REPORT

Eskom Komati - Aquatic Biodiversity (riparian and wetland systems) Specialist Assessment - Scoping Report

Eskom Holdings SOC Ltd

Submitted to:

Eskom Holdings SOC Ltd

Submitted by:

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Executive Summary

Eskom Holdings SOC (Ltd) (Eskom) is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for Komati Power Station. Eskom plans to install 100MW of Solar Photovoltaics (PV) and 150MW of Battery Energy Storage System (BESS), for which authorisation at a national level, and financing at the international level, must be sought, supported by an Environmental and Social Impact Assessment (ESIA) that is aligned to the requirements of the World Bank Environmental & Social Framework; World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHSG) both for general and sector; the International Finance Corporation (IFC) Performance Standards; Good International Industry Practices (GIIP) and South African legislation and applicable regulations.

Golder Associates Africa (Pty) (Ltd), now a member of WSP (Golder), was appointed to undertake the necessary aquatic biodiversity baseline specialist studies and impact assessments, in support of the scoping, baseline and impact assessment phases of the environmental regulatory process required to authorise development-related activities.

This report describes the baseline aquatic (riparian and wetland) ecology of areas that will be impacted by the proposed infrastructure developments at Eskom Komati Power Station, and documents the scoping-level assessment of the potential impacts of the proposed Project on aquatic ecosystems and biodiversity, i.e. riparian and wetland ecosystems, and associated species. The report also provides recommended measures for the mitigation of any negative impacts for inclusion in the updated EMPr for the Project, as well as guidance on any additional baseline data gathering needs for the ESIA.

The proposed study area is located within the B11B quaternary sub-catchment of the upper Olifants Water Management Area. An unnamed tributary of the Koringspruit passes immediately north of the study area while a small drainage line runs through the center of the study area, eventually reporting to the Koornfontein River via the Gras Dam, and ultimately draining into the Olifants River. Based on the National Web-based Environmental Screening Tool, the study area is located within an area classified as having a Very High Sensitivity in terms of the Aquatic Biodiversity Theme.

The study area is located within the Eskom Power Station facility and is boarded by a number of land uses such as crop farming, residential setting (both informal and formal) and mining activities. Four Wetland HGM units (Channel valley bottom, two seep wetlands and a depression wetland) were identified and mapped within the study area. These wetlands were considered Largely Modified in terms of their Present Ecological State and are of low/marginal ecological importance. The channeled valley bottom wetland was however assessed as having Moderate importance in terms of its Ecological Importance and Sensitivity as well as having a Moderately high importance in terms of ecosystem services, on account of biodiversity maintenance.

The proposed project is likely to have Medium impact significant on wetland systems, with the exception of one potentially high impact significance associated with the loss of wetland habitat. With the implementation of recommended mitigation measures the potential impacts are expected to be of low significance.

DETAILS OF THE SPECIALIST

Table 1: Details of specialist

Specialist Information	
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Email:	Lufuno.nemakhavhani@wsp.com
SACNASP Registration Number	116461
Curriculum Vitae	See APPENDIX B

Declaration of Independence by Specialist

I, Lufuno Nemakhavhani declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed project.
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have nor will have a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan, or document.

ACRONYMS AND ABBREVIATIONS

Abbreviation	Explanation
AC	Alternating Current
BESS	Battery Energy Storage System
CARA	Conservation if Agricultural Resources Act
CVB	Channel Valley Bottom
DC	Direct Current
DSD	Dead Stop Date
EA	Environmental Authorisation
EHSG	Environmental, Health and Safety Guidelines
EIA	Environmental Impact Assessment
EIS	Ecological Importance Sensitivity
EMPr	Environmental Management Programme
ESIA	Environmental Social Impact Assessment
ESS6	Environmental Social Services 6
FEPA	Freshwater Ecosystem Priority Areas
GIIP	Good International Industry Practices
IFC	International Finance Corporation
LSA	Local Study Area
MBSP	Mpumalanga Biodiversity Sector Plan
MRA	Mining Rights Area
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NFEPA	Freshwater Ecosystem Priority Areas
NG	Net Gain
NNL	No Net Loss
NPAES	National Protected Area Expansion Strategy
NWM5	National Wetland Map 5
PES	Present Ecological State
PoC	Point of Connection
PV	Photovoltaics
SANBI	South African National Biodiversity Institute
WBG	World Bank Group

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1.0 INTRODUCTION AND BACKGROUND

Eskom Holdings SOC (Ltd) (Eskom) is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for Komati Power Station, which is situated in Mpumalanga, about halfway between Middelburg and Bethal (Figure 1).

