approximately 35% of the expected species. Parahyaena brunnea is classified as NT on a regional and global scale (Wiesel, 2015). Moreover, due to the diversity of habitats on a broad and fine scale, there is a high likelihood of occurrence of other select mammal SCC occurring within the project area.

Several of the species recorded are considered important in maintaining biodiversity and ecosystem functioning. Species such as Orycteropus afer afer (Southern Aardvark) and Geosciurus inauris (South African Ground Squirrel) are regarded as ecosystem engineers and the burrows they create are also utilised as shelter by an array of faunal species, which is pertinent in the thermally variable and semi-arid environment of the project area and surrounding landscape. In addition, the foraging behaviour of the former species plays a role in vegetation dynamics. Orycteropus afer feed on the Formicidae species, Messor capensis, which is a major seed predator within the Karoo bioregion. During foraging by *O.afer afer*, the nests are damaged but usually not destroyed, and the seed stores are frequently distributed with the mound soils over a larger area. The seeds are usually buried within the mound soil and germinate during favourable conditions. A portion of the seeds may also be ingested by *O. afer afer* while feeding on the ants and these are distributed with the faeces. Consequently, the species inadvertently also plays a role in seed dispersal and germination.

While it is acknowledged that *O. afer afer* is regarded as keystone species within the landscape, *G. inauris* could also be regarded as such, as herbivorous mammal burrows are usually associated with higher levels of soil nutrients and greater degree of water infiltration and can result in elevated foliar nutrient concentrations and greater plant biomass surrounding their burrows (Davidson et al, 2012). Therefore, the areas around the burrows are utilised by many species and can result in a highly diverse arthropod community, which consequently drives a higher diversity in higher trophic levels.

The project area and surrounding landscape also supports a species rich assemblage of *mesocarnivores*. *Mesocarnivores* have strong effects on their prey species, and this especially so in simple ecological communities or in regions where apex predators are lacking (Roemer et al, 2009). Consequently, shifts in

the population or diversity of the *mesocarnivore* community may lead to trophic cascade effects. This may result in the population explosion of lower trophic organisms, including groups that reach pest proportions such as rodents.

Table 7.4: Mammal species recorded within the proposed Xhariep Export Programme Agricultural Development project area during the survey period. Species of conservation concern are highlighted in bold. LC = Least Concern and NT = Near Threatened

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Bathyergidae	*Cryptomys hottentotus*	Common Molerat	LC	LC
Bovidae	*Antidorcas marsupialis marsupialis*	Karoo Sprinbok	LC	LC
Bovidae	*Raphicerus campestris campestris*	Southern Steenbok	LC	LC
Bovidae	*Tragelaphus strepsiceros strepsiceros*	Southern Greater Kudu	LC	LC
Canidae	*Lupulella mesomelas mesomelas*	Southern Black-backed Jackal	LC	LC
Felidae	*Caracal caracal caracal*	Southern and Eastern African Caracal	LC	LC
Felidae	*Felis lybica cafra*	Southern African Wildcat	LC	LC
Herpestidae	*Cynictis penicillata penicillata*	Southern Yellow Mongoose	LC	LC
Herpestidae	*Herpestes pulverulentus*	Cape Grey Mongoose	LC	LC
Hyaenidae	***Parahyaena brunnea***	**Brown Hyaena**	**NT**	**NT**
Hystricidae	*Hystrix africaeaustralis africaeaustralis*	Southern Porcupine	LC	LC
Leporidae	*Lepus saxatilis*	Scrub Hare	LC	LC
Macroscelididae	*Elephantulus myurus*	Eastern Rock Sengi	LC	LC
Muridae	*Rhabdomys pumilio*	Four-striped Grass Mouse	LC	LC
Orycteropodidae	*Orycteropus afer afer*	Southern Aardvark	LC	LC
Suidae	*Phacochoerus africanus sundevallii*	Southern Warthog	LC	LC
Viverridae	*Genetta feline*	Southern Small-spotted Genet	LC	LC

v. Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the proposed project overlaps with a LC ecosystem (**Figure 7.15**).

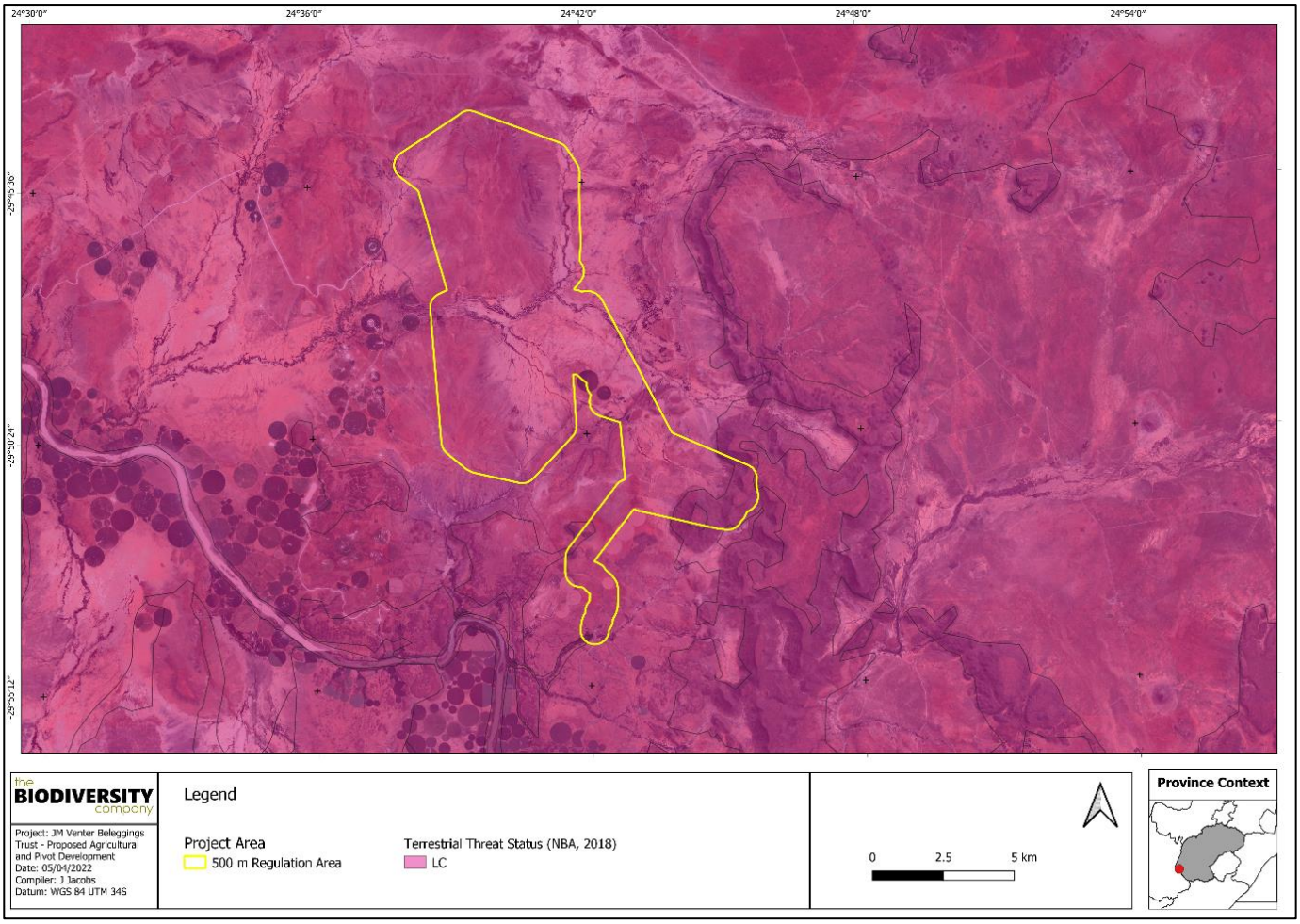


Figure 7.15: Map illustrating the ecosystem threat status associated with the project area

vi. Site Ecological Importance (SEI) and Ecosystem Processes

a) Environmental Screening Tool

According to the Screening Tool Report generated (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended), the following sensitivity classifications were extracted from the National Web-based Environmental Screening Tool (**Figure 7.16**):

» Combined Terrestrial Biodiversity Theme is Very High, due to overlap with CBA1, CBA2, ESA1, ESA2 and Protected Areas Expansion Strategy areas;
» Plant Species Theme is Medium; and
» Animal Species Theme is High, due to the overlap with Redunca fulvorufula (EN), Hydrictis maculicollis (NT) Neotis ludwigii (EN) and Aquila verreauxii (LC) (screening tool was unable to obtain a map image at the time of reporting).

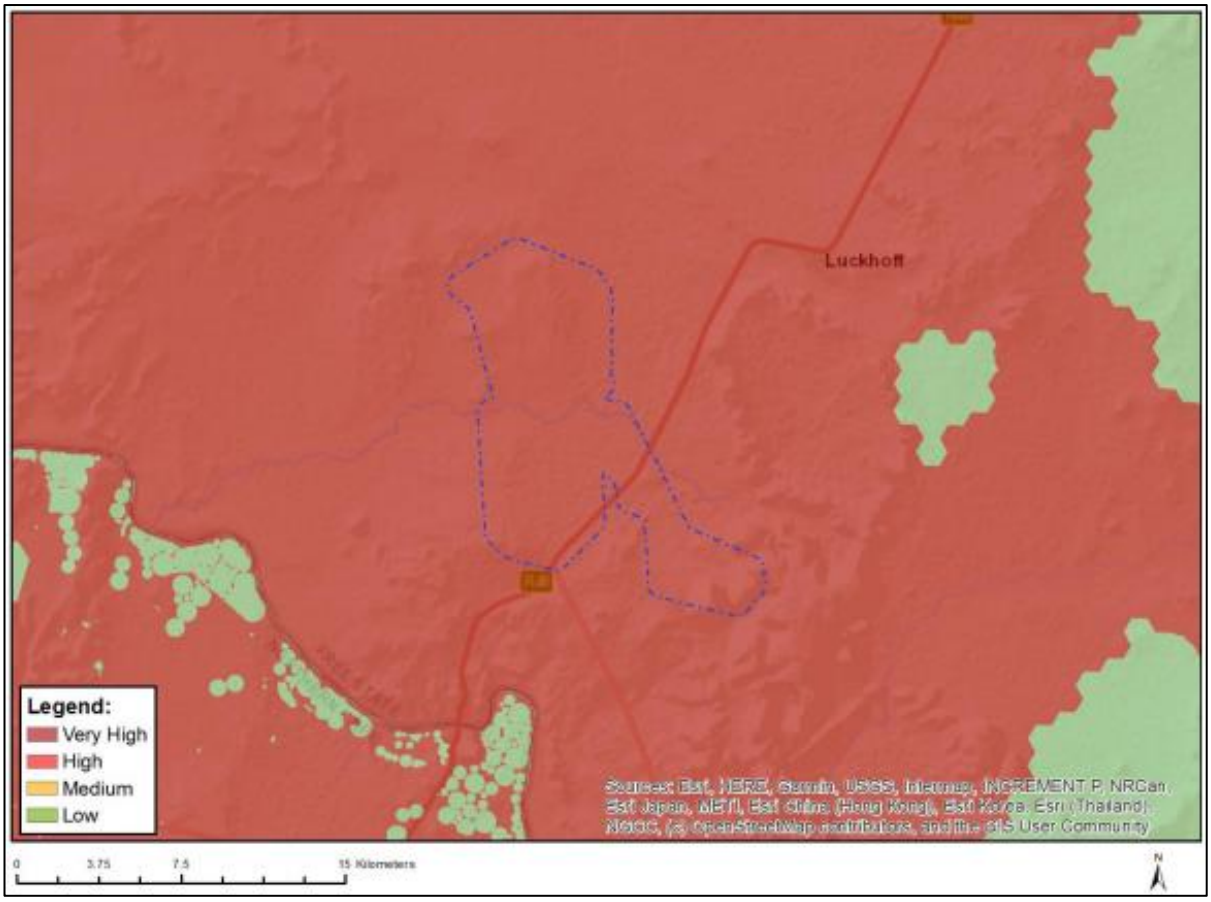


Figure 7.16: Relative Terrestrial Biodiversity Theme Sensitivity for the proposed Xhariep Export Programme Agricultural Development

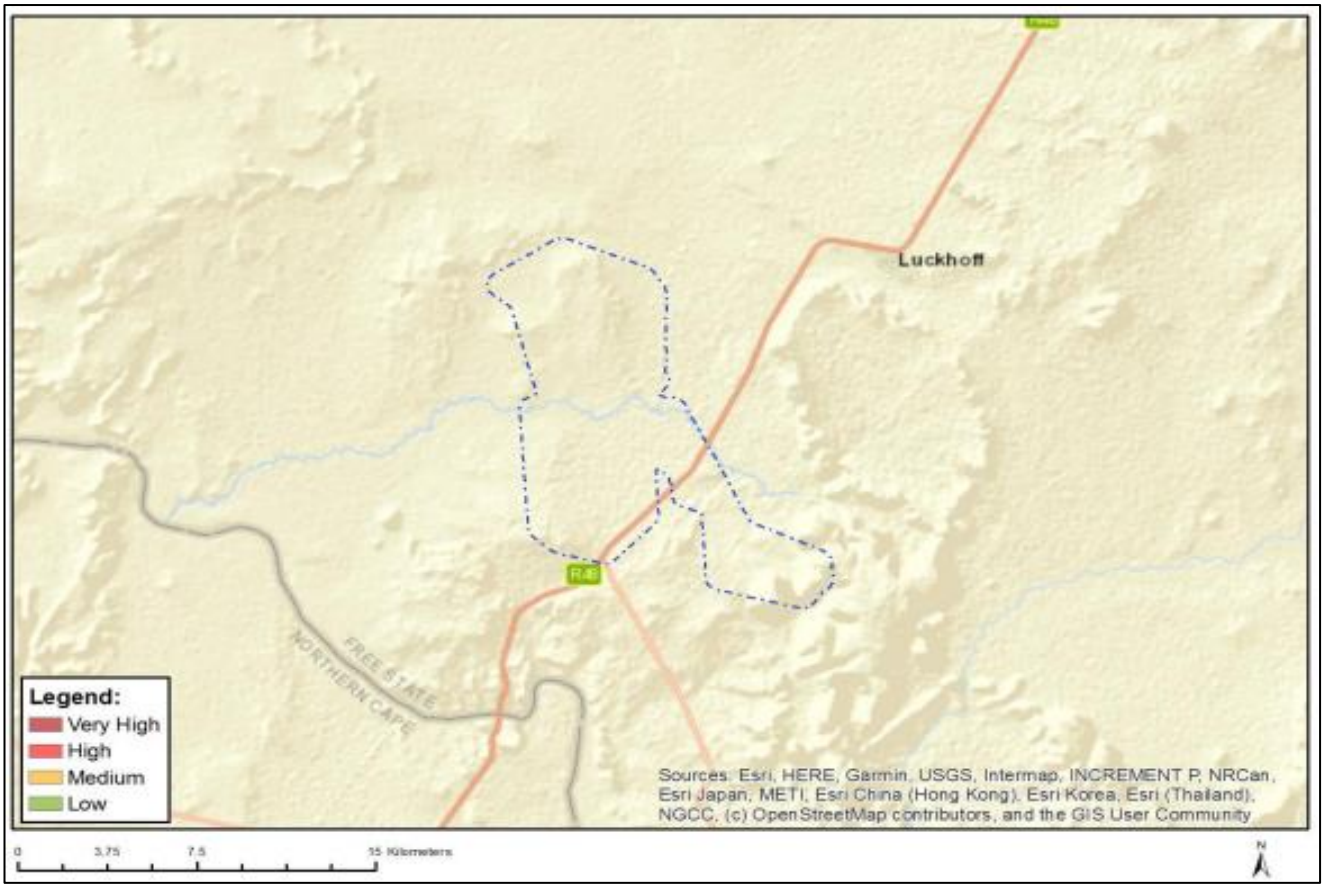


Figure 7.17: Relative Plant Species Theme Sensitivity for the proposed Xhariep Export Programme Agricultural Development

b) Site Ecological Impact

All habitats within the project area were assigned a sensitivity category, i.e., a SEI category. The project area was categorised as possessing habitats possessing areas of 'Very Low', 'High' and 'Very High' SEI. (**Table 7.5**). This indicates that the findings of this assessment are congruent with the Screening Tool with respect to the Combined Terrestrial and Animal Species Theme sensitivity.

The SEI of the project area as well as lotic system buffers are illustrated in **Figure 7:18**. Based on the buffer recommendations as provided in Macfarlane et al (2009) the Lemoenspruit mainstem was allocated a 100 m buffer and its associated tributaries a 50 m buffer. This is because these lotic systems play a critical role in maintaining connectivity within the landscape and support a diversity of fauna species.

Table 7.5: Site Ecological Impact categorises of habitat possessing areas.

Ecological Features (Area [ha])	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Critical Biodiversity Area 1, Calcrete Outcrop and Lotic Systems	High Confirmed or highly likely occurrence of CR, EN, VU	Very High Very large (> 100 ha) intact area for any conservation status of	Very High	Low Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less	Very High

Ecological Features (Area [ha])	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
including Buffer Zones (5 673)	species that have a global EOO of > 10 km^2.	ecosystem type. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.		than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.	
Critical Biodiversity Area 2 and Ecological Support Areas (2 733)	High Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2.	Very High Very large (> 100 ha) intact area for any conservation status of ecosystem type. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches.	Very High	High Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.	High
Modified Areas (207)	Very Low No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.	Low Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area.	Very Low	Very High Habitat that can recover rapidly (~ less than 5 years) to restore > 75%28 of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.	Very Low

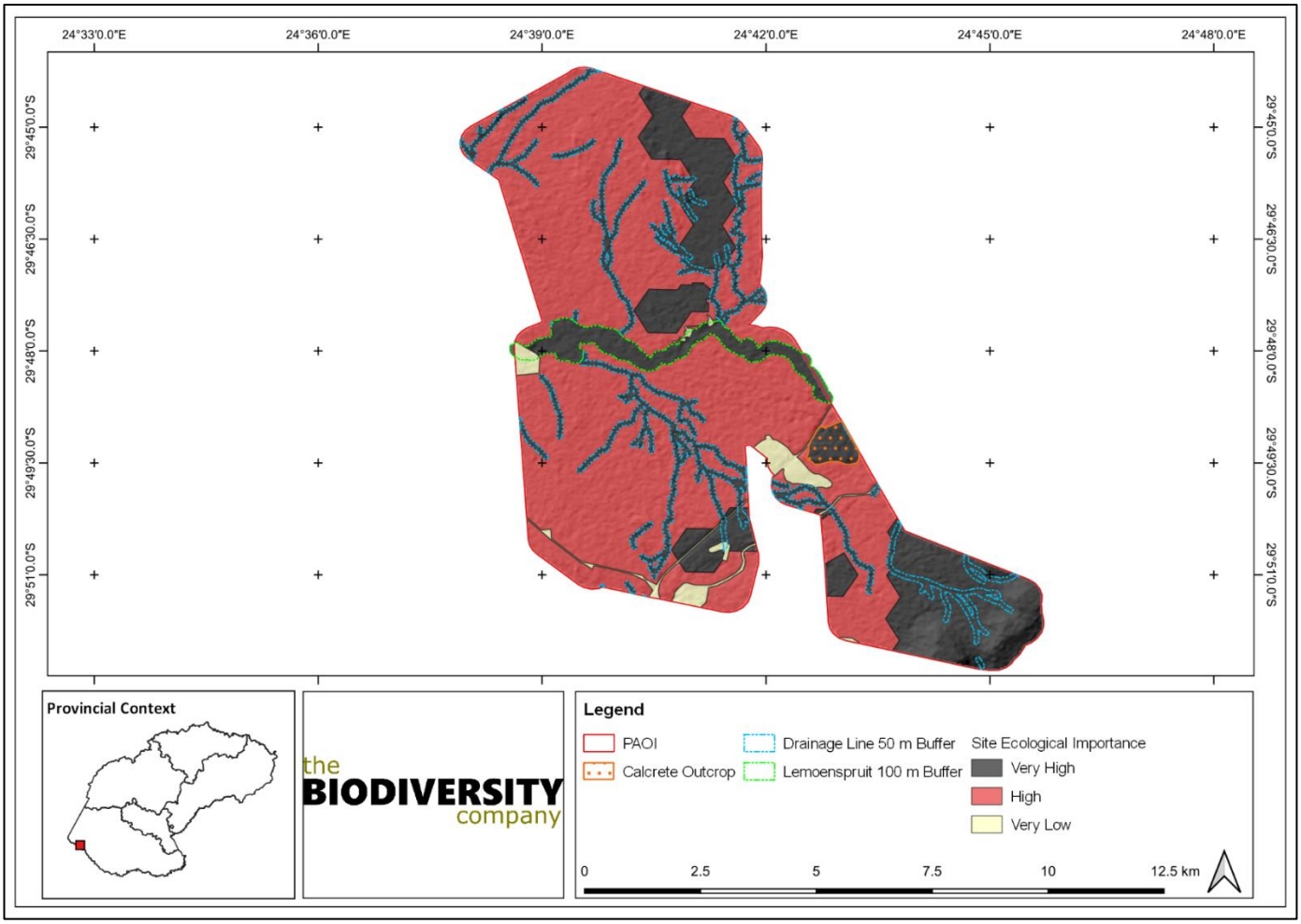


Figure 7.18: Site Ecological Importance of the proposed Xhariep Agricultural Development

vii. Ecosysetm protection level

This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed project overlaps mainly with a NP ecosystem, followed by a PP ecosystem (**Figure 7.19**).

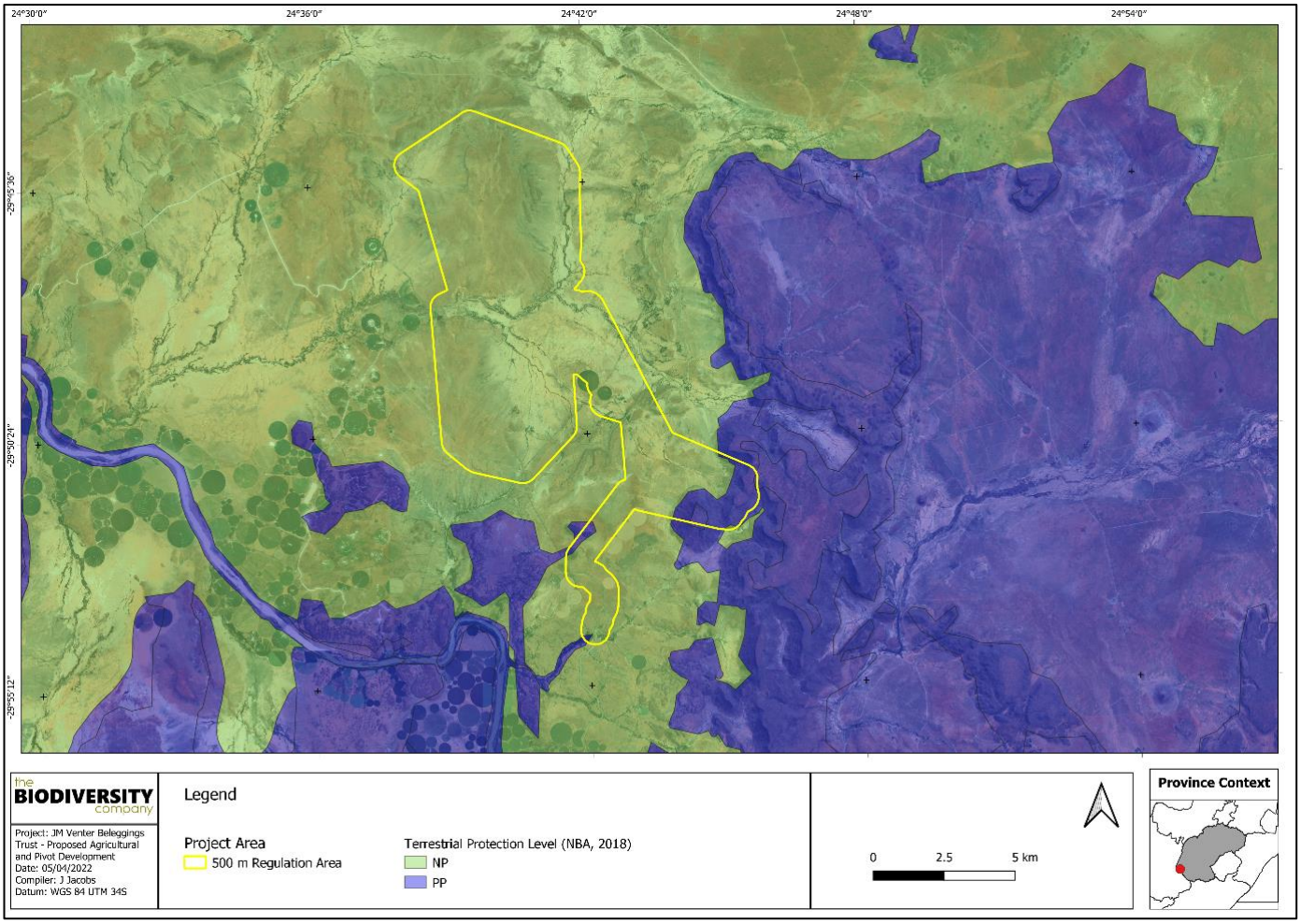


Figure 7.19: Map illustrating the ecosystem protection level associated with the project area

viii. Critical Biodiversity Areas and Ecological Support Areas

The conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

The purpose of the Free State Biodiversity Sector Plan (2016) is to inform land-use planning and development on a provincial scale and to aid in natural resource management. One of the outputs is a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely Protected Areas, CBA1 areas, CBA2 areas, ESA1 areas, ESA2 areas, Other Natural Areas (ONAs) and areas with No Natural Habitat Remaining (NNR) based on biodiversity characteristics, spatial configuration, and requirements for meeting targets for both biodiversity patterns and ecological processes. The site overlaps with a number of these areas as illustrated in **Figure 7.20** overleaf.

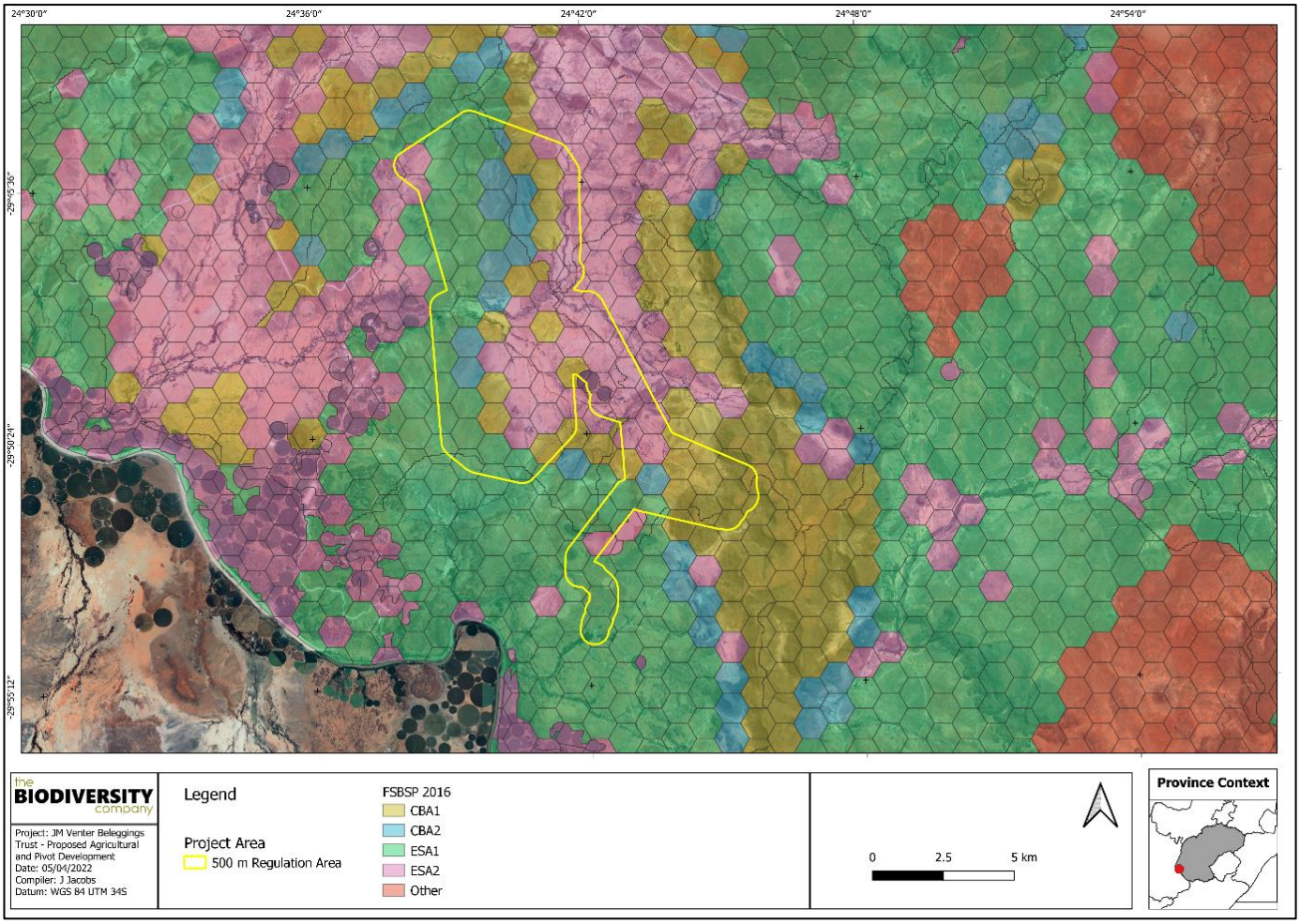


Figure 7.20: Map illustrating the locations of CBAs in the project area

ix. Protected Areas

According to the protected area spatial datasets from SAPAD (2021) and SACAD (2021), the project area does not overlap with any protected areas or conservation areas. However, the project area is located approximately 2 km northwest from Tuinhoek Reserve and Grasberg Reserve (the two reserves overlap almost identically) (**Figure 7.21**). Thus, the project area is located within the 5 km Protected Area Buffer Zones of two protected areas.

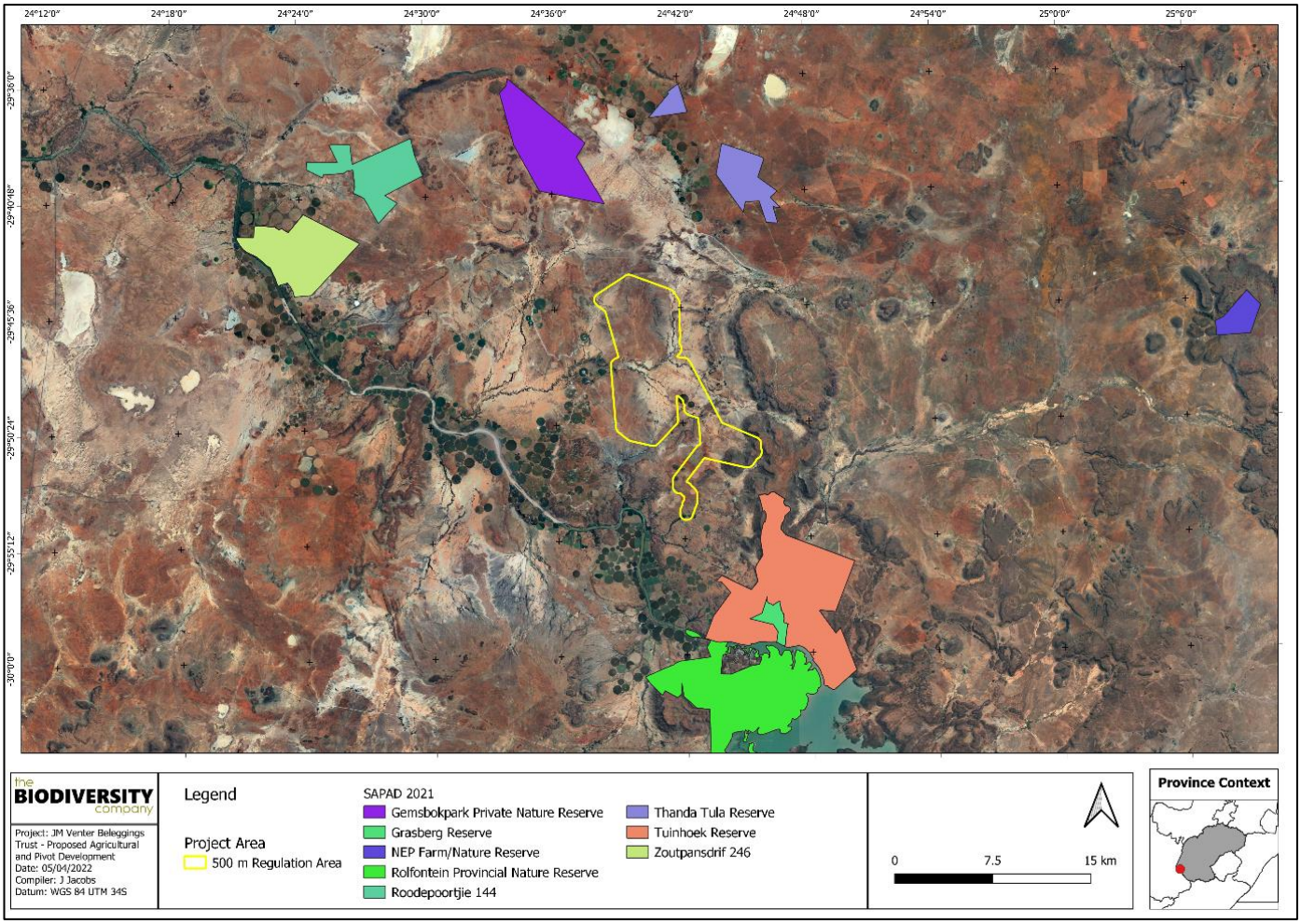


Figure 7.21: The project area in relation to the nearest protected

x. *National Protected Area Expansion Strategy*

National Protected Area Expansion Strategy 2016 (NPAES) areas were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2016). The project area overlaps with a NPAES priority focus area as can be seen in **Figure 7.22**.

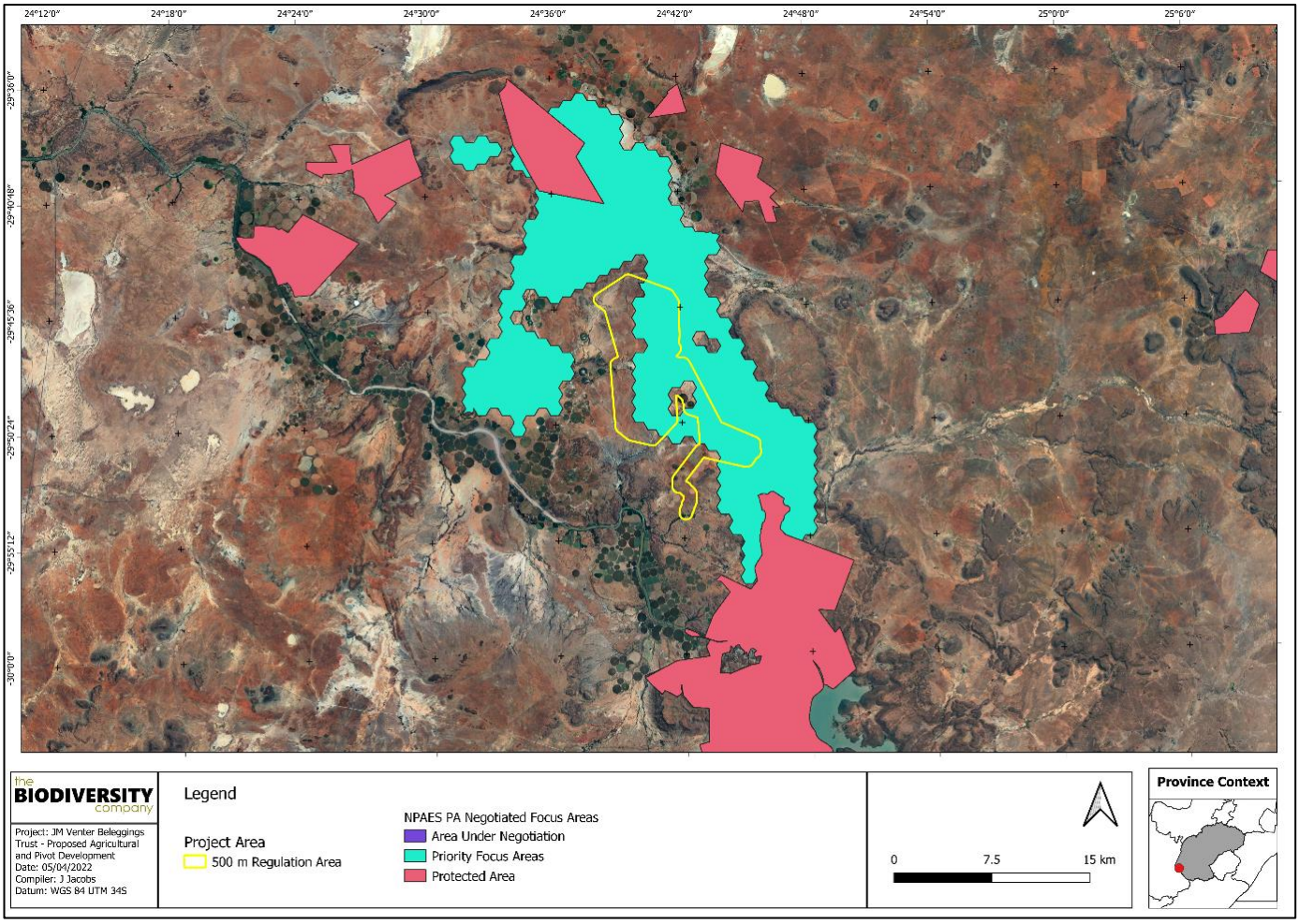


Figure 7.22: The project area in relation to the nearest IBAs

xi. Hydrological Setting

As presented in **Figure 7.23**, the proposed Xhariep Export Programme (XEP) Agricultural development will be drained by several non-perennial, ephemeral and perennial watercourses, which falls predominantly within the D33C quaternary catchment (sub-catchment), with small portions (internal water pipeline) within the D33A quaternary catchments, and the larger Orange Water Management Area (WMA 6 - NWA, 2016). The non-perennial and ephemeral are unnamed and drain into the Lemoenspruit which traverses the middle of the project area and forms the watercourse. The Lemoenspruit is a non-perennial system which flows in a westerly direction into the Orange River at the catchment boundary. The spatial framework for the PES assessment of the watercourses falls within the Orange WMA and includes the Lemoenspruit, as well as several unnamed tributaries of the Lemoenspruit which drain the project area.

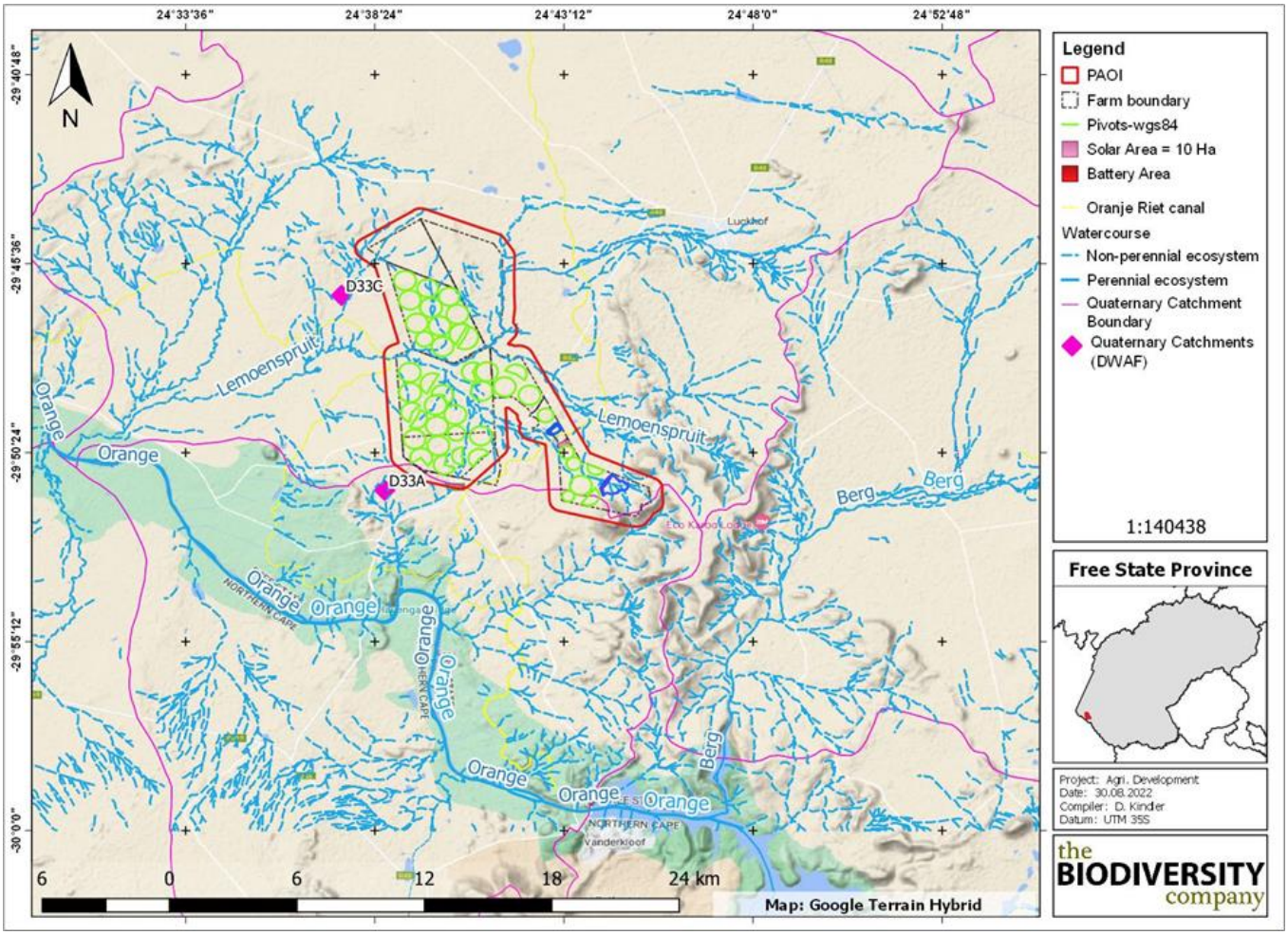


Figure 7.23: Hydrological setting associated with the project area

xii. National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals (Nel *et al.,* 2011). **Figure 7.24** shows the project area overlaps with both unclassified FEPA wetlands and true FEPA wetlands.

The project area falls across two SQRs with several NFEPAs listed within the project area (Table 7.10). These FEPAs are associated with wetland type ecosystems and no aquatic biodiversity FEPAs are designated to the watercourses within the project area. The catchment does however serve as an upstream management area.

Table 7.6: The project area falls across two SQRs with several NFEPAs listed within the project area

Type of FEPA map category	Biodiversity features
Lemoenspruit SQR D33C-4458	
Wetland ecosystem type	2 WetCluster FEPAs
Wetland ecosystem type	Upper Nama Karoo_Channelled valley-bottom wetland

Type of FEPA map category	Biodiversity features
Wetland ecosystem type	Upper Nama Karoo_Flat
Wetland ecosystem type	Upper Nama Karoo_Unchannelled valley-bottom wetland
Wetland ecosystem type	Upper Nama Karoo_Valleyhead seep

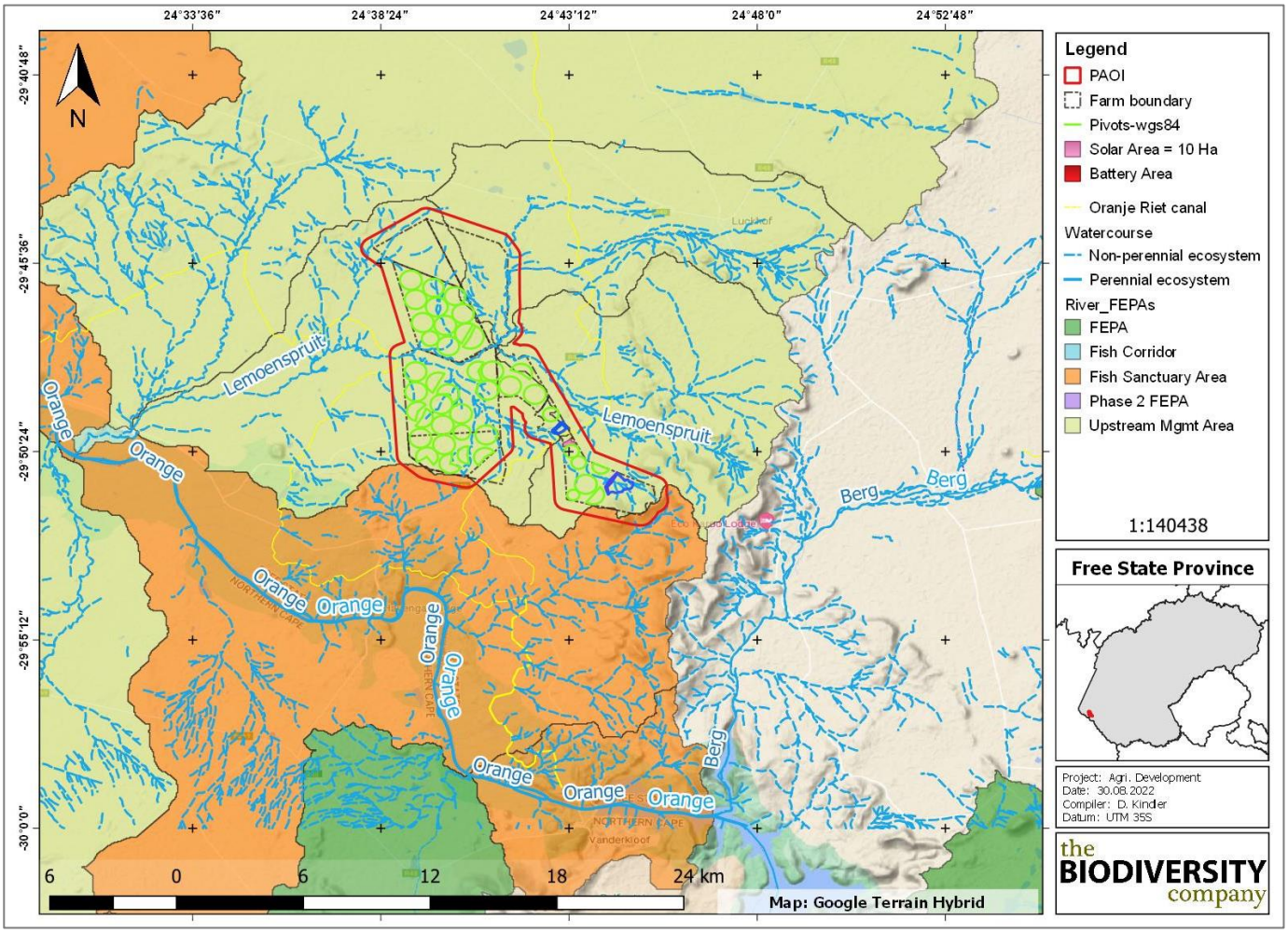


Figure 7.24: Aquatic FEPAs associated with the project area.

a) Status of Watercourses

The locally affected Lemoenspruit is classified as a lower foothills geoclass river system (Rountree et al., 2000), with a gentle gradient alluvial bed and meandering channel. A distinctive macro-channel is visible with sand and silt deposits occurring throughout the watercourse. The area surrounding the proposed project site consists of predominantly natural vegetation (grasslands and bushveld) between the Lemoenspruit and its tributary network which are lined with well-developed riparian vegetation.

The Present Ecological Status (PES) of the watercourse's catchments in relation to project area are illustrated in **Figure 7.25**. The Lemoenspruit and its tributary network are ecologically interlinked and are affected by various land use activities such as agriculture and need to be managed to prevent degradation of the catchment condition, water quality and ecological integrity of the downslope watercourses. Catchment mismanagement within a Sub-Quaternary Reach (SQR) is well documented to degrade its catchment and associated watercourses due to damaged ecological drivers.

The Lemoenspruit and tributary reach within the project area are represented by two adjacent SQRs. These two SQRs comprise the upper reaches of the project area D33C-4483 which drains into the adjacent and downstream D33C-4458 SQR. Water draining from these two SQRs drains downstream through another Endangered SQR Lemoenspruit (D33C-4552) eventuating in the Critically Endangered Orange River SQR requiring upstream management.