Eskom plans to install 100MW of Solar Photovoltaics (PV) and 150MW of Battery Energy Storage System (BESS), for which authorisation at a national level, and financing at the international level, must be sought, supported by an Environmental and Social Impact Assessment (ESIA) that is aligned to the requirements of the World Bank Environmental & Social Framework; World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHSG) both for general and sector; the International Finance Corporation (IFC) Performance Standards; Good International Industry Practices (GIIP) and South African legislation and applicable regulations.

Golder Associates Africa (Pty) (Ltd), now a member of WSP (Golder), was appointed to undertake the necessary ecological baseline studies and impact assessments, in support of the scoping, baseline and impact assessment phases of the environmental regulatory process required to authorise development-related activities.

1.1 Purpose of the report

This report describes the baseline aquatic biodiversity (riparian and wetland systems) of areas that will be impacted by the proposed infrastructure developments at Komati Power Station and documents the results of the scoping-level screening of the potential impacts of the proposed Project on riparian and wetland ecosystems and species.

The report also provides a preliminary set of recommended measures for the mitigation of any negative impacts for inclusion in the updated EMPr for the Project, to ensure that the lender objectives of No Net Loss (NNL) of Natural Habitats, and Net Gain (NG) of Critical habitats, as well as South African biodiversity legislation and policy requirements, are satisfactorily met.

2.0 PROJECT LOCATION AND EXTENT

The Komati Power Station is situated about 37 km from Middelburg, 43 km from Bethal and 40 km from Witbank, via Vandyksdrift in the Mpumalanga Province of South Africa (Figure 1).

2.1 Current Operation

The station has a total of nine units, five 100MW units on the east (Units 1 to 5) and four 125 MW units on the west (Units 6 to 9), with a total installed capacity of 1000 MW. Komati Power Station will reach its end-of-life expectancy in September 2022 when Unit 9 will have reached its dead stop date (DSD). Units 1 to 8 have already reached its DSD.

2.2 Proposed Infrastructure and Activities

Eskom is proposing the establishment of a solar electricity generating facility and associated infrastructure as part of its repurposing programme for Komati Power Station. The plan is to install 100MW of Solar Photovoltaics (PV) and 150MW of Battery Energy Storage System (BESS). The parcels of land in Komati for the proposed development are owned by Eskom. The proposed infrastructure that are the subject of the current application process are illustrated in Figure 2.

2.2.1 Project Components

The specifications of the Solar PV and BESS project including aspects of construction and operation are outlined below:

- The total site area for PV installation is approximately 200-250 hectares to allow for the construction of a PV facility with capacity up to 100 MW and BESS up to 150 MW.
- Solar PV modules, up to a total of approximately 720,000 m^2, that convert solar radiation directly into electricity. The solar PV modules will be elevated above the ground and will be mounted on either fixed tilt systems or tracking systems (comprised of galvanised steel and aluminium). The Solar PV modules will be placed in rows in such a way that there is allowance for a perimeter road and security fencing along the boundaries, and O&M access roads in between the PV module rows.
- Inverter stations, each occupying a footprint up to approximately 30 m^2, with up to 100 Inverter stations installed on the identified sites. Each Inverter station will contain an inverter step-up transformer, and switchgear. The Inverter stations will be distributed on the site, located alongside its associated Solar PV module arrays. The Inverter station will perform conversion of DC (direct current) to AC (alternating current), and step-up the LV voltage of the inverter to the appropriate voltage to allow the electricity to be fed into the appropriate substation / grid point of connection (PoC). Inverter stations will connect several arrays of Solar PV modules and will be placed along the internal roads for easy accessibility and maintenance.
- Below ground electrical cables with trenching for connecting PV arrays, Inverter stations, O&M buildings, and Combiner Substations.
- Above ground overhead lines for connecting Combiner Substations to grid PoC.
- Adequately designed foundations and mounting structures that will support the Solar PV modules and Inverter stations.
- Access roads that provide access to the Komati PV sites.
- Perimeter roads around the PV sites.
- Internal roads for access to the Inverter stations.
- Internal roads/paths between the Solar PV module rows, to allow access to the Solar PV modules for operations and maintenance activities.
- Infrastructure required for the operation and maintenance of the Komati PV installations: -
    - Meteorological Station
    - O&M Building – comprising control room, server room, security equipment room, offices, boardroom, kitchen, and ablution facilities (including water supply and sewage infrastructure)
    - Spares Warehouse and Workshop
    - Hazardous Chemical Store – approx. 30 m^2
    - Security Building
    - Parking areas and roads
- Small diameter water supply pipeline from existing supply infrastructure.
- Fire water supply during Construction and Operation.