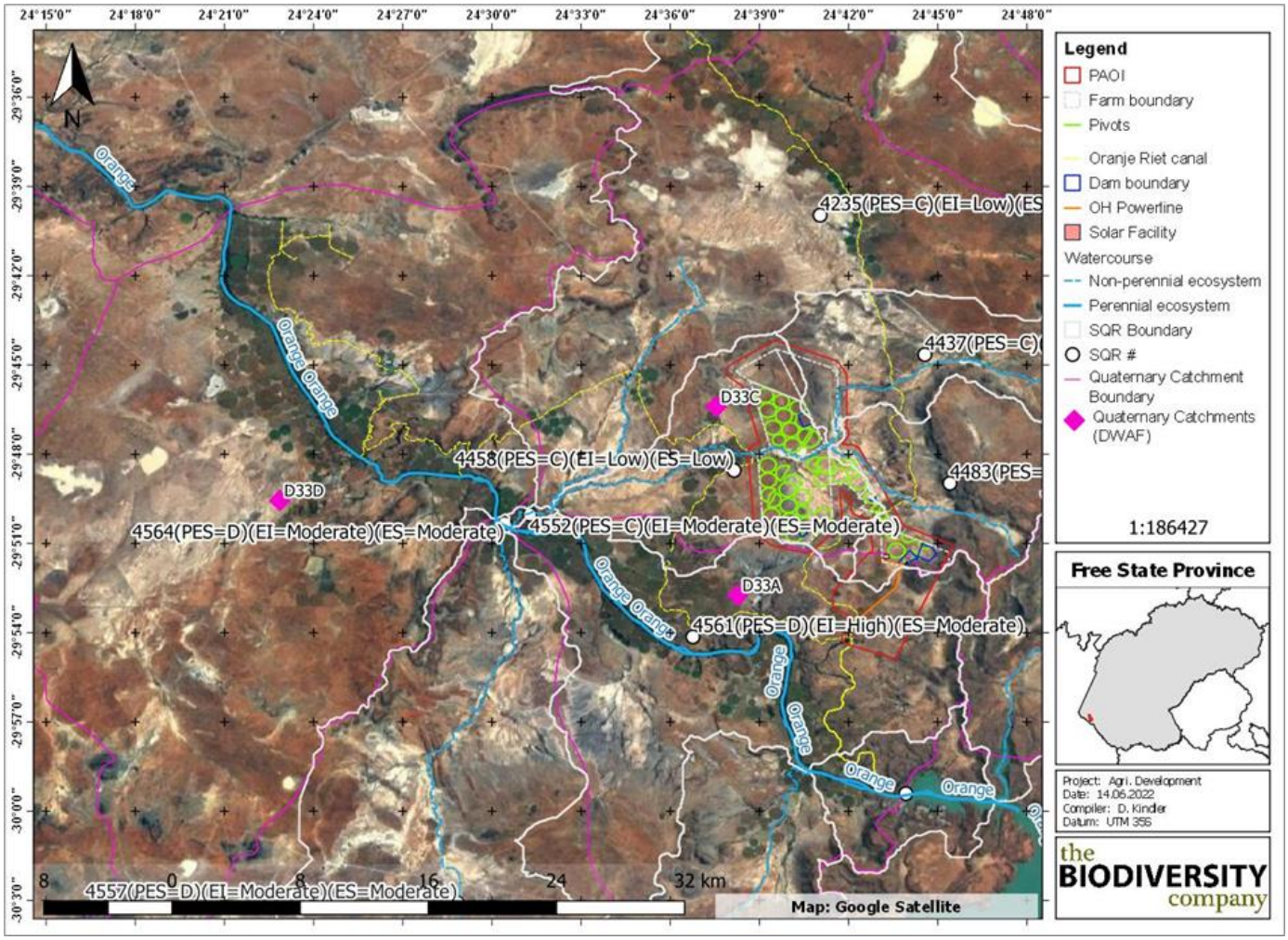


Figure 7.25: Illustration of the Present Ecological State within the relevant catchments (DWS, 2014)

The PES of the two Lemoenspruit SQRs are moderately modified (class C) at a desktop level (DWS, 2014). The desktop listed impacts to the watercourses are attributed to runoff from agricultural activities and flow modifications. The activities have contributions to water quality perturbations and impacts to instream habitat, erosion of channel and banks, and proliferation of alien vegetation. A summary of the PES, stream orders, and Ecological Importance (EI) and Ecological Sensitivity (ES) for the relevant SQRs.

b) Expected Fish Species

An expected species list was generated from DWS (2014), and Skelton (2011) for the Lemoenspruit D33C-4483 and D33C-4458 SQRs and the associated downstream Orange River SQR. A total of 11 fish species are expected to occur within the watercourses potentially influenced (cumulatively) by the project and these are presented in **Table 7.7**.

The expected species are generated on a reach basis, and the occurrence of all species in the system is unlikely as different species are specialists of different habitats which are present along a reach. The Lemoenspruit reach does however have limited habitat diversity and cover features associated with the non-perennial and heavily sedimented nature of the watercourse which would likely limit the diversity of the fish community. This has resulted in a single species expected within the Lemoenspruit, while the downstream Orange River with a high habitat diversity has a much higher number of expected species. The conservational status of the fish species was assessed against the latest IUCN database to identify Species of Conservation Concern (SCC) (IUCN, 2022).

The small barb species previously known as *Enteromius anoplus* (Chubbyhead barb) was thought to be widely distributed across southern Africa with an IUCN listed status of Least Concern (LC) due to an extensive distribution range. However, according to a recent genetic study conducted by Kambikambi et al. (2021), *Enteromius anoplus* was reclassified into four distinct genetic lineages separated by major river systems, with *Enteromius oraniensis* (Orange River Chubbyhead barb) forming the Orange River lineage, a distinct species endemic to the Orange River system. These results render the current IUCN Red List assessment of *E. anoplus* obsolete. Kambikambi et al. (2021), suggest that there is thus the need for generating baseline information, including knowledge of ecological requirements, habitat utilization, distribution, life history and feeding ecology to support conservation and protection of these endemic fish. In absence of a threatened status these fish should be conserved through the precautionary principle and be treated as highly threatened for proposed developments until otherwise proven to be less threatened.

An additional indigenous species of conservational concern is expected within the downstream systems, namely Labeobarbus kimberleyensis (Largemouth yellowfish) which is listed as Near Threatened (NT) requiring management of water quality and habitat (IUCN, 2022). This large predator species is subjected to threat from water pollution (Vaal and Orange Rivers and their tributaries which receive effluent water), habitat destruction and fragmentation, migration barriers and river regulation by impoundments, destruction of spawning areas due to siltation and inundation, subsistence fisheries (netting) and the spread of alien and invasive fish across its distributional range (IUCN, 2022). Additional species of conservational concern are expected in the Orange River and these include alien species such as Common Carp (*Cyprinus carpio*) and Grass Carp (*Ctenopharyngodon idella*). These are known habitat modifiers degrading instream habitat integrity (IUCN, 2022).

Both *Enteromius oraniensis* and *Labeobarbus kimberleyensis* are SCC taxa potentially influenced from the proposed agricultural project with water quality impacts of key concern to their survival. The latter two species are not SCC taxa for the project due to their tolerance to water quality alterations

Table 7.7 Expected fish species for the SQRs potentially influenced by the project

Species	Common Name	IUCN (2022)*	D33C-4483 (Upper Lemoenspruit)	D33C-4458 (Lower Lemoenspruit)	D33C-4552 (Lemoenspruit & Orange Confluence)	D33A-4561 (Downstream Orange River)
Austroglanis sclateri	Rock-catfish	LC				1
Clarias gariepinus	Sharptooth catfish	Unknown (High)			1	1
Enteromius	Orange River	LC	1	1	1	1

Species	Common Name	IUCN (2022)*	D33C-4483 (Upper Lemoenspruit)	D33C-4458 (Lower Lemoenspruit)	D33C-4552 (Lemoenspruit & Orange Confluence)	D33A-4561 (Downstream Orange River)
oraniensis	Chubbyhead barb					
Enteromius paludinosus	Straightfin barb	LC				1
Enteromius trimaculatus	Threespot barb	LC				1
Labeo capensis	Mudfish	LC			1	1
Labeo umbratus	Moggel	LC			1	1
Labeobarbus aeneus	Smallmouth yellowfish	LC			1	1
Labeobarbus kimberleyensis	Largemouth yellowfish	NT				1
Pseudocrenilabrus philander	Southern mouthbrooder	LC				1
Tilapia sparrmanii	Banded tilapia	LC				1
Total expected species	**11**		**1**	**1**	**5**	**11**

*LC - Least concern; NT - Near Threatened; NA - Not assessed

c) Sensitivity Assessment

The ecological sensitivity of the watercourses draining the project area was determined to be largely uniform across the project area. Limited presence of sensitive riverine biota was noted during the assessment, which is attributed to water quality and habitat degradation. Overall, the macroinvertebrate communities were made up of tolerant taxa with limited sensitivities. Taxa such as Aeshnidae (Hawkers and Emperor dragonflies), Baetidae 2 species (Mayflies), Caenidae (Squaregills/Cainflies), Gomphidae (Clubtail dragonflies) and Naucoridae (Creeping water bugs) were determined to be the most sensitive aquatic macroinvertebrates observed during the baseline assessment. The ichthyofauna community was also found to be dominated by a single endemic cyprinid, namely *Enteromius oraniensis* (Orange River Chubbyhead barb). The species is unlisted and is therefore to be treated as a species of high conservational concern. Considering the presence of such aquatic taxa, and the reliance/ dependence of these systems by terrestrial biota for drinking, foraging, nesting and refugia, the watercourses in the project area are regarded as sensitive environments in relation to changes in habitat integrity, flow and water quality.

In-line with GN704, the delineated floodline of 1:50 year or within a horizontal distance of 100 m from a watercourse, whichever is greatest should be considered a no-go area. According to the National Water Act, Section 21 (c) and (i), the term "wetland" is included in the legal definition of a watercourse. The legal definition of the extent of a watercourse is defined in the amendment of the General Authorisation for section 21 (c) and (i) water uses in terms of GN509 of 2016 (DWS, 2016a). The extent of the watercourse is defined as:

» A river, spring or natural channel in which water flows regularly or intermittently "within the outer edge of the 1 in 100 year floodline or riparian habitat measures from the middle of the watercourse from both banks" and for:
» Wetlands and pans: the delineated boundary (outer temporary zone) of any wetland or pan.

Given the varied geomorphological features of the watercourses, the lower foothill Lemoenspruit and tributary networks riparian zones were delineated by identifying vegetation features on aerial imagery and confirmation through ground truthing during the survey. An example of the proposed watercourse extent as well as where appropriate buffer areas are provided in **Figure 7.26** The various layouts and their respective delineated sensitive areas are depicted in **Figure 17.27**.

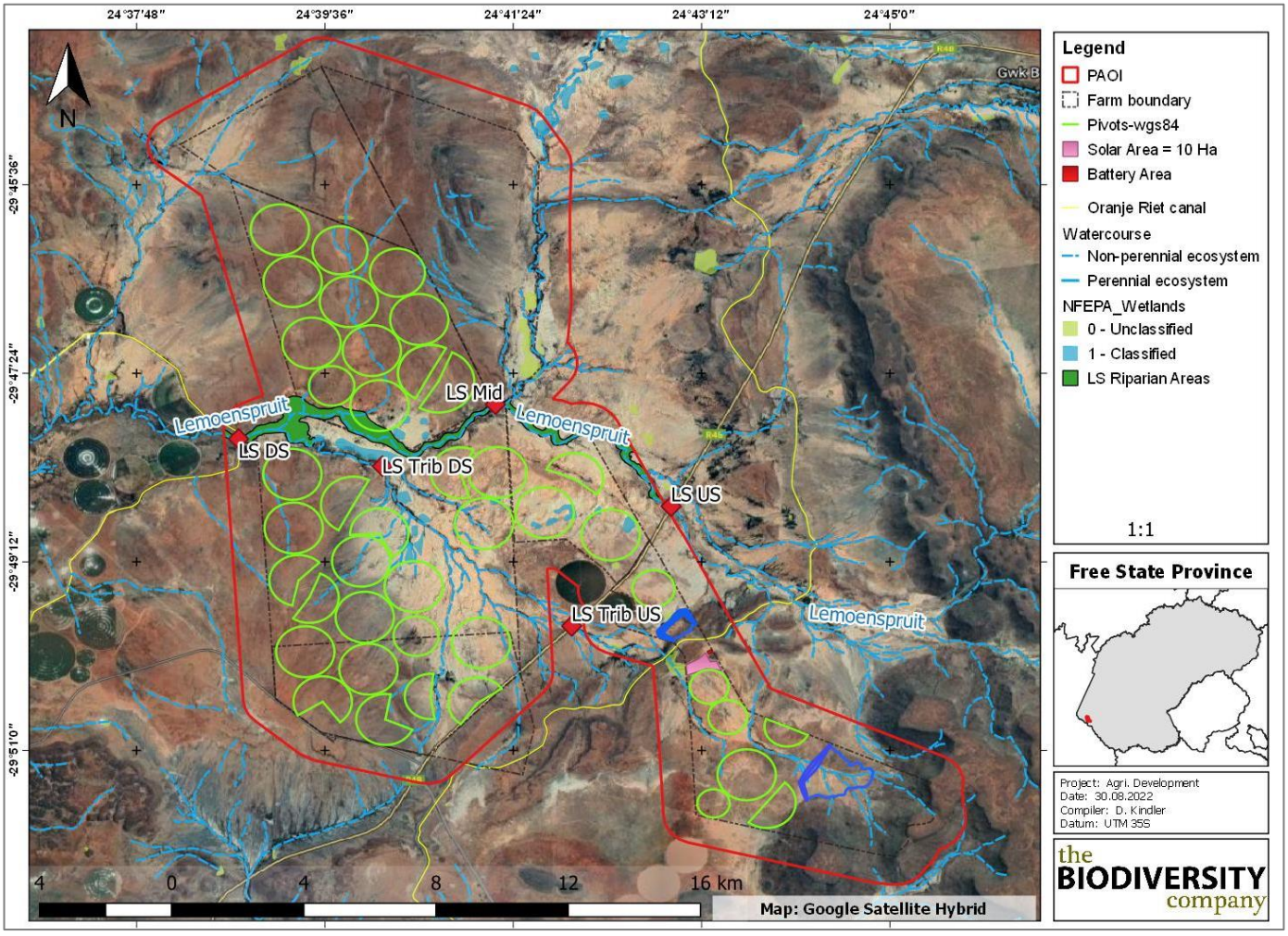


Figure 7.26: Project related infrastructure and associated sensitive freshwater resources

d) Buffer Requirements

The appropriate riparian vegetation buffer zone widths were determined for the proposed activity according to Macfarlane et al. (2009). These vegetation zone widths considered type the type and slope of each watercourse and their associated ecological requirements needed to maintain both the ecosystem functioning and services offered. Additionally, the watercourses potentially influenced by the proposed development have High EIS, requiring protection from the development.

The buffer size for the delineated water resources has been calculated according to the various watercourses, and are as follows:

» Riparian zones of the lower foothill Lemoenspruit – 100 m; and
» The riparian zones of Lemoenspruit tributary network comprising non-perennial systems and drainage lines and wetlands – 50 m.

According to Macfarlane et al. (2009), the "longitudinal zones of lower foothills rivers generally have more confined riparian zones than mountain streams and upper foothills and are generally threatened by agricultural practices. These larger buffers are particularly important to lower the amount of crop-spray reaching the river". Therefore, considering the aforementioned statement, baseline catchment condition, habitat integrity, water quality, presence of sensitive aquatic biota and terrestrial wildlife dependence on the assessed watercourses a no-go buffer zone of 100 m would ensure adequate ecological integrity maintenance adjacent to the proposed agricultural activities (Macfarlane et al., 2009). Ensuring buffers are intact increases the resilience of a watercourse to future disturbances.

Buffers and sensitive receptors are presented in **Figure 7.26** to **Figure 7.29.** Linear infrastructure includes pipelines (bulk and reticulation network), road network and associated river crossings (no shapefiles available for proposed projects road network and associated river crossings), and non-linear infrastructure includes centre pivots and proposed impoundments that intersect with riparian zones and buffers, notably within the tributary system. The allocated buffers consider the project footprint's slope and high erodibility of the soils within the catchment. Areas associated with the watercourses that are eroded should be avoided or stabilised to minimise additional channel and bank erosion and subsequent sedimentation to downstream systems.

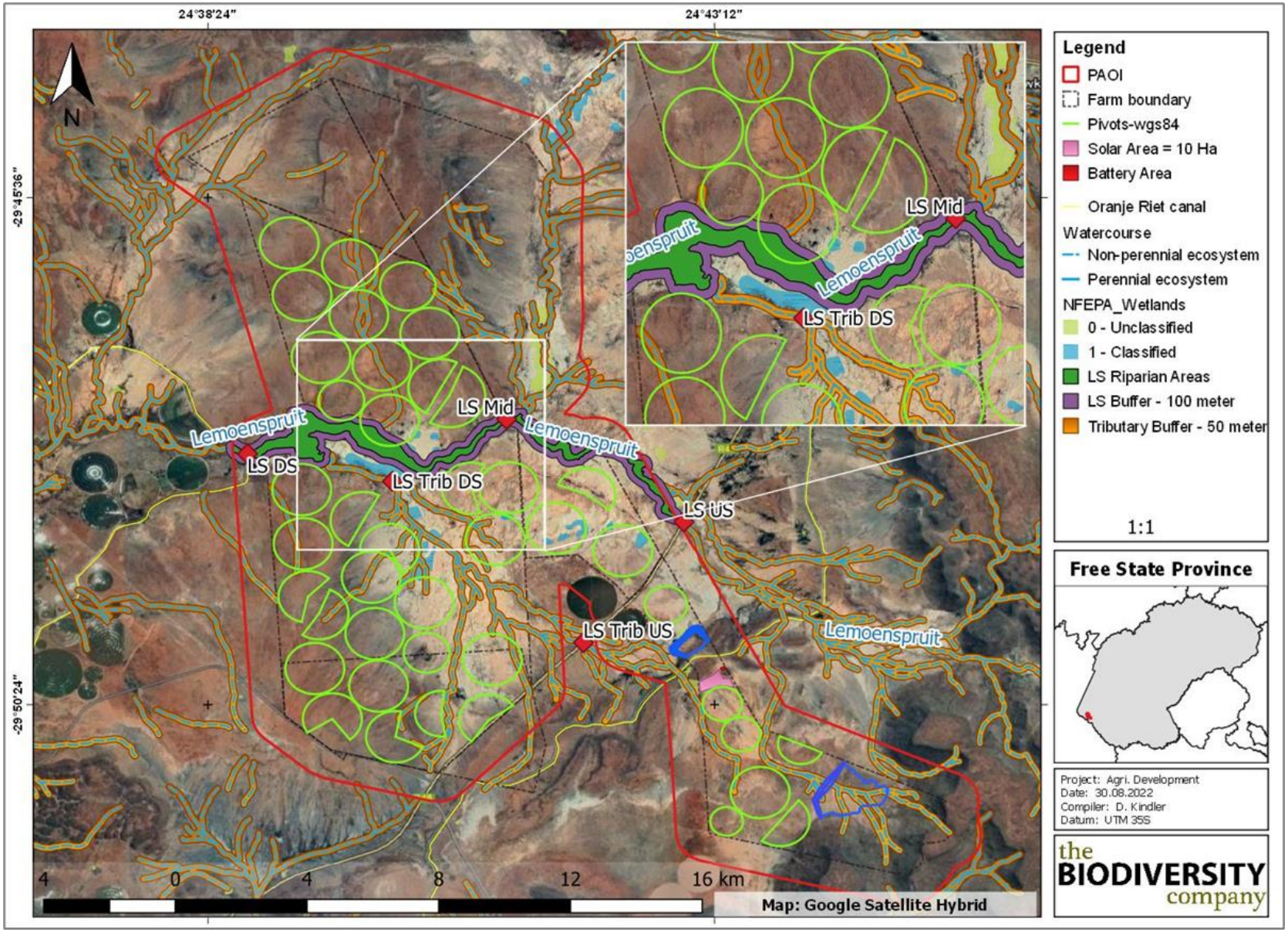


Figure 7.27: Sensitive freshwater resources and buffers overview map

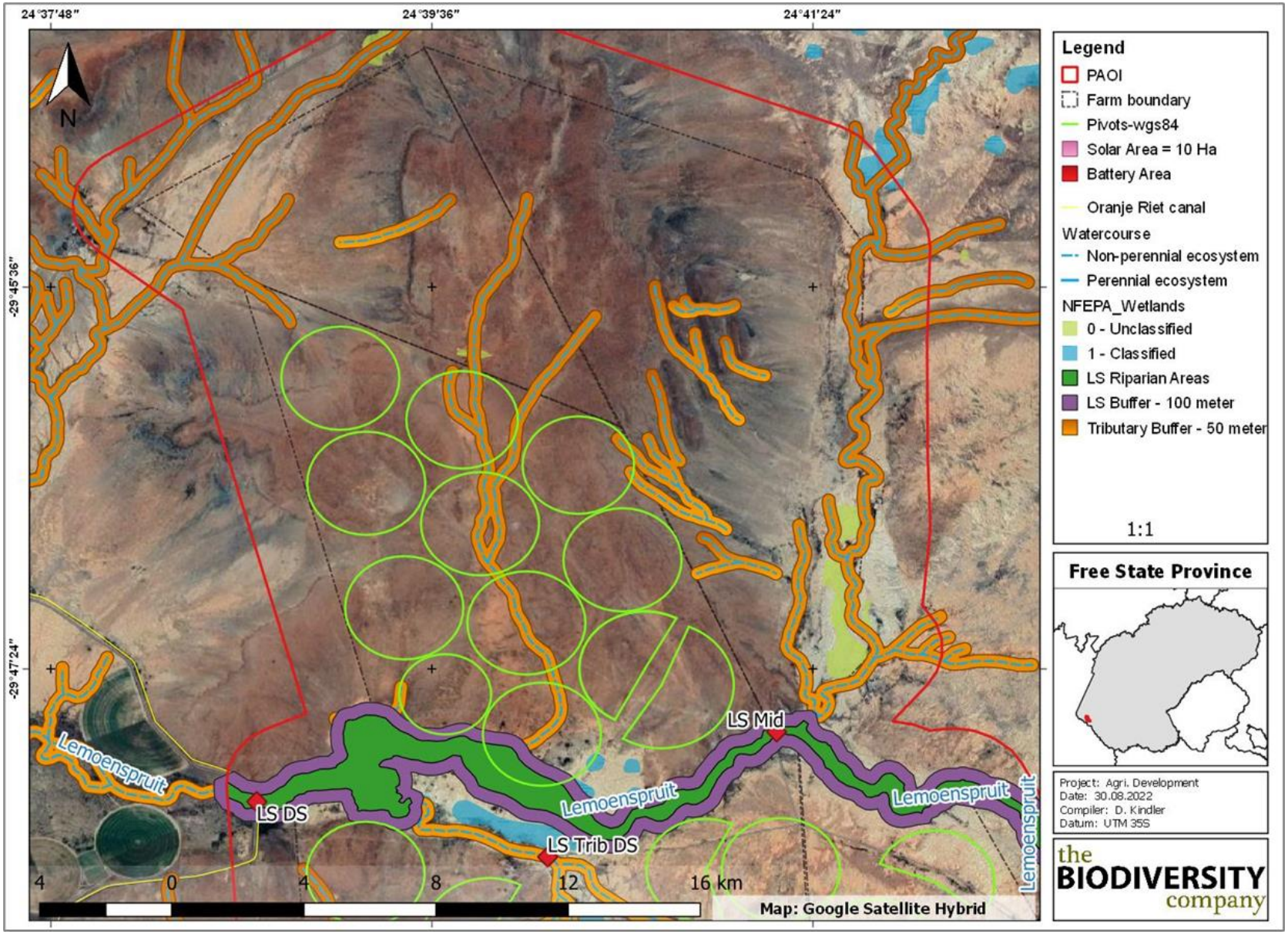


Figure7.28: Sensitive freshwater resources and buffers and proposed infrastructures in the northern section

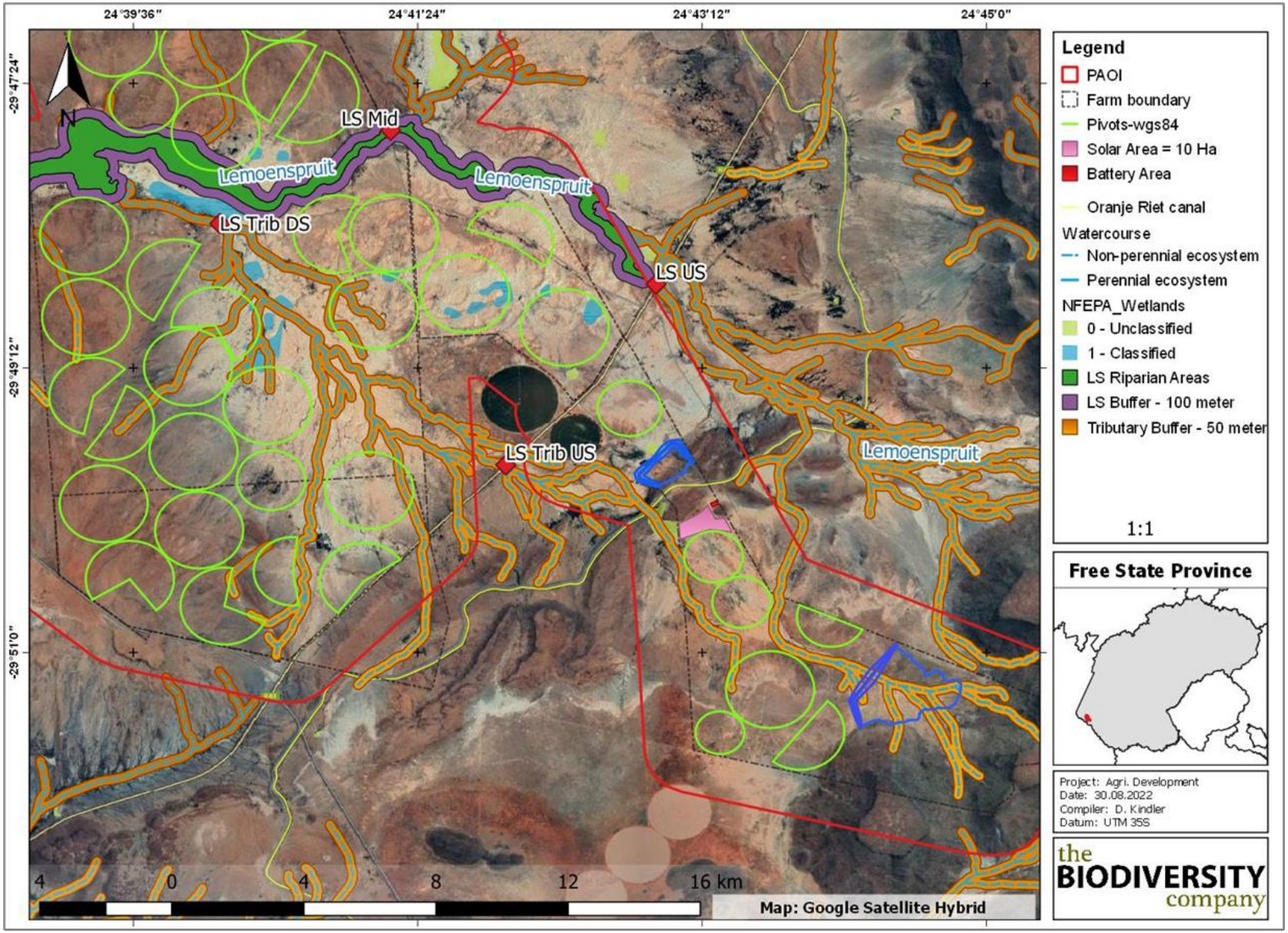


Figure7.29: Sensitive freshwater resources and buffers and proposed infrastructures in the southern section

xiii. Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by Birdlife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

The Platberg–Karoo Conservancy IBA covers the entire districts of De Aar, Philipstown and Hanover, including suburban towns, and consists of extensive flat to gently undulating plains that are broken by dolerite hills and flat-topped inselbergs. It is used mainly for grazing and agriculture (Birdlife South Africa, 2015). This IBA is important because it contributes significantly to the conservation of large terrestrial birds as well as raptors. These birds include Blue Crane (*Anthropoides paradiseus*), Ludwig's Bustard (*Neotis ludwigii*), Kori Bustard (*Ardeotis kori*), Blue Korhaan (*Eupodotis caerulescens*), Black Stork (*Ciconia nigra*), Secretarybird (*Sagittarius serpentarius*), Martial Eagle (*Polemaetus bellicosus*), Verreaux's Eagle (*Aquila verreauxii*) and Tawny Eagle (*A. rapax*) (Birdlife South Africa, 2015). The project site falls outside of this IBA.

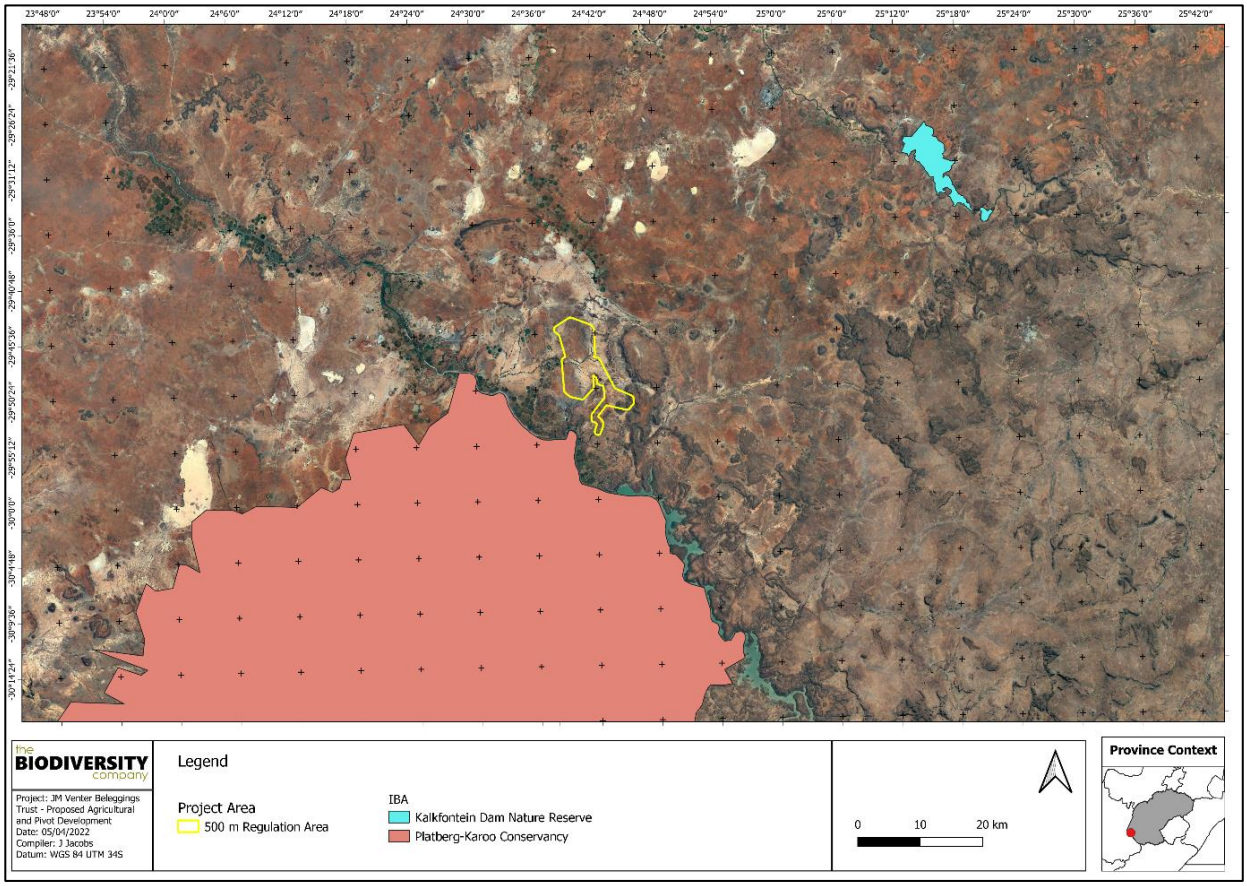


Figure 7.30: The project area in relation to the nearest IBAs

7.5. Heritage Impact Assessment (Including Archaeology & Palaeontology)

History and Evolution of the site and context

7.5.1. Archaeology and the Built Environment

Very few Heritage Impact Assessments have been completed in the area according to the South African Heritage Resources Information System and very few heritage resources are known from the vicinity of the project area. According to Morris (2008), "The Northern Cape has a wealth of archaeological sites (Beaumont & Morris 1990; Morris & Beaumont 2004), with locales along and adjacent to the major river systems being of particular significance. Stone Age material found in the broader region spans the Earlier, Middle and Later Stone Ages through Pleistocene and Holocene times. Late Holocene material with pottery is known to occur on the river banks, while rock engravings are richly distributed in the region (Wilman 1933; Fock & Fock 1989; Morris 1988). A particularly notable rock engraving is known from the farm Kraai Bosch, while others occur on the hills near Petrusville."

In his assessment, Morris (2008) identified low significance Middle and Later Stone Age scatters of archaeological material. These finds correspond with the findings of Tusenius (2016) who noted that "Most of the archaeological remains recorded in the study area consist of a background scatter of weathered and patinated, typologically mixed Middle Stone Age (MSA)/ Later Stone Age (LSA) artefacts, with the former being more common. These artefacts occur dispersed within the surface gravels, rather than as discrete concentrations, and are in a secondary context in areas affected by sheet erosion. The fact that there appears to be no stratigraphic context and no organic remains are preserved would suggest that most of the proposed Kloofsig 1 development area is of low archaeological heritage sensitivity." Three archaeological observations have been noted within the area proposed for pivot development. Two of these observations consist of very low density MSA archaeological scatters and the third reflects a corrugated iron shed.

Table 7.8: Archaeology resources identified during fieldwork 2022

Site ID	Site No	Full Site Name	Description	Site Type	Grading
139138	GTP-001	Grootpoort	Two localised areas, associated with small outcrops, where thin scatters of MSA tools and flakes were identified. The density of the material is approximately 1 artefact/flake per 10m^2. The material used for the tools are hardened shale and lideanite.	Artefacts	Grade IIIC
139139	GTP- 002	Grootpoort	Two localised areas, associated with small outcrops, where thin scatters of MSA tools and flakes were identified. The density of the material is approximately 1 artefact/flake per 10m^2. The material used for the tools are hardened shale and lideanite.	Artefacts	Grade IIIC

Heritage Resources

Most of the 70 observations made consisted of open-air Middle Stone Age scatters of stone tools. Some Later Stone Age material was also observed along with historical/modern farm graves and ruined farm buildings. The stone tools are almost entirely made of locally sourced hornfels and siltstones which is typical

of the area where these are highly abundant. Retouched blade forms and blade blanks were present across the study area as well as radial cores and various flakes with prepared platforms. The density and variety of Stone Age material definitely increased towards the banks and floodplain of the Lemoenspruit while much of the rest of the area held isolated and generally dispersed archaeological material. The Havenga Bridge spans the Orange/Gariep River and was built in 1934. The bridge features Scottish steel trusses and has been vandalised - the plaque has been stolen and one beam is bent.

The farm graves are not well marked and will require some careful planning in creating a site development plan which formalises the area around these locations. The ruined homestead at Diepdraai is already intersected by relatively clear farm roads and infrastructure and is unlikely to be negatively affected by the development of the agricultural fields. **Table 7.9** provides a record of some of the heritage finds.

Table 7.9: Heritage resources identified from fieldwork 2022

Site No.	Site Name	Description	Density m^2	Period	Co-ordinates		Grading	Mitigation
009	Diepdraai 009	At least two clear marked graves, one in stones, the other with bricks and fencing. Bottles with flower dedications strewn around, labourers graves most likely, unnamed. Probably more graves x 2 due to bottles	n/a	Modern / historic	29.82597	24.71001	IIIA	100m Buffer area around site
028	Diepdraai 028	Havenga Bridge built in 1934. Scottish steel trusses. Plaque stolen and one beam bent. There's mention of additions made in 1990s, perhaps the overhead trusses but can't be sure without research. Spans the Orange/Garip River	n/a	Historic	29.91090935	24.63635735	IIIA	Outside of development area - no impacts anticipated
041	Diepdraai 041	Stone covered farm workers graves x 3 clear, apparently 7, graves in veld, green grass marks area near Eskom 33kV poles.	n/a	Historic	-29.79571	24.67954	IIIA	100m Buffer area around site

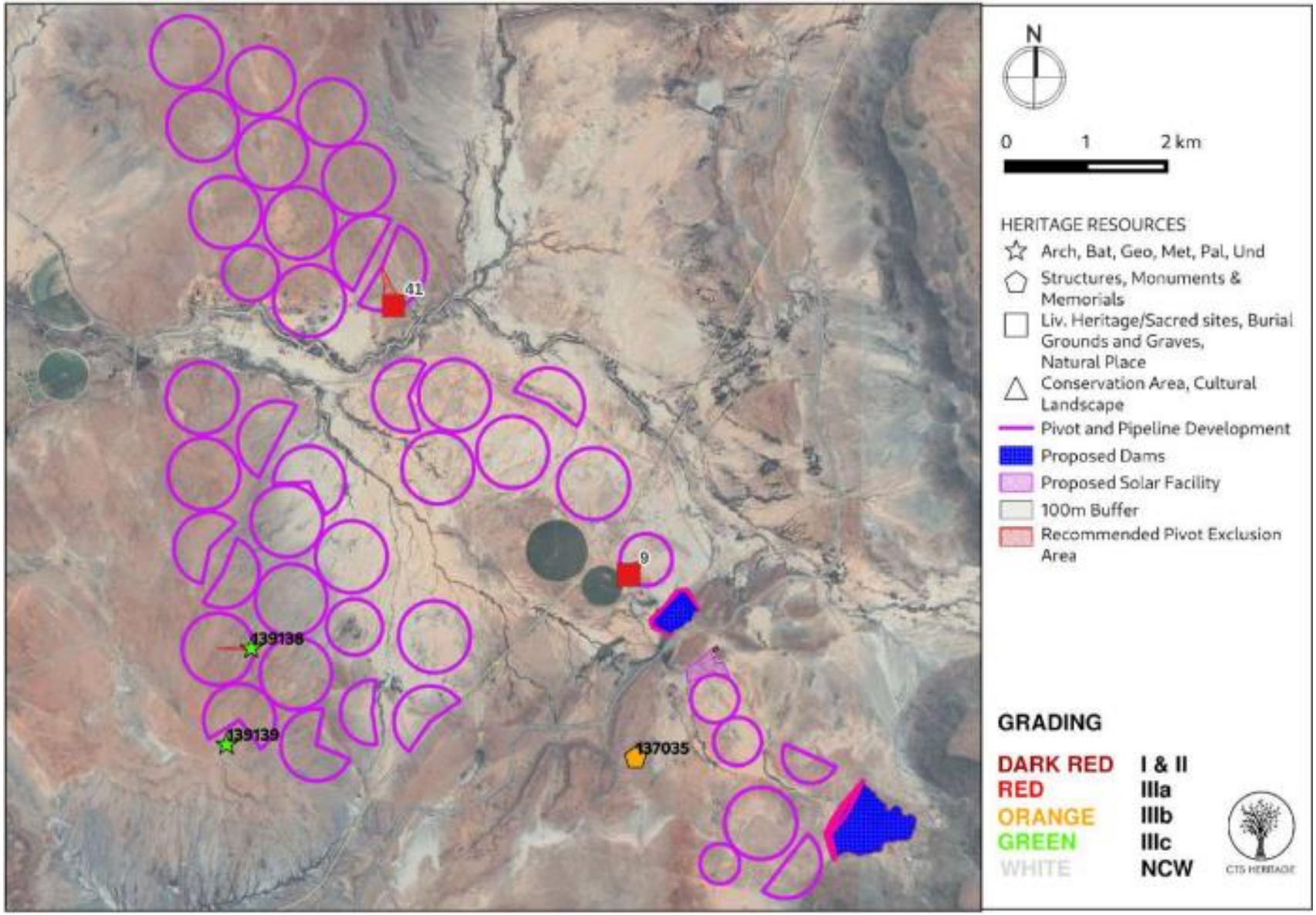


Figure 7.31: Heritage Finding on the project site

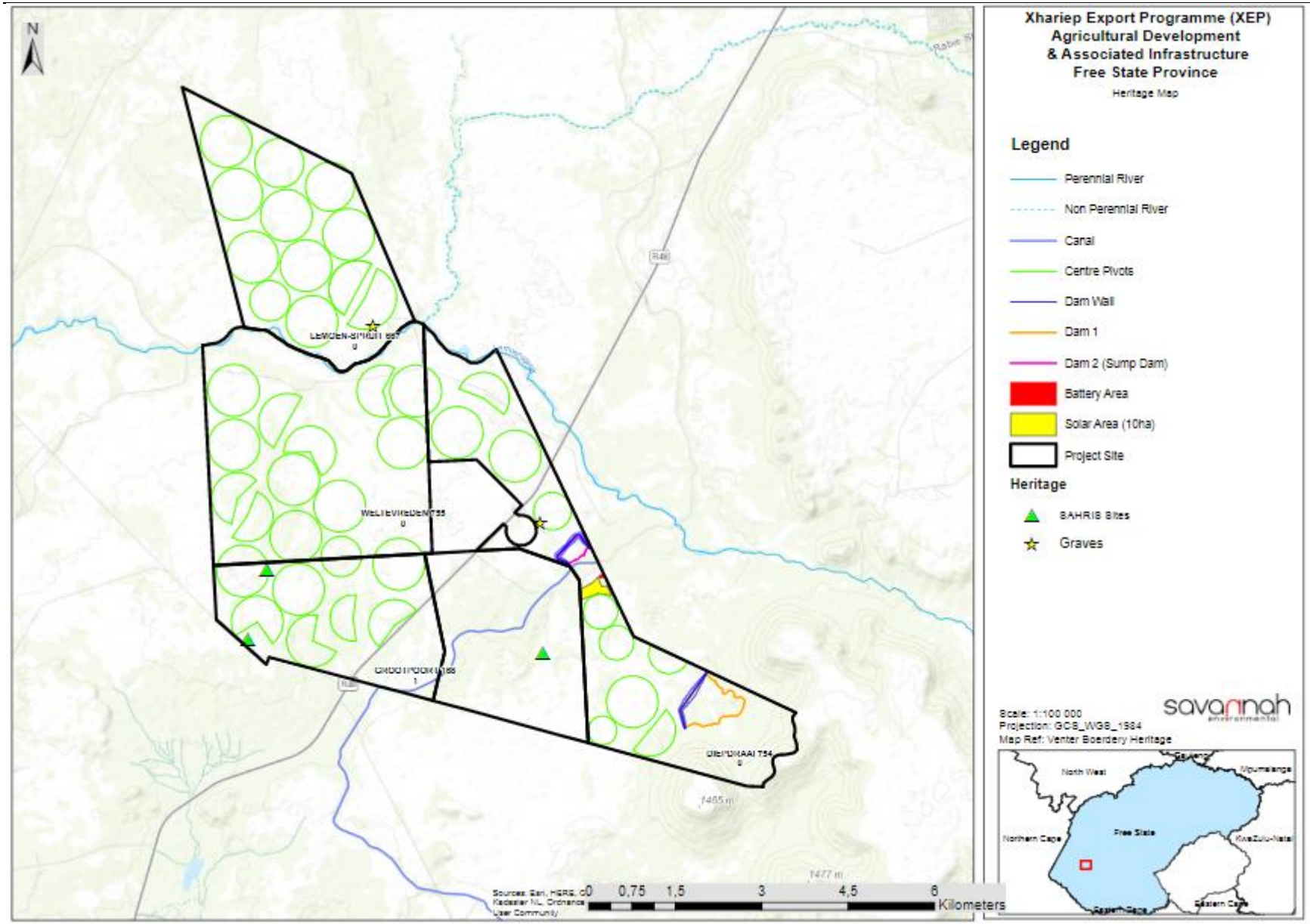


Figure 7.32: Heritage Resources identified within the project site

7.5.2. Palaeontology

The palaeontological sensitivity of the area under consideration is presented in **Figure 7.33.** The site for development is in the Tierberg Formation (orange) and the Quaternary calcretes (green). Vertebrate fossils are not present, but the deep-water shales of the Tierberg Formation might preserve trace fossils of invertebrate trackways and burrows. These are deep water deposits so there would be no terrestrial plants either (Plumstead, 1969). The Quaternary calcretes might preserve fossils trapped in features such as palaeo-pans or palaeo-springs. There would be more robust but transported fossils such as bone fragments or silicified wood.

According to the extract from the Council for GeoScience Map 2924 for Koffiefontein, the area is underlain by Jurassic Dolerite (zero paleontological sensitivity) and Quaternary Sands (moderate and high sensitivity). According to the Desktop Palaeontological Assessment completed by Bamford (2021) for a grid connection project located in the immediate vicinity of this development, the proposed development is positioned within "a mix of potentially fossiliferous (trace fossils) Tierberg Formation (Ecca Group, Karoo Supergroup), Jurassic dolerite and on the Quaternary aeolian sands and calcretes that are non-fossilferous unless there are traps for fossils such as paleo-pans or palaeo-springs. No such feature is visible on the satellite imagery."

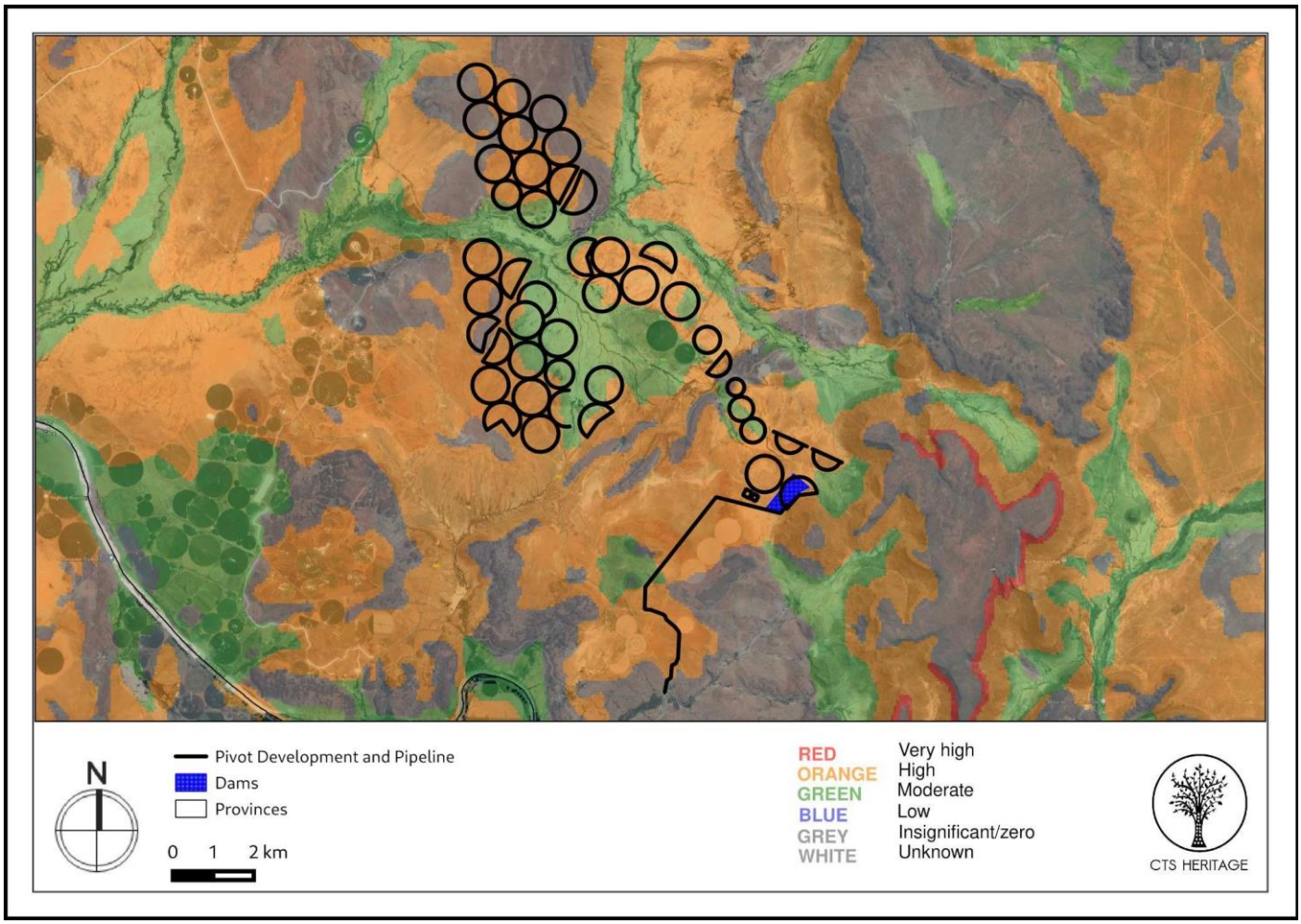


Figure 7.33: Palaeo sensitivity Map indicating fossil sensitivity underlying the project site

CHAPTER 8 : ASSESSMENT OF IMPACT

This chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect and cumulative) expected to be associated with the development of the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure.

Legal Requirements as per the EIA Regulations, 2014 (as amended) for the undertaking an Environmental Impact Assessment Report

This chapter includes the following information required in terms of the EIA Regulations, 2014 - Appendix 3: Content of the Environmental Impact Assessment Report:

Requirement	Relevant Section
3(h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed, (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated.	The impacts and risks associated with the development of the Xhariep Export Programme (XEP) Agricultural Development, including the nature, significance, consequence, extent, duration and probability of the impacts and the degree to which the impact can be reversed and cause an irreplaceable loss of resources are included in **sections 8.3, 8.4, 8.5, 8.6** and **8.7.**
3(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The positive and negative impacts associated with the development of the Xhariep Export Programme (XEP) Agricultural Development are included in **sections 8.3, 8.4, 8.5, 8.6 and 8.7**.
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	The mitigation measures that can be applied to the impacts associated with the Xhariep Export Programme (XEP) Agricultural Development are included in **sections 8.3, 8.4, 8.5, 8.6 and 8.7**.
3(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures,.	A description of all environmental impacts identified for the Xhariep Export Programme (XEP) Agricultural Development during the EIA process, and the extent to which the impact significance can be reduced through the implementation of the recommended mitigation measures provided by the specialists are included in **sections 8.3, 8.4, 8.5, 8.6 and 8.7**.
3(j) an assessment of each identified potentially significant impact and risk, including (i) cumulative impacts, (ii) the nature, significance and consequences of the impact and risk, (iii) the extent and duration of the impact and risk, (iv) the probability of the impact and risk occurring, (v) the degree to which the impact and risk can be reversed, (vi) the degree to which the impact and risk may cause irreplaceable loss of resources and, (vii) the degree to which the impact and risk can be	An assessment of each impact associated with the development of the Xhariep Export Programme (XEP) Agricultural Development, including the nature and significance, the extent and duration, the probability, the reversibility, and the potential loss of irreplaceable resources, as well as the degree to which the significance of the impacts can be mitigated are included in **sections 8.3, 8.4, 8.5, 8.6 and 8.7**.

Requirement	Relevant Section
avoided, managed or mitigated.	
3(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr.	Mitigation measures recommended by the various specialists for the reduction of the impact significance are included in **sections 8.3, 8.4, 8.5, 8.6 and 8.7**.

Quantification of Areas of Disturbance on the Site

This assessment has considered the proposed Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure on Farms Weltevreden 755, Lemoen-spruit, Diepdraai 754 and within the Letsemeng Municipality in the Xhariep District Municipality. The development footprint includes the following infrastructure:

- Development of centre pivot areas (cultivation and irrigation) which is planned to take approximately 2154ha or more within the project site.
- Two irrigation water storage dams, with a combined surface area of 82ha in extent.
- Establishment of an irrigation pipeline network from the irrigation dams to the centre pivot areas.
- A new pump station taking a total surface area of 549m^2.
- A 5MW solar PV facility occupying an area of 10ha, and an associated overhead power line of ~6.9km in length.
- A Battery Energy Storage System covering a surface area of 0.36ha.

The full extent of the project site (~ 4690ha) and development area (~4276.32ha) was considered through the Scoping Phase of the EIA process by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desktop evaluations and detailed field surveys. The identification of a development footprint for the Xhariep Export Programme (XEP) Agricultural Developments within the development area was undertaken by the developer through consideration of the sensitive environmental features and areas, and application of a mitigation hierarchy which aimed at avoidance as the first level of mitigation. The specialist assessments undertaken as part of this EIA process have considered the development area, as well as the proposed development footprint (refer to **Figure 8.1**) which was provided by the developer.

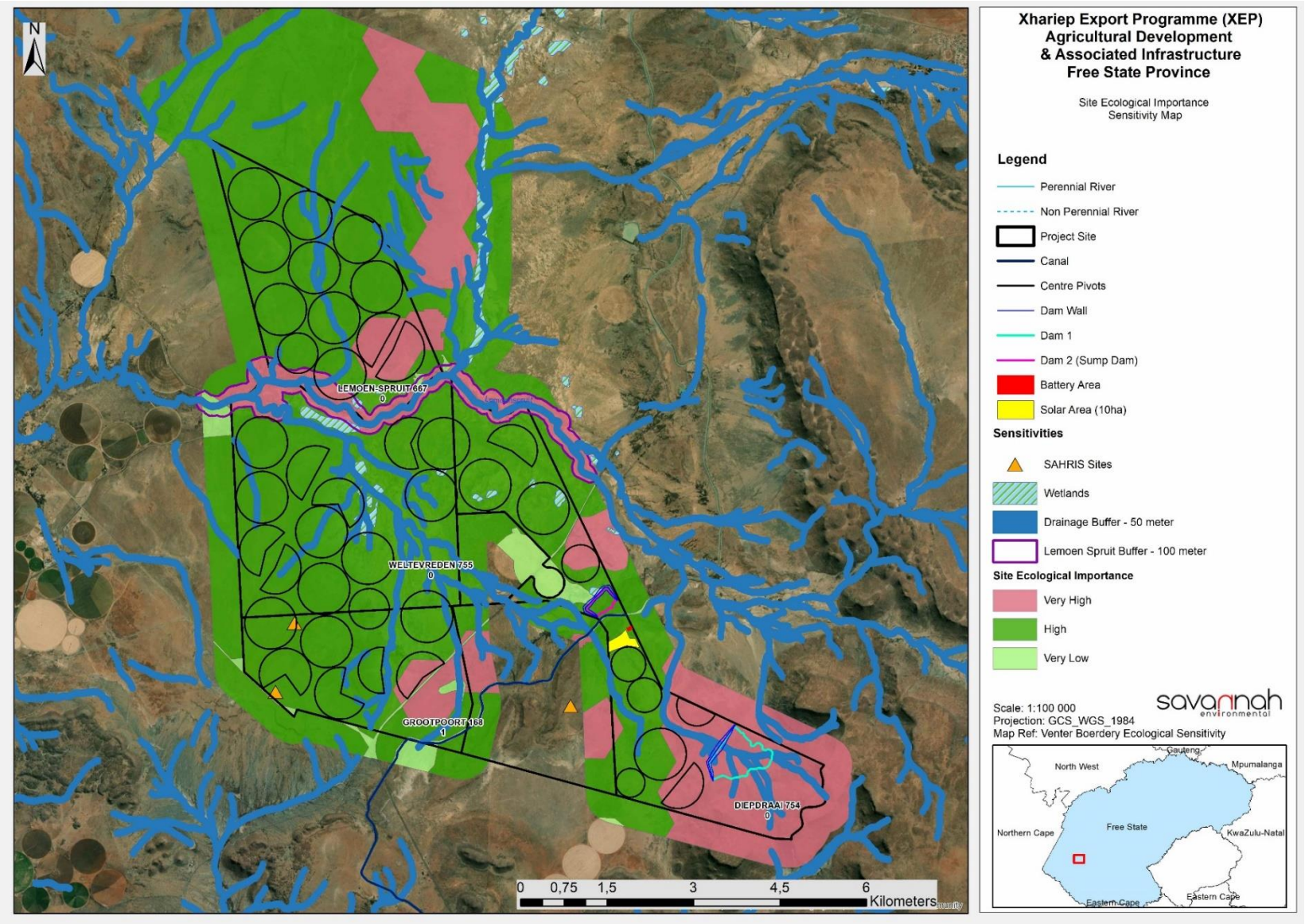


Figure 8.1. Project Layout Map showing the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure

Potential Impacts on Ecology (Flora and Fauna)

The development of the Xhariep Export Programme is likely to result in a variety of impacts associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat to hard infrastructure such as agricultural development, as well as impacts associated with the use of pesticide etc. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

8.3.1. Results of the Ecological Impact (flora and Fauna)

The study area is located with the Nama Karoo Biome. The Nama Karoo has a high diversity of plant life. These include co-occurring ephemerals, annuals, geophytes, C3 and C4 grasses, succulents, evergreen chamaepytes and trees. The proposed development will therefore have significant effects on natural habitat. The existing biodiversity on site is, however, relatively limited in terms of uniqueness or potential presence of species of concern, with the possible presence of Critically Biodiversity.

a) Flora

The vegetation on site has six species that are indigenous to South Africa, accounting for 11% of the total number of recorded species. None of the species recorded are regarded as SCC. Nevertheless, five species are protected by legislation and if granted authorisation, it is imperative that a Plant Search and Rescue Plan be developed prior to clearing and development. The following species were found on site during survey *Cineraria lyratiformis, Lessertia frutescens*, *Aloe claviflora*, Euphorbia crassipes, *Malephora smithii* and *Moraea polystachya*. A permit from the relevant authority, Department of Economic Development, Tourism and Environmental Affairs, must be obtained to remove and relocate individuals of these species to surrounding natural areas. The site is threated by a widespread of invasive alien plants which tend to dominate or replace the indigenous flora. Noted invasive alien species on site in *Arundo donax, Cylindropuntia imbricata* and *Opuntia cespitosa*.

b) Fauna

No amphibian species were report during the site visit due to the seasonal period. Due to the richness of the area, Giant Bull frog may be expected.

40 reptile species are expected occur with the proposed site. During site visit no species of conservation were noted.

51 avifauna species were recorded on the proposed site during the site visit however three of these specials are regarded as SCC.

17 mammal species were record during the site visit. Parahyaena brunnea was confirmed during site visit within the proposed site.

Fifty (51) species, representing 31 families of indigenous avifauna were recorded within the project area during the survey period. This accounts for approximately 26% of the species expected to occur within the project area. The habitat structure within the project area, a high diversity of species is expected with more species likely to be recorded with additional surveys. *Aquila rapax* (Southern Tawny Eagle) and

Ardeotis kori kori (Southern Kori Bustard) are listed as SCC on a regional and global scale, and *Falco biarmicus* (Lanner Falcon) is listed as a SCC on a regional scale.

8.3.2. Description of Ecological Impact

A summary of the potential ecological issues for the study are as follows:

- Loss of habitat within development footprint
- Degradation and loss of surrounding natural habitat
- Direct mortality of fauna
- Emigration of fauna due to noise pollution
- Encroachment of Invasive Alien Plants into disturbed areas

Direct and indirect Impacts associated with the construction, operation and decommissioning phases of the proposed Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure on ecology include the following:

Construction Phase

Nature: Loss of habitat within development footprint There will be a loss of natural vegetation and habitat due to construction of centre pivots and associated infrastructure. This impact was considered for both the construction and operational phases.		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Very High (10)
Probability	Definite (5)	Definite (5)
Significance	**High (80)**	**High (80)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, albeit to a limited extent.	
Mitigation: » Vegetation clearing to commence only after the necessary permits have been obtained. » Avoid 'Very High' SEI areas. » Avoid dolerite extrusions. » Riparian buffer zones must be avoided.		
Residual Impacts: The loss of indigenous vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would be moderate.		

Nature: Degradation and loss of surrounding natural habitat

Degradation and loss of surrounding natural vegetation arising from construction activities if these are allowed to penetrate into the surrounding area.

	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Permanent (5)	Very short term (1)
Magnitude	Very High (10)	None (0)
Probability	Highly Probable (4)	Improbable (2)
Significance	**High (72)**	**Low (6)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

- Avoidance of 'Very High' SEI habitats and riparian buffers.
- Pre-construction environmental induction for all staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc.
- All construction activity to be within the clearly defined and demarcated areas.
- Temporary laydown areas should be clearly demarcated and rehabilitated subsequent to end of use.
- Suitable sanitary facilities to be provided for construction staff as per the guidelines in Health and Safety Act.
- All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner.

Residual Impacts:

It is unlikely that residual impacts are expected if the appropriate mitigation measures are implemented. However, there may still be minimal degradation due to dust precipitation.

Impact Nature: Direct mortality of fauna

Construction activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills and persecution.

	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (44)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, vehicle collisions, poaching, and persecution can be mitigated.	

Mitigation:

- All personnel should undergo environmental induction with regards to fauna and awareness about not harming or collecting species.
- Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate.

- Any fauna threatened by the construction activities should be removed safely by an appropriately qualified removal specialist.
- All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner.
- Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter.

Residual Impacts:
It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

Impact Nature: Emigration of fauna due to noise pollution

Construction activity will likely lead to the emigration of fauna due to noise pollution.

	Without mitigation	**With mitigation**
Extent	Moderate (3)	Moderate (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (44)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, but only to a limited extent. The mitigation of noise pollution during construction is difficult to mitigate against	

Mitigation:

- Noise pollution within the context of the project is difficult to mitigate against. No construction activity is to occur at night to limit impacts to nocturnal species that tend to be more reliant on sound for behavioural processes.

Residual Impacts:
It is probable that some individuals of susceptible species will emigrate due to the noise generated from the construction activity. However, this is not likely to impact the viability of the local population of any fauna species.

Operational Phase

Nature: Loss of habitat within development footprint

There will be a loss of natural vegetation and habitat due to construction of centre pivots and associated infrastructure. This impact was considered for both the construction and operational phases.

	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Very high (10)	Very High (10)
Probability	Definite (5)	Definite (5)
Significance	**High (80)**	**High (80)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, albeit to a limited extent.	

Mitigation:

- Vegetation clearing to commence only after the necessary permits have been obtained.
- Avoid 'Very High' SEI areas.
- Avoid dolerite extrusions.
- Riparian buffer zones must be avoided.

Residual Impacts:
The loss of indigenous vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would be moderate.

Nature: Encroachment of Invasive Alien Plants into disturbed areas

Invasive Alien Plants (IAPs) tend to encroach into disturbed areas and can outcompete/displace indigenous vegetation.

	Without mitigation	**With mitigation**
Extent	Moderate (3)	Moderate (3)
Duration	Permanent (5)	Very short term (1)
Magnitude	High (8)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**High (64)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- An IAP Management Plan must be written for the proposed development.
- Regular monitoring for IAP encroachment during the operation phase to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project.
- All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan.

Residual Impacts:
Based on the lack of IAPs within the development area and the implementation of an IAP Management Plan there are unlikely to be residual impacts

Nature: Application of pesticides

Pesticide application within the agricultural fields will lead to direct mortality, secondary poisoning, and accidental poisoning of fauna. This will lead to detrimental trophic cascade effects within the landscape. In addition, irrigation and rainfall will lead to transfer of the pesticide into surrounding areas.

	Without Mitigation	**With Mitigation**
Extent	High (4)	Very Low (1)
Duration	Long Term (4)	Very Short Term (1)
Magnitude	Very High (10)	None (0)
Probability	Highly Probable (4)	Very Improbable (3)
Significance	**High (72)**	**Low (6)**
Status	Negative	Neutral
Reversibility	Low	High
Irreplaceable loss of resources	No	No

Can impacts be mitigated?	No

Mitigation:

- The optimum mitigation measure would be to ensure that no pesticides are used for the proposed development.
- Should it be deemed absolutely necessary for the control of pests, then appropriate organic biocides must be investigated for use as an alternative.

Residual Impacts:
There is still the potential for reflection impacts but would have a low impact.

Impact Nature: Avifauna collisions with power lines

This impact is considered pertinent as there are several species that occur within the area that exhibit a high probability of colliding with power lines. These include SCC.

	Without mitigation	**With mitigation**
Extent	High (4)	Very low (1)
Duration	Long term (4)	Long term (4)
Magnitude	Very High (10)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**High (72)**	**Low (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- The design of the proposed power line must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa.
- Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used. This would involve using existing/approved pylons and associated infrastructure for different lines.
- The power line should be marked with bird diverters along all high-priority sections in order to make the lines as visible as possible to collision-susceptible species. Shaw et al (2021) demonstrated that Blue Crane mortality was reduced by 92% (95% confidence interval [CI]: 77–97%) and all large birds by 51% (95% CI: 23–68%). The Inotec BFD88 bird diverter is highly recommended due to its visibility under low light conditions when most species move from roosting to feeding sites. The devices must be placed 5 m apart.

Residual Impacts:
There is still the risk of large-bodied species colliding but the level of impact will be minimsed.

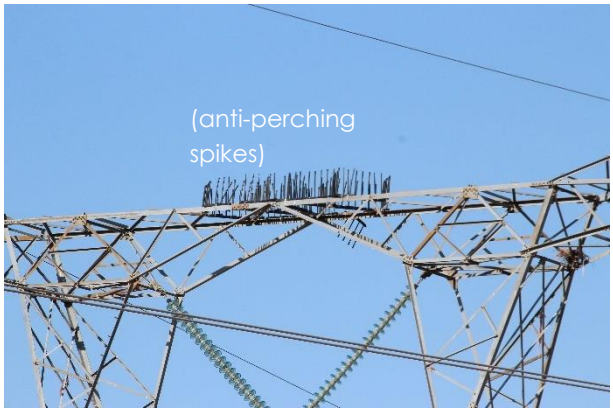
Impact Nature: Avifauna electrocution on power lines

Several species potentially occur within the area that exhibit a high probability of electrocution by powerlines. These are typically the raptor species that use the powerlines as perching spots.

	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Minor (2)
Probability	Definite (5)	Probable (3)
Significance	**High (75)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- The design of the proposed power line must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa.
- Insulation where energised parts and/or grounded parts are covered with materials appropriate for providing incidental contact protection to birds. It is best to use suspended insulators and vertical disconnectors, if upright insulators or horizontal disconnectors are present, these should be covered.
- Perch discouragers can be used such as perch guards or spikes[3].



[3] It should be noted that the picture below is for illustrative purposes only and reflects a larger transmission line than that proposed for this project.

Residual Impacts:
There may still be the possibility of electrocution although the severity of the impact is minimised if the appropriate mitigation measures are implemented.

Decommissioning / Rehabilitation Phase

Impact Nature: Direct mortality of fauna

Decommissioning activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions and persecution.

	Without mitigation	With mitigation
Extent	Moderate (3)	Low (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (44)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, vehicle collisions, poaching, and persecution can be mitigated.	

Mitigation:

- All personnel should undergo environmental induction with regards to fauna and awareness about not harming or collecting species.
- Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate.
- Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist.
- All vehicles should adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.
- All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner.
- Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter.

Residual Impacts:

It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

Nature: Continued habitat degradation

Disturbance created during decommissioning will leave the development area vulnerable to erosion and alien plant invasion for several years.

	Without Mitigation	With Mitigation
Extent	Moderate (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (3)	Minor (2)
Probability	Probable (3)	Improbable (2)

Significance	**Medium (24)**	**Low (12)**
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Yes	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		
» Rehabilitation in accordance with the Rehabilitation Plan for the development must be undertaken in areas disturbed during the decommissioning phase. » Monitoring of the rehabilitated area must be undertaken at quarterly intervals for 3 years after the decommissioning phase. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.		
Residual Impacts: No significant residual risks are expected, although IAP encroachment and erosion might still occur but would have a negligible impact if effectively managed.		

8.3.3. Overall result

The main expected impacts of the proposed development will be the loss of habitat and mortality of fauna. Based on the outcomes of the SEI determination, the project possesses areas of 'Very High' SEI and 'High' SEI.

The 'High' SEI denotes that "avoidance mitigation wherever possible must be implemented. This includes changes to project infrastructure design to limit the amount of habitat impacted." (SANBI, 2020). Considering that the area has been zoned for agriculture, development may proceed in the 'High' SEI Areas, as long as the 'Very High' SEI areas are avoided and actively managed. Where pivots overlap minor drainage lines (also with Very High SEI), activity adjacent to these system is permissible, albeit only if the remaining channel extent is rehabilitated and actively managed. The dam located within the 'Very High' SEI areas is considered to be acceptable due to the technical requirement for the location of the dam in this area, without requiring additional earthworks and piping. The amount of hectarage lost within that portion of the site is deemed acceptable from an ecological perspective. All of the mitigation measures and Biodiversity Impact Management Actions must be implemented if the proposed development is authorised.

Potential Impacts Aquatic Ecology

The development of Xhariep Export Programme (XEP) Agricultural Development is likely to result in a variety of impacts from an aquatic perspective. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** for more details).

8.4.1. Result of the Aquatic Impact Assessment

The baseline assessment established a single main watercourse with an associated tributary network draining the project area, namely the Lemoenspruit ecosystem. Additionally, numerous ephemeral drainage lines and some wetlands occur in the project area. The Lemoenspruit flows into the Orange River downstream of the project area and due to flood conditions at the time of the survey the Orange River

could not be assessed. The ecological assessment of the Lemoenspruit indicated moderate modifications attributed to varying land use, comprising mostly open/ natural land with some agriculture and widespread livestock activities present in the project areas catchment. The land use activities and erodible soils have cumulatively resulted in a moderate deterioration in water quality, flow, and instream habitat, and subsequently to the biotic communities (macroinvertebrate and fish) within the systems. The baseline water quality indicated exceedance of the Orange WMA RWQOs for electrical conductivity of 550 µS/cm at all of the investigation sites and increased in a downstream direction from 953 µS/cm in the upper Lemoenspruit at site LS US to 1 686 µS/cm in the lower reaches at LS DS. Despite modifications, the Lemoenspruit met the RWQOs Management Class for the Orange River (which incorporates the Lemoenspruit), and all the water resources and their associated habitats associated with the project area are considered sensitive to further disturbance. Given the findings of this assessment, the Lemoenspruit was classed as moderately modified (class C).

The entire drainage network is presented by a well-defined riparian zone consisting of woody vegetation. The soils within the catchment and along the watercourses are highly susceptible to erosion and considered sensitive to any potential anthropogenic activities along these systems which could potentially compromise the ecological integrity of the watercourses.

The directly influenced Lemoenspruit is listed as *not protected*, and the ecosystem is classified as *Endangered*. The indirectly affected Orange River system downstream of the project area is listed as *poorly protected*, and is classified as *Critically Endangered*. Additionally, Freshwater Priority Areas are assigned to them. The Lemoenspruit catchment serves as an *upstream management area* to assist in limiting impacts to the downstream Orange River which serves as a Fish Sanctuary area for threatened fish species such as Largemouth Yellowfish (*Labeobarbus kimberleyensis*). Largemouth Yellowfish are red listed as Near Threatened and are showing population declines due to habitat fragmentation and water quality deterioration. The Lemoenspruit includes an additional species of conservational concern, namely the recently described Orange River Chubbyhead barb (*Enteromius oraniensis*). The species currently has no threatened status and should be conserved through the precautionary principle and be treated as highly threatened. This barb was collected during the survey at LS DS. The poorly protected nature of the systems, the high EIS and presence of SCC indicates that strict mitigation measures should be adhered to ensure no further deterioration of the watercourses should the project proceed.

The riparian zones of the lower foothills geoclass Lemoenspruit require a buffer of 100 m, and Lemoenspruit tributary network comprising non-perennial systems, ephemeral drainage lines and wetlands require a buffer of 50 m. These buffers would ensure adequate ecological integrity maintenance adjacent to the proposed agricultural activities.

8.4.2. Description of Impacts on Aquatic Ecology

Construction Phase

The following potential main impacts on the watercourses and associated biodiversity dependent on these systems (based on the framework above) were considered for the construction phase of the proposed development. This phase refers to the period during construction when the proposed development is constructed; and is considered to have a large direct impact on aquatic ecology. This phase typically involves the removal of indigenous vegetation for infrastructure (laydown yards, centre pivots, water pipelines, impoundments, power lines, solar area, BESS and the associated road network &

river crossing structures), landscaping to desired topography, establishment of infrastructure and planting of crops. This involves earthworks activities (digging and soil stockpiling) and the use of construction chemicals and materials and machinery all of which influence adjacent habitats and includes watercourses. The following construction phase related impacts to aquatic ecology were considered:

- Disturbance/ displacement/ loss of riparian, marginal and instream riverine habitat (Habitat fragmentation),
- Contamination of watercourse and biotic community effects; and
- Alteration of catchment hydrology and associated habitat ecology impacts.

Impact Nature: Disturbance/ displacement/ loss of riparian, marginal and instream riverine habitat (Habitat fragmentation).

Destruction, loss and fragmentation of the of habitats, ecosystems and biotic community responses to the alteration of the catchment for cultivation.

	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Footprint & surrounding areas (2)	Footprint & surrounding areas (2)
Duration	Permanent (5)	The lifetime of the impact will be of a short duration (2-5 years) (2)
Magnitude	High (processes are altered to the extent that they temporarily cease) (8)	Moderate and will result in processes continuing but in a modified way (6)
Probability	Definite (5)	Probable (3)
Significance	**High (75)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the loss of vegetation is unavoidable. However, the construction footprint can be realigned to avoid watercourses and associated buffers	

Mitigation:

- This impact has already occurred, and thus pro-active mitigation is limited, reactive measures must now actively control and eradicate alien vegetation establishment in these disturbed areas;
- Strictly avoid any further loss of the riparian zone by avoiding any further development within the Lemoenspruit, its riparian zone and associated floodplain and its 100 m buffer as delineated in this report. Any supporting aspects and activities not required to be within the buffer area should adhere to the buffer zone;
- As per the DEA mitigation hierarchy this impact requires offsetting. It is recommended that this takes the form of on-site rehabilitation of the riparian zone;
- Based on the site inspection and delineated riparian area map, portions of the centre pivot croplands and impoundments (and likely the associated road network too) are located within the riparian area of the Lemoenspruit and tributary network and respective buffer zones. It is recommended that these proposed areas of disturbance be relocated outside of the buffer zone, with the rehabilitation of adjacent disturbed areas not being used to serve as an offset against existing areas of disturbed riparian areas; and
- Rehabilitation should recognize and take into consideration adaptive management, and rehabilitation actions should be concurrent to ensure ongoing integrity.

Residual Impacts:

The loss of currently intact vegetation is an unavoidable consequence of the project and cannot be entirely mitigated. The residual impact would however be medium for the construction phase with focus on limiting erosion required.

Nature: Pollution of water resources from construction activities.

Pollution stemming from construction activities that enters the natural environment and downslope watercourses, with associated impacts to habitat integrity and ecological function which in turn lowers the aquatic and terrestrial biodiversity dependent on the affected ecosystems. Potential loss of SCC.

	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Site specific (1)
Duration	Moderate term (5–15 years) (3)	Very short term (0–1 years) (1)
Magnitude	Moderate and will result in processes continuing but in a modified way (6)	Low and will cause a slight impact on processes (4)
Probability	Definite (5)	Probable (3)
Significance	**High (60)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as some level of pollution is unavoidable.	

Mitigation:

- Loose soils are particularly prone to loss due to wind or water. It is therefore preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces;
- Practice good soil management across the project area;
- Minimize the bare soil intercrop period as much as possible;
- Investigate the use of a cover crop (e.g. Eragrostis or better) if intercrop period is expected to be long. The cover species should not be exotic or invasive and should be chosen in consultation with a qualified vegetation specialist;
- Continue to grass all inter-cropland areas to prevent soil loss;
- Avoid the creation of concentrated flow paths wherever possible;
- Devise and implement a stormwater management plan for the croplands;
- Install sandbags as a temporary measure around key areas of soil loss to prevent soils washing into the local watercourse;
- Signs of erosion must be addressed immediately to prevent further erosion of the area to prevent headcut erosion from forming;
- Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching;
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil;
- Relandscape to gentler gradients and re-vegetate all cleared areas as soon as possible to limit erosion potential. Sandbags and geotextiles should be used to assist until vegetation has established in these reworked areas.
- Stem any headcut/ erosion gulley as it occurs by bulldozing, filling, re-contouring to gentler gradients and re-vegetating; and
- The rehabilitation of watercourse banks should take place as an offset to altered land use with associated negative ecological impacts. Key areas where erosion has occurred should be rehabilitated through bank reprofiling to gentler gradients and the revegetation of the marginal and riparian areas.

Residual Impacts:

Some level of pollution is inevitable due to the nature of the construction activities and cannot be entirely mitigated. The residual impact would however be low and of short duration for the construction phase.

Nature: Alteration of catchment hydrology and associated habitat ecology impacts from construction activities.

Construction phase activities that result in the reshaping and change in vegetative cover type and density for cultivation with associated alterations of slope, runoff velocities, infiltration capacity and sediment movement from baseline conditions. This is expected to occur across the catchment, with associated impacts to habitat integrity and ecological function.

	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Site specific (1)
Duration	Permanent (5)	The lifetime of the impact will be of a short duration (2-5 years) (2)
Magnitude	High (processes are altered to the extent that they temporarily cease) (8)	Low and will cause a slight impact on processes (4)
Probability	Definite (5)	Probable (3)
Significance	**High (80)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	None	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the hydrology alterations are unavoidable. However, the construction footprint can be realigned to avoid watercourses and associated buffers	

Mitigation:

» Loose soils are particularly prone to loss due to wind or water. It is therefore preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces;
» Practice good soil management across the project area;
» Minimize the bare soil intercrop period as much as possible;
» Investigate the use of a cover crop (e.g. Eragrostis or better) if intercrop period is expected to be long. The cover species should not be exotic or invasive and should be chosen in consultation with a qualified vegetation specialist;
» Continue to grass all inter-cropland areas to prevent soil loss;
» Avoid the creation of concentrated flow paths wherever possible;
» Devise and implement a stormwater management plan for the croplands;
» Install sandbags as a temporary measure around key areas of soil loss to prevent soils washing into the local watercourse;
» Signs of erosion must be addressed immediately to prevent further erosion of the area to prevent headcut erosion from forming;
» Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching;
» Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil;
» Relandscape to gentler gradients and re-vegetate all cleared areas as soon as possible to limit erosion potential. Sandbags and geotextiles should be used to assist until vegetation has established in these reworked areas.
» Stem any headcut/ erosion gulley as it occurs by bulldozing, filling, re-contouring to gentler gradients and re-vegetating; and
» The rehabilitation of watercourse banks should take place as an offset to altered land use with associated negative ecological impacts. Key areas where erosion has occurred should be rehabilitated through bank reprofiling to gentler gradients and the revegetation of the marginal and riparian areas.

Residual Impacts:

Alteration of the catchment hydrology is inevitable due to the nature of the construction activities and cannot be entirely mitigated. The residual impact would however be low and of short duration for the construction phase.

Operation Phase Impacts

The operational phase impacts are related to daily agricultural and maintenance activities which are anticipated to have indirect impacts on aquatic ecology, as well as the deterioration of the riparian habitats due to the increase in soil salinity and dissolved constituents from crop activities which includes dust, and its associated edge effect impacts from farm vehicles across the project footprint. The modification of the catchment drainage will alter watercourse habitats through altered drainage from baseline conditions with increased erosion and sedimentation, especially in exposed/ denuded areas. Stormwater management will therefore be crucial within the proposed operations footprint. This phase typically involves irrigation of the croplands via centre pivot and artificial impoundment systems, treatment through spraying and fertilization of crops and the operation of the road network and river crossing structures. The associated infrastructure (power lines, solar area and BESS) are not located within watercourses with insignificant operational impacts to aquatic ecology expected and therefore not assessed for the operational phases. The following operational phase related impacts to aquatic ecology were considered:

- Continued fragmentation and degradation of habitats and ecosystems;
- Contamination of watercourse and biotic community effects (including SCC);
- Alteration of catchment hydrology and associated habitat ecology impacts

Nature: Continued disturbance/ displacement/ loss of riparian, marginal and instream riverine habitat.

Disturbance created during the construction phase will leave the project area vulnerable to erosion and encroachment by alien vegetation. The operational phase activities that result in the continued destruction, loss and fragmentation of habitats, ecosystems and biotic community responses.

	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Low (2)	Site specific (1)
Duration	Long term (> 15 years) (4)	The lifetime of the impact will be of a short duration (2-5 years) (2)
Magnitude	Moderate and will result in processes continuing but in a modified way (6)	Low and will cause a slight impact on processes (4)
Probability	Definite (5)	Probable (3)
Significance	**High (60)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	

Mitigation:

- Keep disturbances to within footprints and outside of buffer zones;
- Control new stands of alien species as they arise;
- Land users are required by law, to remove and / or control Category 1 alien and invasive vegetation according to the National Environmental Management: Biodiversity Act (NEMBA: Act 10 of 2004) (September 2020 List – GN1003). Additionally, unless authorised, in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also

prohibited from occurring within proximity to a watercourse;
» It is recommended that Category 1 species are prioritised for control, with control of herbaceous weedy species (which would need to include follow-up control);
» Foliar herbicide spray must not be used within any of the sensitive riparian areas, rather opt for mechanical removal or direct dribbled application to stumps (use a dye); and
» Quarterly vegetation rehabilitation surveys need to be conducted of the vegetation within the project footprint to stay on top of the alien vegetation for the life of the project. This will improve the biotic integrity of the watercourses over the long term.

Residual Impacts:
Several CBA1 & 2 and ESA1 & 2 areas will be lost or degraded by the agricultural activities. Despite mitigation, erosion is expected across the project footprint, influencing downslope watercourses. Potential influence on habitat required by SCC fauna. The residual impact would however be low.

Nature: Pollution of water resources from operational activities.

The operation and maintenance of the proposed development will involve the application of fertilizers, pesticides and herbicides which are environmental pollutants. These pollutants wash from their intended areas of application (centre pivot croplands) and escape into the natural environment and downslope watercourses, with associated impacts to habitat integrity and ecological function which in turn lowers the aquatic and terrestrial biodiversity dependent on the affected ecosystems. Potential loss of SCC locally and further downstream in the region. Impacts are limited to the watercourses draining the croplands with no impacts to water quality expected for the proposed operation of impoundments.

	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Regional (4)	Local area (3)
Duration	Long term (> 15 years) (4)	Moderate term (5–15 years) (3)
Magnitude	High (processes are altered to the extent that they temporarily cease) (8)	Moderate and will result in processes continuing but in a modified way (6)
Probability	Definite (5)	Highly probable (4)
Significance	**High (80)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as some level of pollution is unavoidable.	

Mitigation:
» Avoid the use of rodenticides wherever possible. Excessive rodent populations can be effectively controlled with the use of large buckets baited with peanut butter, partially filled with water. Of course, these should be placed strategically so as to minimize incidental trapping of non-target organisms such as reptiles and amphibians. (i.e. place away from wetlands and natural areas);
» Minimise pesticide and herbicide use wherever possible. Do not apply in any of the watercourses unless used for alien control in which case apply directly to cut stumps (not foliar spray);
» Investigate incorporating biopesticides into the farm's Integrated Pest Management (IPM) system so as to rely less on higher-risk pesticides and effectively produce higher crop yields and quality with lower impact on the environment;
» Based on the survey findings, the baseline concentrations of dissolved solids are elevated, therefore the buffer zone widths need to be as wide as possible to limit further increases in contaminants within the watercourses and those downstream such as the Orange River (cumulative impacts); and
» It is recommended that artificially and densely vegetated areas be established in keys areas of surface runoff to

increase plant cover (reeds, etc.) to polish any wastewater releases through phytoremediation. This will assist in limiting potential contamination of groundwater and downslope watercourses;
» It is recommended that septic tanks be opted for over a French drain systems for toilet systems;
» Utilize a French drain / artificial wetland to return process water in a diffuse manner to the nearest watercourse;
» It is recommended that artificially and densely vegetated areas be established in keys areas of surface runoff to increase plant cover (reeds, etc.) to polish any wastewater releases through phytoremediation. This will assist in limiting potential contamination of groundwater and downslope watercourses;
» The client should monitor wastewater discharge quality for the life of the project to ensure best environmental practice;
» During operation of the farm employees must have spill kits available to ensure that any fuel or oil spills are cleaned-up and discarded correctly;
» Have action plans on site, and training for employees in the event of spills, leaks and other impacts to the aquatic systems;
» All chemicals and toxicants must be stored in bunded areas;
» All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced in a workshop and not near watercourses or drainage lines;
» All waste generated on-site during operation must be adequately managed. Separation and recycling of different waste materials should be supported;
» A suitable stormwater plan must be compiled for the development and implemented for the life of the project. This plan must attempt to displace and divert stormwater from areas where contaminants are used and/or stored and discharge the water into adjacent areas without eroding the receiving areas. It is preferable that run-off velocities be reduced with energy dissipaters (thick vegetative cover is preferred) and flows discharged into the local watercourses. This plan must be ongoing and adaptive based on on-site conditions. All stormwater infrastructure must be monitored and maintained addressing areas on non-efficacy; and
» It is preferred that during the operation phase, stormwater and return flow from crops and the road network should pass through vegetated depressions and channels with stepped and vegetated swales for flow attenuation, lowering erosion potential and phytoremediation before entering the watercourse.

Residual Impacts:
» Some level of pollution is inevitable due to the nature of the operational activities and cannot be entirely mitigated. The residual impact would be moderate and of medium duration following the implementation of mitigation.
» Potential loss of SCC or decline in their population numbers expected.

Nature: Alteration of catchment hydrology and associated habitat ecology impacts from operational activities.

As a result of the landscaping to new topography and change in vegetative cover type and density for cultivation, new functioning regimes pertaining to surface runoff, infiltration and sediment movement patterns will influence the adjacent natural habitat characteristics. This in turn will influence habitat integrity and ecological functioning, notably from increased return flows, erosion and instream sedimentation impacts. This would be applicable to habitat and watercourse features in proximity to all of the proposed infrastructure, notably the centre pivots and downslope areas of the impoundments.

	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Site specific (1)
Duration	Long term (> 15 years) (4)	The lifetime of the impact will be of a short duration (2-5 years) (2)
Magnitude	High (processes are altered to the extent that they temporarily cease) (8)	Low and will cause a slight impact on processes (4)
Probability	Definite (5)	Probable (3)
Significance	**High (75)**	**Low (21)**
Status (positive or negative)	Negative	Negative

Reversibility	Low	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the hydrology alterations are unavoidable. However, the operational activities need to avoid direct impacts to watercourses and associated buffers, notably erosion.	

Mitigation:

- Loose soils are particularly prone to loss due to wind or water. It is therefore preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces;
- Practice good soil management across the project area;
- Minimize the bare soil intercrop period as much as possible;
- Investigate the use of a cover crop (e.g. Eragrostis or better) if intercrop period is expected to be long. The cover species should not be exotic or invasive and should be chosen in consultation with a qualified vegetation specialist;
- Continue to grass all inter-cropland areas to prevent soil loss;
- Avoid the creation of concentrated flow paths wherever possible;
- Devise and implement a stormwater management plan for the croplands;
- Install sandbags as a temporary measure around key areas of soil loss to prevent soils washing into the local watercourse;
- Signs of erosion must be addressed immediately to prevent further erosion of the area to prevent headcut erosion from forming;
- Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching;
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil;
- Relandscape to gentler gradients and re-vegetate all cleared areas as soon as possible to limit erosion potential. Sandbags and geotextiles should be used to assist until vegetation has established in these reworked areas.
- Stem any headcut/ erosion gulley as it occurs by bulldozing, filling, re-contouring to gentler gradients and re-vegetating; and
- The rehabilitation of watercourse banks should take place as an offset to altered land use with associated negative ecological impacts. Key areas where erosion has occurred should be rehabilitated through bank reprofiling to gentler gradients and the revegetation of the marginal and riparian areas.

Residual Impacts:

Residual impacts are largely related to altered instream water levels associated with agricultural return flows and erosion due to altered hydrodynamics and erodibility of the associated catchment.

8.4.3. Overall Result

The impact assessment considered both direct and indirect impacts to the water resources. According to the layout provided and the delineated riparian zones and applicable buffers, the centre pivots, impoundments (several options), power line and internal pipeline intersect with the water resources posing risk to these receptors. The relocation of the aforementioned infrastructure to avoid sensitive water resources and the prescribed buffer zones (no-go zones) will lower the impacts to these receptors. The relocation of the centre pivots outside of no-go zones would result in an overall reduction in the number of proposed centre pivots, lowering the associated negative ecological impacts expected. Avoidance of no-go zones would lower their impacts and should be considered. Additionally, the project should consider the least number of river crossing structures possible to limit further watercourse disturbance.

The solar area and BESS infrastructure are expected to have no impacts towards local watercourses.

Impacts associated with the proposed infrastructure are related to habitat disturbance and fragmentation, contamination of water quality and alteration of catchment hydrology which cumulatively result in negative ecology impacts within watercourses. The construction and operational phase impacts range from moderate to high, with the majority of impacts being reduced to low and moderate following the implementation of adequate mitigation measures. Due to the nature of the project, the footprint of the proposed agricultural infrastructure has a large, localised impact, while cumulatively the project poses regional water quality impacts and threat to SCC.

It is the specialist's opinion that no fatal flaws have been identified for the proposed activities, and authorisation of the proposed development must be carefully considered. Considerations must take into account the carrying capacity of the local and regional watercourses potentially influenced by the proposed activities and their resilience to future disturbances.

The alternative positioning of infrastructure is preferred due to the avoidance of water resource sensitive areas (no-go zones). The soils within the catchment are prone to erosion and care is required to ensure proposed activities do not exacerbate erosion within the catchment. Monitoring of the aquatic resources is required during construction and operational activities.

Due to the high threat level of water quality deterioration and negative ecological impacts expected, notably from typically used Organophosphates, the project must consider environmentally friendly alternatives to Organophosphates. This together with the prescribed mitigation must be implemented in totality in order to proceed in a sustainable manner.

A competent ECO must oversee the construction and operational activities, with watercourse areas as a priority. Additional reccomendations listed in this report should be considered for this project.

Potential Impact on Land Use, Soil and Agricultural Potential

The development of the Xhariep Export Programme (XEP) Agricultural Development is likely to result in a variety of impacts from a soil and agricultural perspective. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F** for more details).

8.5.1. Results of the Land Use, Soil, and Agricultural Potential Assessment

Various soil forms were identified throughout the development area, namely the Oakleaf, Hutton and Augrabies soil. In the terrain soils associated with the presence of lime or carbonates also occurs. These soil forms are characterised by a high carbonate subsurface horizons which includes the Addo, Augrabies and Plooysburg soil forms. The area has few profiles that are saturated for long periods with surface water such as the Katspruit soil form.

The most sensitive soil forms identified within the assessment corridor is the Oakleaf, Hutton and Augrabies soils. The land capability sensitivities (DAFF, 2017) indicate land capabilities with "Very Low" to "Moderate" sensitivities, which correlates with the findings from the baseline assessment. The area has land capability classes of "III" and "IV" with a climate capability level "C8" associated with harsh conditions. The assessment area is characterised with a land potential class level "L6" for all the soils. The development footprint area is associated with non-arable soils, which correspond to the current land use of livestock

grazing and irrigated crop production in the area. As a result of the low to moderate sensitivity, a compliance statement is applicable in accordance with the specialist protocols.

8.5.2. Overall Result

The land capability sensitivity (DAFF, 2017) indicates a range of sensitivities expected throughout the project focus area, which predominantly covers "Very Low" to "Low" sensitivities. Some patches are characterised by "Moderate" sensitivities. The area has a "Low" sensitivity based on these land potential classes. The "Very Low to Moderate" sensitivities baseline findings concur with the DAFF, (2017) land potential for the requirements for a compliance statement report only. According to the DEA Screening Tool, (2022), few portions within the assessment area has "High" sensitivity crop fields. Since rainfall is one of the limiting factors for crop production in the assessment area, the agricultural pivot expansion project can increase the land potential without segregation of such agricultural lands or crop fields with high potentials. In the case the landowners of such crop fields are not part of the expansion project, it is the specialist`s recommendation that such high potential crop fields be avoid for the project. In a case relocating of the project is not feasible, the stakeholders should engage with the owners of the crop fields for an appropriate compensation. Thus, the agricultural and pivot expansion project maybe favourably considered as planned.

Assessment of Impacts on Heritage Resource

8.6.1. Results of the Heritage impact Assessment

Archaeology

Only one site of archaeological significance was identified within the proposed development area in a previous archaeological assessment conducted by Van Schalkwyk in 2015. SAHRIS Site 139138 is graded IIIC and is described as "Two localised areas, associated with small outcrops, where thin scatters of MSA tools and flakes were identified. The density of the material is approximately 1 artefact/flake per 10m^2. The material used for the tools are hardened shale and lideanite." Van Schalkwyk (2015) goes on to conclude that "as the density of the scatter is very low, as well as the fact that it is surface material and therefore not in its original context anymore, it is viewed to have a low significance and it is judged that the impact would be very low" and no recommendations for mitigation are provided.

As such, we reiterate the findings of Van Schalkwyk (2015) as they pertain to this site and as such, no mitigation measures are recommended in this report. There is no objection to the destruction of this site in terms of its archaeological significance.

In the field assessment conducted in 2022, all of the archaeological resources observed were determined to be low density surface scatters. As such, these sites have limited scientific value beyond their recording as per this report. To this end, these resources are determined to be Not Conservation-Worthy (NCW) and there is no objection to their impact as a result of this development.

Two burial sites were identified within the development footprint (Observation 009 and 041), graded IIIA due to their high levels of social and spiritual significance. Both of these burial grounds are located within the boundaries of the proposed development footprint and if the development proceeds as intended, it is likely that these burial sites will be negatively impacted. As such, it is recommended that a no-impact

buffer of 100m is implemented around each of these sites in order to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The Havenga Bridge, originally constructed in 1934, was identified as a structure of high local significance for its architectural significance and as such, has been graded IIIA. This site is located well outside of the development area and no impact is anticipated.

Palaeontology

According to the SAHRIS Palaeosensiitvity Map, the area proposed for development is underlain by sediments of low, moderate and high palaeontological sensitivity. According to the extract from the Council for GeoScience Map 2924 for Koffiefontein, the area is underlain by Jurassic Dolerite (zero paleontological sensitivity) and Quaternary Sands (moderate and high sensitivity). According to the Desktop Palaeontological Assessment completed by Bamford (2021) for a grid connection project located in the immediate vicinity of this development, the proposed development is positioned within "a mix of potentially fossiliferous (trace fossils) Tierberg Formation (Ecca Group, Karoo Supergroup), Jurassic dolerite and on the Quaternary aeolian sands and calcretes that are non-fossilferous unless there are traps for fossils such as paleo-pans or palaeo-springs. No such feature is visible on the satellite imagery."

According to the desktop assessment completed by Bamford (2022), "Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. Furthermore, the material to be cultivated is soil and this does not preserve fossils. Since there is an extremely small chance that fossils from the Tierberg Formation may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

Bamford (2022) concludes that "Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the soils of the Quaternary. There is a very small chance that trace fossils may occur in the shales of the early Permian Tierberg Formation so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations for pipes, dam walls and infrastructure have commenced then they should be rescued, and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low so as far as the palaeontology is concerned, the project should be authorised."

8.6.2. Potential Impact on Heritage Resource

Potential impacts on heritage resources are expected mainly in the construction phase of the project.

Nature: It is possible that buried archaeological resources may be impacted by the proposed development in the preferred location.		
	Without Mitigation	**With Mitigation**
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (8)
Probability	Definite (5)	Very improbable (1)

Significance	**High (70)**	**Low (7)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	Yes
Mitigation: » A no-impact buffer of 100m is implemented around Observations 009 and 041. » Should any previously unrecorded archaeological resources or possible burials be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward		
Residual Risk: None		

Nature: It is possible that buried Paleontological resources may be impacted by the proposed development in the preferred location.		
	Without Mitigation	**With Mitigation**
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (2)
Probability	Very improbable (1)	Very improbable (1)
Significance	**Medium (70)**	**Medium (52)**
Status (positive or negative)	Negative	Negative
Reversibility	No	No
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: » A Chance Fossil Finds Procedure must be implemented for the duration of construction activities. » Should any previously unrecorded paleontological resources be identified during the course of construction activities, work must cease in the immediate vicinity of the find, and SAHRA must be contacted regarding an appropriate way forward.		
Residual Risk: None		

8.6.3. Overall Result

The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage. Two burial sites were identified within the development footprint (Observation 009 and 041), graded IIIA due to their high levels of social and spiritual significance. Both of these burial grounds are located within the boundaries of the proposed development footprint and if the development proceeds as intended, it is likely that these burial sites will be negatively impacted. As such, it is recommended that a no-impact buffer of 100m is implemented around each of these sites in order to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The specialist concluded that there is no objection to the proposed development in terms of impacts to archaeological heritage on condition that:

- A no-impact buffer of 100m is implemented around Observations 009 and 041.
- A Chance Fossil Finds Procedure is implemented for the duration of construction activities.
- Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.

Social Impact

8.7.1. Potential Impacts on the Social Environment

The majority of social impacts associated with the project are anticipated to occur during the construction phase of the development and are typical of the type of social impacts generally associated with construction activities. These impacts will be temporary and short-term (~12 months) but could have long-term effects on the surrounding social environment if not planned or managed appropriately. It is therefore necessary that the detailed design phase be conducted in such a manner so as not to result in permanent social impacts associated with the ill-placement of project components or associated infrastructure or result in the mismanagement of the construction phase activities.

The positive and negative social impacts identified and assessed for the construction phase includes:

- Direct and indirect employment opportunities
- Economic multiplier effects
- Safety and security impacts
- Impacts on daily living and movement patterns
- Nuisance impacts, including noise and dust
- Visual impacts and sense of place impacts

Construction Phase

Nature: Employment opportunities and skills development

Impact description: The creation of employment opportunities and skills development opportunities during the construction phase for the country and local economy.

	Prior to Enhancement	**Post Enhancement**
Duration	Short-term (2)	Short-term (1)
Extent	Local – Regional (3)	Regional (3)
Magnitude	Low (4)	Moderate (6)
Probability	Medium Probability (3)	Definite (5)
Significance	**Low Positive (30)**	**Medium Positive (55)**

Enhancement measures:

To enhance the local employment, skills development and business opportunities associated with the construction phase, the following measures should be implemented:

- It is recommended that a local employment policy be adopted to maximise the opportunities made available to the local labour force. JN Venter Beleggings Trust should make it a requirement for contractors to implement a 'locals first' policy, especially for semi and low skilled job categories.
- Enhance employment opportunities for the immediate local area, i.e., Letsemeng Local Municipality. If this is not possible, then the broader focus areas should be considered for sourcing workers.
- Consideration must be given to women during the recruitment process.

- » It is recommended that realistic local recruitment targets be set for the construction phase.
- » Training and skills development programmes should be initiated prior to the commencement of the construction phase.

Residual Risks:
Improved pool of skills and experience in the local area

Nature: Multiplier effects on the local economy.

Impact description: Significance of the impact from the economic multiplier effects from the use of local goods and services.

	Prior to Enhancement	**Post Enhancement**
Duration	Long-term (4)	Long-term (4)
Extent	Local – Regional (3)	Local Regional (3)
Magnitude	Low (4)	Low (4)
Probability	Medium Probability (3)	Definite (5)
Significance	**Medium Positive (36)**	**Medium Positive (60)**

Enhancement measures:

- » It is recommended that a local procurement policy be adopted by the developer to maximise the benefit to the local economy, where feasible (Letsemeng Local Municipality).
- » JN Venter Beleggings Trust should develop a database of local companies, specifically Historically Disadvantaged (HD) companies, which qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work where applicable.
- » It is a requirement to source as much good and services as possible from the local area.
- » Engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers, where feasible.

Residual Risks:
Improved local service sector, growth in local business.

Nature: Safety and security.

Impact description: Temporary increase in safety and security concerns associated with the influx of people during the construction phase.

	Prior to Mitigation	**Post Mitigation**
Duration	Short-term (2)	Short-term (2)
Extent	Local – Regional (3)	Local (2)
Magnitude	Low (4)	Low (4)
Probability	Medium Probability (3)	Improbable (2)
Significance	**Low Negative (27)**	**Low Negative (16)**

Mitigation:

- » Access in and out of the construction area should be strictly controlled by a security company.
- » The appointed EPC contractor must appoint a security company and appropriate security procedures are to be implemented to limit access to the site and surrounding areas.
- » The contractor must ensure that open fires on the site for heating, smoking or cooking are not allowed except in designated areas.
- » The contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.
- » Have clear rules and regulations for access to the proposed site to control loitering.

- A comprehensive employee induction programme would cover land access protocols, fire management and road safety must be prepared. A Community Liaison Officer should be appointed. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process

Residual Risks:
None anticipated.

Nature: Disruption of daily living and movement patterns.

Impact description: Temporary increase in traffic disruptions and movement patterns during the construction phase.

	Prior to Mitigation	Post Mitigation
Duration	Short-term (2)	Short-term (2)
Extent	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (1)
Significance	**Medium Negative (40)**	**Low Negative (16)**

Mitigation:

- All vehicles must be road worthy, and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues.
- Heavy vehicles should be inspected regularly to ensure their road safety worthiness.
- Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.
- Avoid heavy vehicle activity during 'peak' hours (when people are driving to and from work).
- The developer and engineering, procurement and construction (EPC) contractors must ensure that any damage / wear and tear caused by construction related traffic to the roads is repaired.
- A comprehensive employee induction programme which covers land access protocols and road safety must be prepared.
- A Community Liaison Officer should be appointed. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.

Residual Risks:
None anticipated.

Nature: Nuisance impacts (noise& dust).

Impact description: Nuisance impacts in terms of temporary increase in noise and dust, and the wear and tear on private farm roads for access to the site.

	Prior to Mitigation	Post Mitigation
Duration	Short-term (2)	Short-term (2)
Extent	Local (1)	Local (1)
Magnitude	High (8)	Moderate (6)
Probability	Highly Probable (4)	Improbable (1)
Significance	**Medium Negative (44)**	**Low Negative (18)**

Mitigation:

- The movement of construction vehicles on the site should be confined to agreed access road/s.
- The movement of heavy vehicles associated with the construction phase should be timed (where possible) to avoid times days of the week, such as weekends, when the volume of traffic travelling along the access roads may be higher.
- Dust suppression measures should be implemented, such as wetting on a regular basis and ensuring that vehicles used to

transport sand and building materials are fitted with tarpaulins or covers.

- All vehicles must be roadworthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits.
- A Community Liaison Officer should be appointed. A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process

Residual Risks:
None anticipated

Operational Phase Impacts

Nature: Job creation during operation

Impact description: The creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy

	Prior to Enhancement	**Post Enhancement**
Duration	Long term (4)	Long-term (4)
Extent	Regional (3)	Local - regional (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Highly Probable (4)
Significance	**Medium Positive (33)**	**Medium Positive (44)**

Enhancement measures:

- It is recommended that a local employment policy is adopted by the developer to maximise the project opportunities being made available to the local community. Enhance employment opportunities for the immediate local area, Letsemeng Local Municipality, if this is not possible, then the broader focus areas should be considered for sourcing employees.
- The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
- The developer should establish vocational training programs for the local employees to promote the development of skills

Residual Risks:
Improved pool of skills and experience in the local area

Nature: Development of clean, renewable energy infrastructure.

Impact description: Development of clean, renewable energy infrastructure.

	Prior to Enhancement	**Post Enhancement**
Duration	Long term (4)	Long term (4)
Extent	Local – Regional -National (4)	National (4)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium Positive (48)**	**Medium Positive (48)**

Enhancement measures:
None required

Residual Risks:
Reduce carbon emissions through the use of renewable energy and contribute to reducing global warming

Nature: Visual impacts and impacts on sense of place.

Impact description: Visual impacts and sense of place impacts associated with the operation phase of the project.

	Prior to Mitigation	**Post Mitigation**
Duration	Long term (4)	N.A. – Mitigation not possible
Extent	Local (1)	N.A. – Mitigation not possible.
Magnitude	Low (4)	N.A. – Mitigation not possible
Probability	Improbable (1)	N.A. – Mitigation not possible
Significance	**Low Negative (18)**	

Mitigation:
None required.

Residual Risks:
None anticipated if the visual impact will be removed after decommissioning, provided the solar energy facility infrastructure is removed and the site is rehabilitated to its original (current) status

Nature: Improved Food security and nutritional status during operation phase.

Impact description: Improved food security of the local region and of the country as a result of the increase in the quantity of food produced once the project becomes operational.

	Prior to Enhancement	**Post Enhancement**
Duration	Long term (4)	Long-term (4)
Extent	Local-National (4)	Local - regional (3)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium Positive (48)**	**Medium Positive (44)**

Enhancement measures:
None required

Residual Risks:
None anticipated

Nature: Minimize food imports, increase food exports and savings of the foreign exchange.

Minimized food imports, increase food exports and currency savings as a result of increased local production and export revenue.

	Prior to Enhancement	**Post Enhancement**
Duration	Long term (4)	Long-term (4)
Extent	Local – International (5)	Local - international (5)
Magnitude	Low (4)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium Positive (33)**	**Medium Positive (44)**

Enhancement measures:
None anticipated

Residual Risks:
None anticipated

8.7.2. Overall Result

From a social perspective, it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to. Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws, and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings can be made:

- The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focused on the construction of PV facilities and pivot infrastructure (these relate to intrusion and disturbance impacts, safety and security) and could be reduced with the implementation of the mitigation measures proposed.
- Employment opportunities will be created in the construction and operation phases and the impact is rated as positive even if only a small number of individuals will benefit in this regard.
- The proposed project could assist the local economy in creating entrepreneurial development, especially if local businesses could be involved in the provision of general material and services during the construction and operational phases.
- Capacity building and skills training amongst employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.
- The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy for use by the development, which, given the challenges created by climate change, represents a positive social benefit for society.

The proposed Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure is unlikely to result in permanent damaging social impacts and will have a number of positive impacts from a social and economic perspective at a local and regional level. From a social perspective, it is concluded that the project could be developed subject to the implementation of the recommended mitigation measures, enhancement measures and management actions contained in the report.

Cumulative Impacts

Cumulative impacts are those that have the potential to be compounded through the development of the project in proximity to other similar developments. The role of the cumulative assessment is to confirm if such impacts are relevant to the Xhariep Export Programme (XEP) Agricultural Development project site being considered for the development. This assessment considers whether the cumulative impact will result in:

- Unacceptable loss of threatened or protected vegetation types, habitat, or species through clearing, resulting in an impact on the conservation status of such flora, fauna, or ecological functioning.
- Unacceptable risk to freshwater features through disturbance associated with construction activities and increased runoff and erosion during the operation phase.
- Unacceptable loss of heritage resources (including palaeontological and archaeological resources).
- Unacceptable negative impact to socio-economic factors and components.

Further to the above, positive cumulative impacts are also expected and will be associated with socio-economic aspects.

8.8.1. Cumulative impacts on Ecology (including flora, fauna and avifauna)

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system.

This section describes the cumulative potential impacts of the project on biodiversity. Cumulative impacts are assessed in context of the extent of the proposed development area, other developments in the area, as well as general habitat loss and transformation resulting from other activities in the area.

Presently, the surrounding immediate and broader landscape consists of natural vegetation used for supporting livestock, protected areas, intensive crop agriculture, renewable energy developments, and to a lesser extent game farms. The proposed development exacerbates habitat loss and operational impacts may lead to a highly significant level of fauna mortality, including SCC. Accordingly, the significance of the cumulative impact of the proposed development was determined to be 'High'.

Nature: Cumulative habitat loss within the region. The development of the proposed Agricultural Development and Associated Infrastructure will contribute to cumulative habitat loss within the Northern Upper Karoo, Critical Biodiversity Areas and Ecological Support Areas.		
	Overall impact of the proposed development considered in isolation	**Cumulative impact of the project and other land-use in the area**
Extent	Very low (1)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Very High (10)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**Medium (52)**	**High (64)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	Yes, in certain scenarios	Yes, in certain cases
Can impacts be mitigated	Yes, to some degree.	
Mitigation: Ensure that all 'Very High' SEI areas and riparian buffers are avoided. A Biodiversity, Rehabilitation and Invasive Alien Plant Management Plan must be developed and implemented. The use of pesticides should not be considered and unless absolutely necessary, organic biocides must be investigated as an alternative.		

8.8.2. Cumulative Impacts on Aquatic Ecology

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general habitat loss and transformation resulting from other activities in the

area. The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for freshwater fauna and flora.

Localised cumulative impacts include the cumulative effects from operations that are close enough (such as nearby farming activities within the area) to potentially cause additive effects on the environment or sensitive receivers. These include disruption of ecological corridors or habitat such as watercourses, impacts to groundwater and surface water quality, and transport of soils and instream habitat smothering impacts.

Long-term cumulative impacts due to the proposed farm footprint, comprising high density centre-pivots in the middle reaches of the Lemoenspruit combined with the high-density agricultural activities currently present on both the lower Lemoenspruit and receiving Orange River downstream **(Figure 8.2**) can lead to the loss of endemic species and threatened species (SCC), and degradation of watercourse habitat these species rely on. The cumulative impact of the project was rated as moderate should the project go ahead and involve the implementation of mitigation.

Figure 8.2: Current level of centre-pivots along the Lemoenspruit and Orange River (Google Earth 2022)

Nature: The development of the proposed infrastructure will contribute to cumulative habitat loss within local CBAs and ESAs with water quality deterioration in both the Lemoenspruit and downstream Orange River and thereby will impact the ecological processes in the region

The construction, operation and maintenance of the proposed development will result in the loss and alteration of habitat adjacent to watercourses with losses of portions of riparian habitat due to stream and pipeline crossings. The lowers the buffering capacity of the catchment to water quality impacts. The agricultural activities will deteriorate water quality even after the implementation of stipulated buffers and other mitigation. This will result in cumulative impacts to habitat integrity and ecological function which in turn lowers the aquatic and terrestrial biodiversity dependent on the affected ecosystems, with potential loss of SCC locally and further downstream in the region.

	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Regional (4)	Local area (3)
Duration	Permanent (4)	Long term (> 15 years) (3)
Magnitude	High (processes are altered to the extent that they temporarily cease) (8)	Moderate and will result in processes continuing but in a modified way (6)
Probability	Definite (5)	Highly probable (4)
Significance	**High (80)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	None	Moderate
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as some level of pollution is unavoidable. Avoidance of riparian and buffer areas and the use of less hazardous products than Organophosphates in environmentally safe quantities will be of highest importance to mitigate impacts.	

Mitigation:

» Avoid the use of rodenticides wherever possible. Excessive rodent populations can be effectively controlled with the use of large buckets baited with peanut butter, partially filled with water. Of course, these should be placed strategically so as to minimize incidental trapping of non-target organisms such as reptiles and amphibians. (i.e. place away from wetlands and natural areas);
» Minimise pesticide and herbicide use wherever possible. Do not apply in any of the watercourses unless used for alien control in which case apply directly to cut stumps (not foliar spray);
» Investigate incorporating biopesticides into the farm's Integrated Pest Management (IPM) system so as to rely less on higher-risk pesticides and effectively produce higher crop yields and quality with lower impact on the environment;
» Based on the survey findings, the baseline concentrations of dissolved solids are elevated, therefore the buffer zone widths need to be as wide as possible to limit further increases in contaminants within the watercourses and those downstream such as the Orange River (cumulative impacts); and
» It is recommended that artificially and densely vegetated areas be established in keys areas of surface runoff to increase plant cover (reeds, etc.) to polish any wastewater releases through phytoremediation. This will assist in limiting potential contamination of groundwater and downslope watercourses;

Residual Impacts:

» Some level of pollution is inevitable due to the nature of the operational activities and cannot be entirely mitigated. The residual impact would be moderate and of long-term duration for the life of the project following the implementation of mitigation.
» Potential loss of SCC or decline in their population numbers expected.

8.8.3. Cumulative impacts on Heritage Resource (including archaeology, palaeontology and cultural landscape)

This application is for the proposed development of pivot irrigation as well as a small solar facility and associated grid connection and BESS. The majority of this development pertains to agricultural activities within a predominantly agricultural context and as such, no negative cumulative impact from the pivot development is anticipated. The proposed solar development is relatively small and as such, is not likely to have a significant negative cumulative impact.

8.8.4. Cumulative impacts on the Social Environment

Cumulative impacts are described as impacts arising from the combined effects of two or more projects of action. They typically refer to large scale rather than site specific impacts and they frequently intensify the effects already anticipated for the proposed project. The aim of this section is to highlight the nature of the cumulative socio-economic impact that are expected to occur as a result of the combined effect of the proposed project has the potential to result in significant positive cumulative impacts and relatively low cumulative impact. The proposed development will create a number of socio-economic opportunities for the area, which in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment and Multiplier effects on the local economy, skills development and training opportunities, and downstream business opportunities, enhance food security, minimize imports of and savings on foreign exchanges. Benefits to the local, regional and national economy through employment and procurement of services could be substantial should many agricultural developments with Solar facilities proceed. This benefit will increase significantly should critical mass be reached that allows local companies to develop the necessary skills to support construction and maintenance activities and that allows for components of the renewable energy facilities to be manufactured in South Africa. Furthermore, at municipal level, the cumulative impact could be positive and could incentivize operation and maintenance companies to centralize and expand their activities towards education and training.

Nature: An increase in employment opportunities, skills development and business opportunities with the establishment of more than one solar energy facility		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local -regional (3)	Local-regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Medium Probability (3)	Medium Probability (3)
Significance	**Medium (33)**	**Medium (52)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impacts be mitigated?	Yes	Yes
Confidence in findings:	High	
Mitigation: The establishment of agricultural development with solar energy facilities in the area does have the potential to have a positive cumulative impact on the area in the form of employment opportunities, skills development and business opportunities. The positive benefits will be enhanced if local employment policies are adopted and local services providers are utilised by the developers to maximise the project opportunities available to the local community.		

Nature: Negative impacts and change to the local economy with an in-migration of labourers, businesses and jobseekers to the area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local-regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (1)	Improbable (2)
Significance	**Low (7)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings: High		
Mitigation: » Develop a recruitment policy / process (to be implemented by contractors), which will ensure the sourcing of labour locally, where available. » Work together with government agencies to ensure that service provision is in line with the development needs of the local area. » Form joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services. » Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated.		

8.8.5. Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Xhariep Export Programme (XEP) Agricultural Development throughout all phases of the project life cycle. The main aim for the assessment of cumulative impacts considering the Xhariep Export Programme (XEP) Agricultural Development is to test and determine whether the development will be acceptable within the landscape proposed for the development, and Xhariep Export Programme (XEP) Agricultural Development, Free State Province whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

» There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the Xhariep Export Programme (XEP) Agricultural Development and similar developments within the surrounding area, provided Very High SEI areas are avoided and the recommended mitigation measures are implemented resulting in a moderate residual impact. The cumulative impact is therefore acceptable.
» The footprint of the proposed development has a large, localised impact, while cumulatively the project poses regional water quality impacts and threat to SCC. There will be moderate significant loss of sensitive and significant aquatic features. The cumulative impact is therefore acceptable.
» There will be no unacceptable loss of land capability due to the development of the Xhariep Export Programme (XEP) Agricultural Development and other agricultural development projects within the surrounding areas, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.

- There will be no unacceptable loss of heritage resources associated with the development of the Xhariep Export Programme (XEP) Agricultural Development. The cumulative impact is therefore acceptable.
- No unacceptable negative cumulative social impacts are expected to occur. Positive cumulative impacts will be of medium significance and are expected to be beneficial at a regional level. The cumulative impact is therefore acceptable.

All cumulative impacts associated with the Xhariep Export Programme (XEP) Agricultural Development will be of a medium or low significance, with impacts of a high significance associated with the visual impacts.

No-go Alternative

The "no-development" alternative implies that the project does not proceed thereby maintaining the status quo. Environmental resources' current state is unaltered, therefore, their condition neither improves nor deteriorates. However, the implementation of this project has many benefits as indicated in this section of the report. The "no development" alternative has various negative and possible long-term impacts to the region which includes the local populations continue to suffer from food scarcity and consequently food insecurity due to lack of agricultural produce and a projected reduction in poverty levels. The no-development alternative would not comprise the development of the Xhariep Export Programme and associated infrastructure across the Free State province and South Africa, but the socio-economic benefits to the Letsemeng Local Municipality and the communities will be lost. The establishment of the proposed project should be developed. However, the enhancement and mitigation measures proposed in this section of the report as well as in other specialist studies for this proposed development should be implemented.

CHAPTER 9 : CONCLUSIONS AND RECOMMENDATIONS

The Applicant, JN Venter Beleggings Trust, is proposing to develop the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure on a site located south-west of Luckhof in the Free State Province. The development will take place on a site of ~4276.32 in extent across four (4) interlinked properties within the Letsemeng Local Municipality of the Xhariep District Municipality. The proposed project is in line with the surrounding land-use in the area. The potential for the proposed crop cultivation (i.e. maize, wheat, soya and possibly peanuts) is apparent as many commercial cultivation developments already occupy the general location. The soil and climate are suited to the proposed crop cultivation, and as a result the proposed development is anticipated to yield high volumes of quality crops for export and domestic distribution.

The project entails the following:

- Development of centre pivot areas (cultivation and irrigation) which is planned to take approximately 2690ha or more within the project site.
- Two irrigation water storage dams, with a combined surface area of 82ha in extent.
- Establishment of an internal irrigation pipeline network from the irrigation dams to the centre pivot areas.
- A new pump station taking a total surface area of 549m^2.
- A 5MW solar PV facility occupying an area of 10ha.
- A Battery Energy Storage System covering a surface area of 0.36ha.

A summary of the details and dimensions of the planned infrastructure associated with the project is provided in **Table 9.1 and Table 9.1a.**

Table 9.1: Details or dimensions of typical infrastructure required for the agricultural development

Infrastructure	Footprint and dimensions
Total extent of the development	~4276.32ha
Centre pivot (Cultivation and irrigation system)	2690ha
Irrigation pipeline network	Internal irrigation pipeline network to take water from the dams to the various centre pivot areas for irrigation purposes
Dams for irrigation water	» Dam 1 – Diepdraai » Dam 2 – (Sump): **See below for the dams' dimensions**
A pump station	One pump station covering a total surface area of 549m^2
5MW Solar PV facility	» 10ha surface area with three alternative sites being considered
Battery	A battery energy storage system to store additional power generated by the PV Facility covering an area of 0.36ha

Table 9.1a: Dimensions of the dams

Dam	Maximum wall height	Wall volume	Capacity	Water Area	Development footprint
Dam 1 – Diepkloof (Diepdraai)	17m	503250m^3	3.1 million m^3	58 ha	63 ha
Dam 2 – (Sump):	14m	426000m^3	1.0 million m^3	14 ha	19 ha

A summary of the recommendations and conclusions for the proposed project is provided in this Chapter.

9.1 Legal Requirements as per the EIA Regulations, 2014 (as amended) for the undertaking of an Impact Assessment Report

This chapter of the scoping report includes the following information required in terms of Appendix 3: Content of the Environmental Impact Assessment Report:

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	A summary of the findings of the specialist studies undertaken for the Xhariep Export Programme (XEP) Agricultural Development has been included in section **9.2.**
3(l) an environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment, (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	An environmental impact statement containing the key findings of the environmental impacts of the Xhariep Export Programme (XEP) Agricultural Development has been included as section 9**.5.** Environmental Sensitivity and Layout map of the Xhariep Export Programme (XEP) Agricultural Development has been included as **Figure 9.1** which overlays the development footprint (as assessed within the EIA) of the agricultural development with the environmental sensitive features located within the development area. A summary of the positive and negative impacts associated with the Xhariep Export Programme (XEP) Agricultural Development has been included in section **9.2**.
3(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	All conditions required to be included in the Environmental Authorisation of the Xhariep Export Programme (XEP) Agricultural Development has been included in section **9.6**.
3(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	A reasoned opinion as to whether the Xhariep Export Programme (XEP) Agricultural Development should be authorised has been included in section **9.5.**

9.2 Evaluation of the Xhariep Export Programme XEP

The preceding chapters of this report together with the specialist studies contained within **Appendices D-H** provide a detailed assessment of the potential impacts that may result from the development of the Xhariep Export Programme (XEP) Agricultural Development. This chapter concludes the environmental assessment of the Xhariep Export Programme (XEP) Agricultural Development by providing a summary of the results and conclusions of the assessment of both the development area and development footprint for the Xhariep Export Programme (XEP) Agricultural Development. In so doing, it draws on the information gathered as part of the EIA process, the knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws or unacceptable impacts were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of sensitive features within the development footprint and the undertaking of the construction and operational, as specified by the specialists.

The potential environmental impacts associated with the Xhariep Export Programme (XEP) Agricultural Development assessed through the EIA process include:

» Disturbance/destruction to and loss of vegetation and fauna and associated habitats
» Introduction and/or spread of declared weeds and alien invasive plants.
» Disturbance / degradation / loss of soils.
» Increased erosion and sedimentation & contamination of soil and water resources.
» Destruction of archaeological and palaeontological heritage.
» Social impacts, both positive and negative (job creation and business opportunities, impacts associated with construction workers in the area, and economic benefits).

The environmental sensitivities identified by the relevant specialists for the project site are illustrated in **Figure 9.1.** The development footprint, as assessed, has been overlain with the relevant environmental sensitivities

9.2.1 Ecology (including Flora, Fauna and Avifauna)

The Nama Karoo Biome is acknowledged to not possess a high diversity of flora species, with a total of 57 species, representing 25 families, recorded within the project area during the survey period. Dominant graminoid species, with respect to cover, indicates overgrazing. Nevertheless, the project site supports a diversity of fauna species including SCC. Five protected species were identified on the project area it is imperative that a Plant Search and Rescue Plan be developed prior to clearing and development.

Based on the fauna components recorded within the project area, the area provides important ecosystem services, particularly with regards to the maintenance of dynamic soil properties, biocontrol of pest species and pollination. The SEI of the project area was determined to vary from 'Very Low' to 'Very High' based on the confirmation of high likelihood of occurrence of fauna SCC, the extent of the area considered and its connectivity to natural areas within the landscape, as well as the low resilience of the vegetation types.

The main expected impacts of the proposed development will be the loss of habitat and mortality of fauna. Based on the outcomes of the SEI determination, the project possesses areas of 'Very High' SEI and 'High' SEI.

The 'High' SEI denotes that "avoidance mitigation wherever possible must be implemented. This includes changes to project infrastructure design to limit the amount of habitat impacted." (SANBI, 2020). Considering that the area has been zoned for agriculture, development may proceed in the 'High' SEI Areas, as long as the 'Very High' SEI areas are avoided and actively managed. Where pivots overlap minor drainage lines (also with Very High SEI), activity adjacent to these system is permissible, albeit only if the remaining channel extent is rehabilitated and actively managed. The dam located within the 'Very High' SEI areas is considered to be acceptable due to the technical requirement for the location of the

dam in this area, without requiring additional earthworks and piping. The amount of hectarage lost within that portion of the site is deemed acceptable from an ecological perspective. All of the mitigation measures and Biodiversity Impact Management Actions must be implemented if the proposed development is authorised.

9.2.2 Aquatic Sensitive Features

The baseline assessment established a single main watercourse with an associated tributary network draining the project area, namely the Lemoenspruit ecosystem. Additionally, numerous ephemeral drainage lines and some wetlands occur in the project area. The Lemoenspruit flows into the Orange River downstream of the project area and due to flood conditions at the time of the survey the Orange River could not be assessed. The ecological assessment of the Lemoenspruit indicated moderate modifications attributed to varying land use, comprising mostly open/ natural land with some agriculture and widespread livestock activities present in the project areas catchment.

Given the findings of this assessment, the Lemoenspruit was classed as moderately modified (class C). The entire drainage network is presented by a well-defined riparian zone consisting of woody vegetation. The soils within the catchment and along the watercourses are highly susceptible to erosion and considered sensitive to any potential anthropogenic activities along these systems which could potentially compromise the ecological integrity of the watercourses.

The directly influenced Lemoenspruit is listed as not protected, and the ecosystem is classified as Endangered. The indirectly affected Orange River system downstream of the project area is listed as poorly protected, and is classified as Critically Endangered. Additionally, Freshwater Priority Areas are assigned to them. The Lemoenspruit catchment serves as an upstream management area to assist in limiting impacts to the downstream Orange River which serves as a Fish Sanctuary area for threatened fish species such as Largemouth Yellowfish (*Labeobarbus kimberleyensis*). Largemouth Yellowfish are red listed as Near Threatened and are showing population declines due to habitat fragmentation and water quality deterioration. The Lemoenspruit includes an additional species of conservational concern, namely the recently described Orange River Chubbyhead barb (*Enteromius oraniensis*). The species currently has no threatened status and should be conserved through the precautionary principle and be treated as highly threatened. The poorly protected nature of the systems, the high EIS and presence of SCC indicates that strict mitigation measures should be adhered to ensure no further deterioration of the watercourses should the project proceed.

The riparian zones of the lower foothills geoclass Lemoenspruit require a buffer of 100m, and Lemoenspruit tributary network comprising non-perennial systems, ephemeral drainage lines and wetlands require a buffer of 50m. These buffers would ensure adequate ecological integrity maintenance adjacent to the proposed agricultural activities.

The impact assessment considered both direct and indirect impacts to the water resources. According to the layout provided and the delineated riparian zones and applicable buffers, the centre pivots, impoundments (several options), power line and internal pipeline intersect with the water resources posing risk to these receptors. The relocation of the aforementioned infrastructure to avoid sensitive water resources and the prescribed buffer zones (no-go zones) will lower the impacts to these receptors. The relocation of the centre pivots outside of no-go zones would result in an overall reduction in the number of proposed centre pivots, lowering the associated negative ecological impacts expected. Avoidance of

no-go zones would lower their impacts and should be considered. Additionally, the project should consider the least number of river crossing structures possible to limit further watercourse disturbance.

The solar area and BESS infrastructure are expected to have no impacts towards local watercourses.

Impacts associated with the proposed infrastructure are related to habitat disturbance and fragmentation, contamination of water quality and alteration of catchment hydrology which cumulatively result in negative ecology impacts within watercourses. The construction and operational phase impacts range from moderate to high, with the majority of impacts being reduced to low and moderate following the implementation of adequate mitigation measures. Due to the nature of the project, the footprint of the proposed agricultural infrastructure has a large, localised impact, while cumulatively the project poses regional water quality impacts and threat to SCC.

It is the specialist's opinion that no fatal flaws have been identified for the proposed activities, and authorisation of the proposed development must be carefully considered. Considerations must take into account the carrying capacity of the local and regional watercourses potentially influenced by the proposed activities and their resilience to future disturbances.

The alternative positioning of infrastructure is preferred due to the avoidance of water resource sensitive areas (no-go zones). The soils within the catchment are prone to erosion and care is required to ensure proposed activities do not exacerbate erosion within the catchment. Monitoring of the aquatic resources is required during construction and operational activities.

Due to the high threat level of water quality deterioration and negative ecological impacts expected, notably from typically used Organophosphates, the project must consider environmentally friendly alternatives to Organophosphates. This together with the prescribed mitigation must be implemented in totality in order to proceed in a sustainable manner.

A competent ECO must oversee the construction and operational activities, with watercourse areas as a priority. Additional recommendations listed in this report should be considered for this project.

9.2.3 Soils and Agricultural Potential Sensitive Features

The most sensitive soil forms identified within the assessment corridor is the Oakleaf, Hutton and Augrabies soils. The land capability sensitivities (DAFF, 2017) indicate land capabilities with "Very Low" to "Moderate" sensitivities, which correlates with the findings from the baseline assessment. The area has land capability classes of "III" and "IV" with a climate capability level "C8" associated with harsh conditions. The assessment area is characterised with a land potential class level "L6" for all the soils. The footprint area is associated with non-arable soils, which correspond to the current land use of livestock grazing and irrigated crop production in the area.

The land capability sensitivity (DAFF, 2017) indicates a range of sensitivities expected throughout the project focus area, which predominantly covers "Very Low" to "Low" sensitivities. Some patches are characterised by "Moderate" sensitivities. The area has a "Low" sensitivity based on these land potential classes. The "Very Low to Moderate" sensitivities baseline findings concur with the DAFF, (2017) land potential for the requirements for a compliance statement report only. According to the DEA Screening Tool, (2022), few portions within the assessment area has "High" sensitivity crop fields. Since rainfall is one of

the limiting factors for crop production in the assessment area, the agricultural pivot expansion project can increase the land potential without segregation of such agricultural lands or crop fields with high potentials. In the case the landowners of such crop fields are not part of the expansion project, it is the specialist`s recommendation that such high potential crop fields be avoid for the project. In a case relocating of the project is not feasible, the stakeholders should engage with the owners of the crop fields for an appropriate compensation. Thus, the agricultural and pivot expansion project maybe favourably considered as planned.

9.2.4 Heritage sensitive features, the cultural landscape (incl. archaeology, palaeontology, and cultural landscape)

The development area is underlain by sediments of low, moderate and high palaeontological sensitivity. According to the extract from the Council for GeoScience Map 2924 for Koffiefontein, the area is underlain by Jurassic Dolerite (zero paleontological sensitivity) and Quaternary Sands (moderate and high sensitivity).

Three archaeological observations were identified within the area proposed for pivot development and two of these observations consist of very low density MSA archaeological scatters and the third reflects a corrugated iron shed.

Two burial sites were identified within the development footprint, graded IIIA due to their high levels of social and spiritual significance a no-impact buffer of 100m must be implemented around each of these sites in order to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The overall archaeological sensitivity of the development area with regard to the preservation of Early, Middle and Later Stone Age archaeology as well as Khoe and San heritage, early colonial settlement is regarded as very high. Despite this, the field assessment conducted for this project has demonstrated that the specific area proposed for development has low sensitivity for impacts to significant archaeological heritage. Two burial sites were identified within the development footprint (Observation 009 and 041), graded IIIA due to their high levels of social and spiritual significance. Both of these burial grounds are located within the boundaries of the proposed development footprint and if the development proceeds as intended, it is likely that these burial sites will be negatively impacted. As such, it is recommended that a no-impact buffer of 100m is implemented around each of these sites in order to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The specialist concluded that there is no objection to the proposed development in terms of impacts to archaeological heritage on condition that:

» A no-impact buffer of 100m is implemented around Observations 009 and 041.
» A Chance Fossil Finds Procedure is implemented for the duration of construction activities.
» Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.

9.2.5 Social Impact

Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws, and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings can be made:

- The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focused on the construction of PV facilities and pivot infrastructure (these relate to intrusion and disturbance impacts, safety and security) and could be reduced with the implementation of the mitigation measures proposed.
- Employment opportunities will be created in the construction and operation phases and the impact is rated as positive even if only a small number of individuals will benefit in this regard.
- The proposed project could assist the local economy in creating entrepreneurial development, especially if local businesses could be involved in the provision of general material and services during the construction and operational phases.
- Capacity building and skills training amongst employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.
- The proposed development also represents an investment in infrastructure for the generation of clean, renewable energy, which, given the challenges created by climate change, represents a positive social benefit for society.

The proposed Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure is unlikely to result in permanent damaging social impacts and will have a number of positive impacts from a social and economic perspective at a local and regional level. From a social perspective, it is concluded that the project could be developed subject to the implementation of the recommended mitigation measures, enhancement measures and management actions contained in the report.

9.2.6. Conclusion regarding Cumulative Impacts

Cumulative impacts are expected to occur with the development of the Xhariep Export Programme (XEP) Agricultural Development throughout all phases of the project life cycle. The main aim for the assessment of cumulative impacts considering the Xhariep Export Programme (XEP) Agricultural Development is to test and determine whether the development will be acceptable within the landscape proposed for the development, and Xhariep Export Programme (XEP) Agricultural Development, Free State Province whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

- There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the Xhariep Export Programme (XEP) Agricultural Development and similar developments within the surrounding area, provided Very High SEI areas are avoided and the recommended mitigation measures are implemented resulting in a moderate residual impact. The cumulative impact is therefore acceptable.

- The footprint of the proposed development has a large, localised impact, while cumulatively the project poses regional water quality impacts and threat to SCC. There will be moderate significant loss of sensitive and significant aquatic features. The cumulative impact is therefore acceptable.
- There will be no unacceptable loss of land capability due to the development of the Xhariep Export Programme (XEP) Agricultural Development and other agricultural development projects within the surrounding areas, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable loss of heritage resources associated with the development of the Xhariep Export Programme (XEP) Agricultural Development. The cumulative impact is therefore acceptable.
- No unacceptable negative cumulative social impacts are expected to occur. Positive cumulative impacts will be of medium significance and are expected to be beneficial at a regional level. The cumulative impact is therefore acceptable.

All cumulative impacts associated with the Xhariep Export Programme (XEP) Agricultural Development will be of a medium or low significance, with impacts of a high significance associated with the visual impacts.

9.2.7. Assessment of No-go Alternative

The "no-development" alternative implies that the project does not proceed thereby maintaining the status quo. Environmental resources' current state is unaltered, therefore, their condition neither improves nor deteriorates. However, the implementation of this project has many benefits as indicated in this section of the report. The "no development" alternative has various negative and possible long-term impacts to the region which includes the local populations continue to suffer from food scarcity and consequently food insecurity due to lack of agricultural produce and a projected reduction in poverty levels. The no-development alternative would not comprise the development of the Xhariep Export Programme and associated infrastructure across the Free State province and South Africa, but the socio-economic benefits to the Letsemeng Local Municipality and the communities will be lost. The establishment of the proposed project should be developed. However, the enhancement and mitigation measures proposed in this section of the report as well as in other specialist studies for this proposed development should be implemented.

9.4 Environmental Costs of the Xhariep Export Programme (XEP) Agricultural Development versus Benefits of Xhariep Export Programme (XEP) Agricultural Development

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures as outlined in the EIA Report and the EMPr are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

- Loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the agricultural development - The cost of loss of biodiversity has been minimised/avoided through the limited placement of project components and infrastructure within the ecological features, and avifauna areas considered to be of high sensitivity.
- Impacts on aquatic resources - the impacts on freshwater resources have been minimised through the avoidance of the sensitive features by project infrastructure. A buffers to be implemented.

» Impact to the archaeological hertiage – A no-impact buffer of 100m is to implemented around the burial grounds.

Benefits of the Xhareip Export Programme (XEP) Agricultural Development include the following:
» The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the pre-construction, construction, operation and decommissioning phases of the project.
» The project contributes towards the Provincial and Local goals of agricultural development as outlined in the respective IDP.
» The project will ensure ensure food security and improve nutritional status within South Africa.
» The project will improve the profitability of agriculture and increase investment in agriculture.

The benefits of the Xhareip Export Programme (XEP) Agricultural Development are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the agricultural development provided that the 100m buffer is placed on the lower foothills of Lemoenspruit as per the recommendation of the aquatic specialist and the 100m buffer is placed on the burial grounds as per the recommendation of the heritage specialist.

9.5 Overall Conclusion (Impact Statement)

The preferred activity was determined by the applicant for an agricultural development consisting of cultivation of various crops (maize, wheat, soya, and nuts), centre pivot irrigation system, dams for storage irrigation water, solar PV, battery storage to supply energy on the farm, and a pump house and related network of pipelines to supply water to the centre pivot system. The centre pivot system is the preferred technology, because of to how the system efficiently spreads water onto growing crops and minimises the amount of water lost due to the wind and runoff. A technically viable development footprint was proposed by the developer and assessed as part of the EIA process. The assessment of the development footprint within the development area was undertaken by independent specialists and their findings have informed the results of this EIA Report.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level.

The specialist findings from the EIA studies undertaken have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the development area. The developer has designed a project development footprint in response to the identified sensitive environmental features and areas present within the development area. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e., tier 1 of the mitigation hierarchy).

The 'Very High' SEI areas identified through the ecological assessment are to be avoided and must be actively managed. Where pivots overlap minor drainage lines (also with Very High SEI), activity adjacent to these system is permissible, albeit only if the remaining channel extent is rehabilitated and actively

managed. The dam located within the 'Very High' SEI areas is considered to be acceptable due to the technical requirement for the location of the dam in this area, without requiring additional earthworks and piping. The amount of hectarage lost within that portion of the site is deemed acceptable from an ecological perspective.

Feedback from the aquatic specialist has indicated the lower foothills of Lemoenspruit requires a buffer of 100m, and Lemoenspruit tributary network comprising non-perennial systems, ephemeral drainage lines and wetlands require a buffer of 50 m to ensure adequate ecological integrity maintenance adjacent to the proposed agricultural activities. The Heritage specialist recommended a no-impact buffer of 100m is implemented around each of burial ground sites to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The impacts that are expected to remain after the avoidance of the sensitive areas have been reduced through the recommendation of specific mitigation measures by the specialists. The minimisation of the significance of the impacts is in line with tier 2 of the mitigation hierarchy.

As detailed in the cost-benefit analysis, the benefits of the Xhariep Export Programme (XEP) Agricultural Development are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive, the benefits of the project are expected to partially offset the localised environmental costs of the agricultural development. From a social perspective, both positive and negative impacts are expected.

Through the assessment of the development footprint within the development area, it can be concluded that the development of the Xhareip Export Programme (XEP) Agricultural Development will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

9.6 Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer, the avoidance of the sensitive environmental features within the development area, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the Xhareip Export Programme (XEP) Agricultural Development, is acceptable within the landscape and can reasonably be authorised subject to buffer of 100m on Lemoenspruit and a buffer of 50m on the Lemoenspruit tributary network comprising non-perennial systems, ephemeral drainage lines as well as a 100m is implemented around each of burial ground sites to ensure that the burials are not disturbed and to maintain a semblance of sense of place associated with the burial sites.

The proposed agricultural development will entail the following:

The development area of ~4276.32ha has been identified within the project area by the Applicant for the development.

- » Developmental of center pivot areas (cultivation and irrigation) which is planned to take approximately 2690ha or more within the project site.
- » Two irrigation water storage dams, with a combined surface area of 82ha in extent.
- » Establishment of an irrigation pipeline network from the irrigation dams to the centre pivot areas.
- » A new pump station taking a total surface area of 549m2.
- » A 5MW solar PV facility occupying an area of 10ha.
- » A Battery Energy Storage System covering a surface area of 0.36ha.

All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within Appendices **D to H** are to be implemented.

- » The EMPr as contained within **Appendix N** and **O** of this EIA Report should form part of the contract with the Contractors appointed to construct and maintain the Xhareip Export Programme (XEP) Agricultural Development in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the Xhareip Export Programme (XEP) Agricultural Development is considered key in achieving the appropriate environmental management standards as detailed for this project.
- » Following the final design of the Xhareip Export Programme (XEP) Agricultural Development, a revised layout must be submitted to DESTEA for review and approval prior to commencing with construction. No development, apart from the storage dam proposed, is permitted within the identified no-go areas as detailed in **Figure9.1** & **9.2**.
- » As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores.
- » Implement a chance finds procedure for the rescuing of any fossils or heritage resources discovered during construction.
- » Undertake a detailed walk-through survey of footprint areas that are within habitats where SCC are likely to occur during a favourable season to locate any individuals of protected plants, as well as for any populations of threatened plant species. This survey must cover the footprint of all approved infrastructure, including internal access roads (final infrastructure layout). The best season is early to late Summer, but dependent on recent rainfall and vegetation growth.
- » Obtain the necessary permits for specimens or protected plant species that will be lost due to construction of the project.

A validity period of 10 years of the Environmental Authorisation is requested, should the project obtain approval from DESTEA.

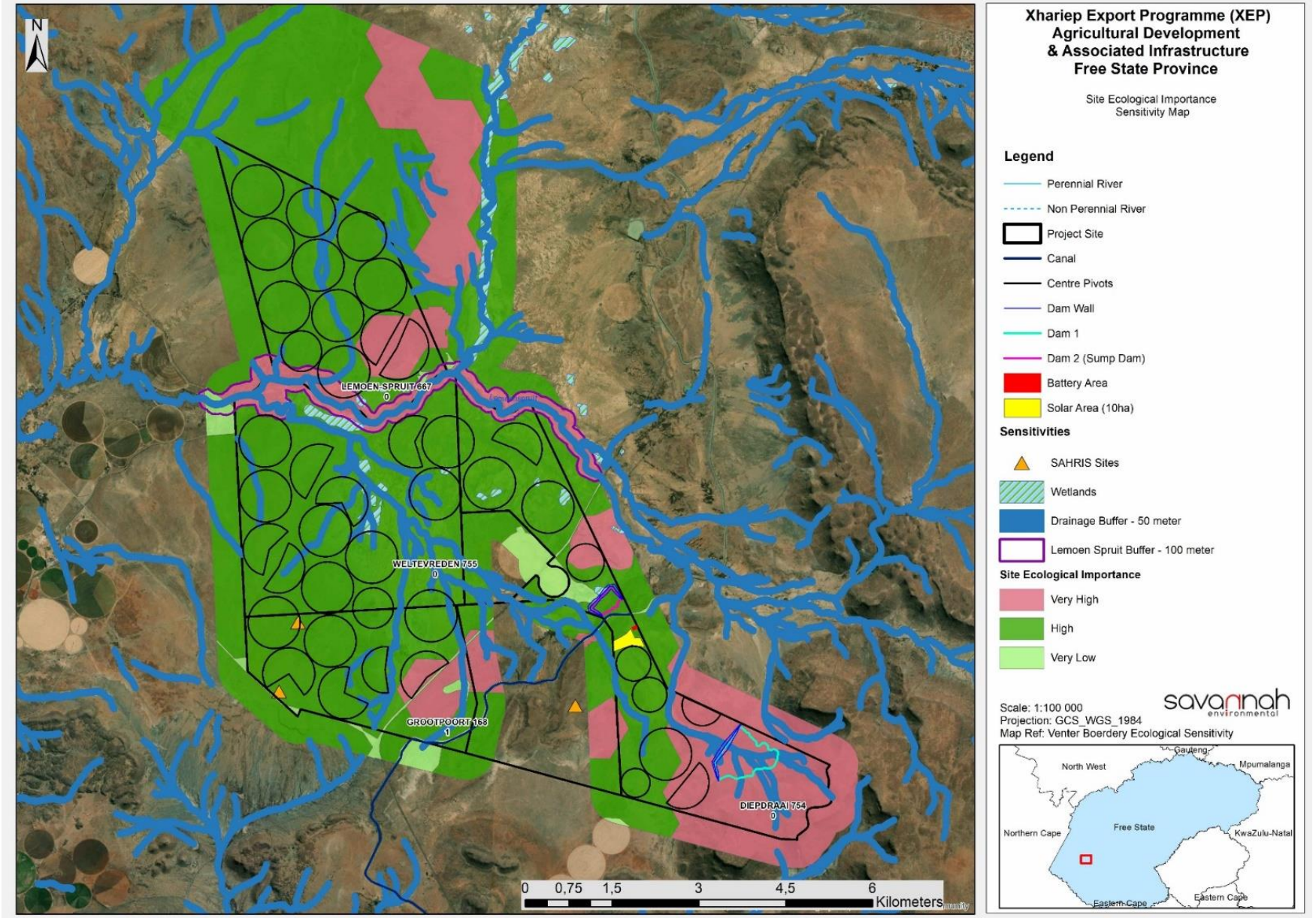


Figure 9.1. Environmental Sensitivity Map for the Xhariep Export Programme (XEP) Agricultural Development,

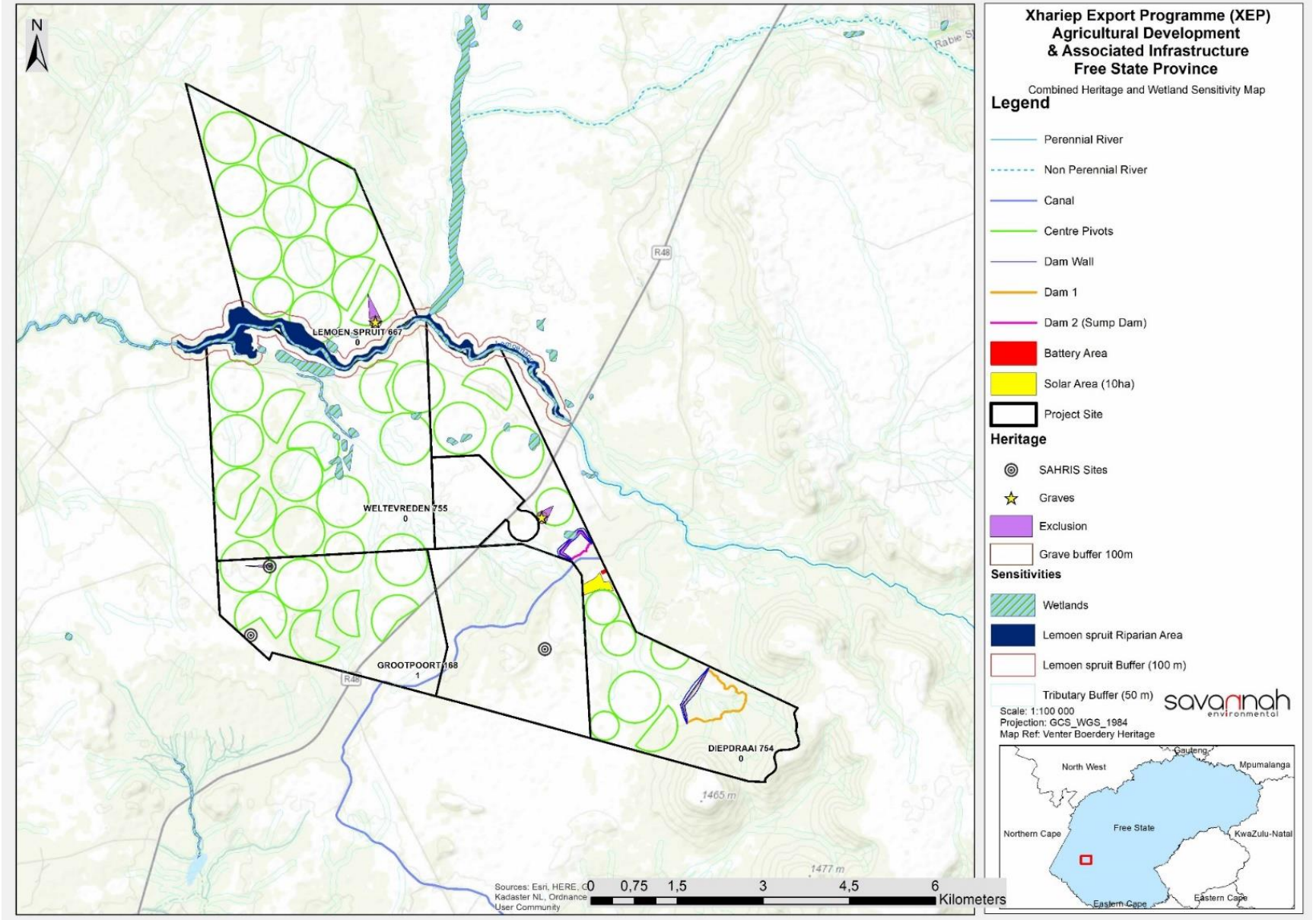


Figure 9.2. Project Layout Map showing the Xhariep Export Programme (XEP) Agricultural Development and associated infrastructure

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Heritage Impact Assessment

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
	HERITAGE SCREENER	Jenna Lavin	**March 2022**	Agricultural and Pivot Expansion near Luckhoff, Free State Province
354852	Heritage Impact Assessment Specialist Report	Johnny Van Schalkwyk		Cultural Heritage Impact Asessment for the proposed Grootpoort Phottovoltaic Solar Energy Development Facility nearr Luckhoff, Letsemeng Local Municipality, Free State Province.
364728	PIA Desktop	John E. Almond	01/06/2016	PALAEONTOLOGICAL IMPACT ASSESSMENT: DESKTOP STUDY PROPOSED GROOTPOORT PHOTOVOLTAIC SOLAR ENERGY FACILITY NEAR LUCKHOFF, FREE STATE PROVINCE
4052	HIA Phase 1	Albert van Jaarsveld	01/03/2006	Hydra-Perseus and Beta-Perseus 765 kV Transmission Power Lines Environmental Impact Assessment. Impact on Cultural Heritage Resources
579389	Letter of Exemption	CTS Heritage	02/08/2021	Desktop Heritage Screening Assessment: Proposed development of the Grootpoort OHL near Luckhoff in the Free State
579390	PIA Desktop	Marion Bamford	29/07/2021	Desktop Palaeontology Assessment: Proposed development of the Grootpoort OHL near Luckhoff in the Free State

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