- Sewage interconnection to existing infrastructure.
- Stormwater channels.
- Perimeter fencing of the Komati PV sites, with access gates.
- Temporary laydown area, occupying a footprint up to approx. 10 hectares. The laydown area will be used during construction and rehabilitated thereafter.
- Temporary concrete batching plant, occupying a footprint up to approx. 1 hectare. The concrete batching plant area will be used during construction and rehabilitated thereafter.
- Temporary site construction office area, occupying a footprint up to approx. 1 hectare. This area will accommodate the offices for construction contractors during construction and rehabilitated thereafter.

2.2.2 Solar PV Construction

It is estimated that approximately 200-300 construction workers will be required on the site. During the construction phase of the project the following activities are anticipated:

- Site Preparation - Vegetation and topsoil will be cleared for the footprint of the infrastructure as well as for the access roads to the solar PV site, internal roads and the laydown yard, etc. The topsoil removed will need to be stored for rehabilitation purposes of the site.
- Transportation of Equipment - All equipment to site will be transported by means of national, provincial and district roads. This includes but is not limited to, transformers, solar PV modules, inverters, excavators, graders, trucks, compacting equipment, construction material, etc.
- Site Establishment Works - The site will have temporary laydown areas and offices for the construction contractors. This will include the contractor's chosen electricity supply infrastructure e.g. use of generators and fuel storage that will be required to conform to acceptable measures to ensure no harm to the environment. The laydown area will also be used for assembling of solar PV modules and structures. A concrete batching plant may also be required as part of the site establishment works.
- Construction of the Solar PV Facility
  - Trenches would need to be excavated for underground cabling to connect Solar PV arrays, Inverter stations, and Combiner Substations.
  - Foundations for the solar PV array mounting structures and Inverter stations may need to be excavated, with the final extent depending on the geotechnical studies that will be conducted. The geotechnical studies will determine the type of foundations that can be utilised at the PV site.
  - Construction of access, perimeter, and internal gravel roads may require material to be imported from outside the site, from a permitted quarry.
- Water consumption during construction phase - The water consumption during the construction phase is estimated as 15,000 kilolitres (total for construction period estimated as 24 months).
- Construction of Electrical Interconnection Line - Construction and installation of overhead electrical interconnection lines, connecting the Solar PV facilities to the grid PoC.
- Storage of diesel and oil for construction activities.
- Once all the construction activities are completed the site will be rehabilitated where possible and practical. All temporal structures and facilities will be removed from site and the area rehabilitated.

- Solar glare reflection – proximity to air strip.
- End of life waste management for both solar panels and batteries.

2.2.3 Solar PV Operation

The solar PV plant has a minimum design life of 25 years.

- During the life of the Solar PV facility, there will be normal maintenance of all electrical and mechanical components of the plant.
- In addition, there will be periodic cleaning and washing of the solar PV modules. This PV module cleaning will be performed when required, and it is estimated to occur 2-4 times a year.
- The water consumption during operation - estimated water required per year during operation is 10,000 kilolitres (total per year for design life of plant).

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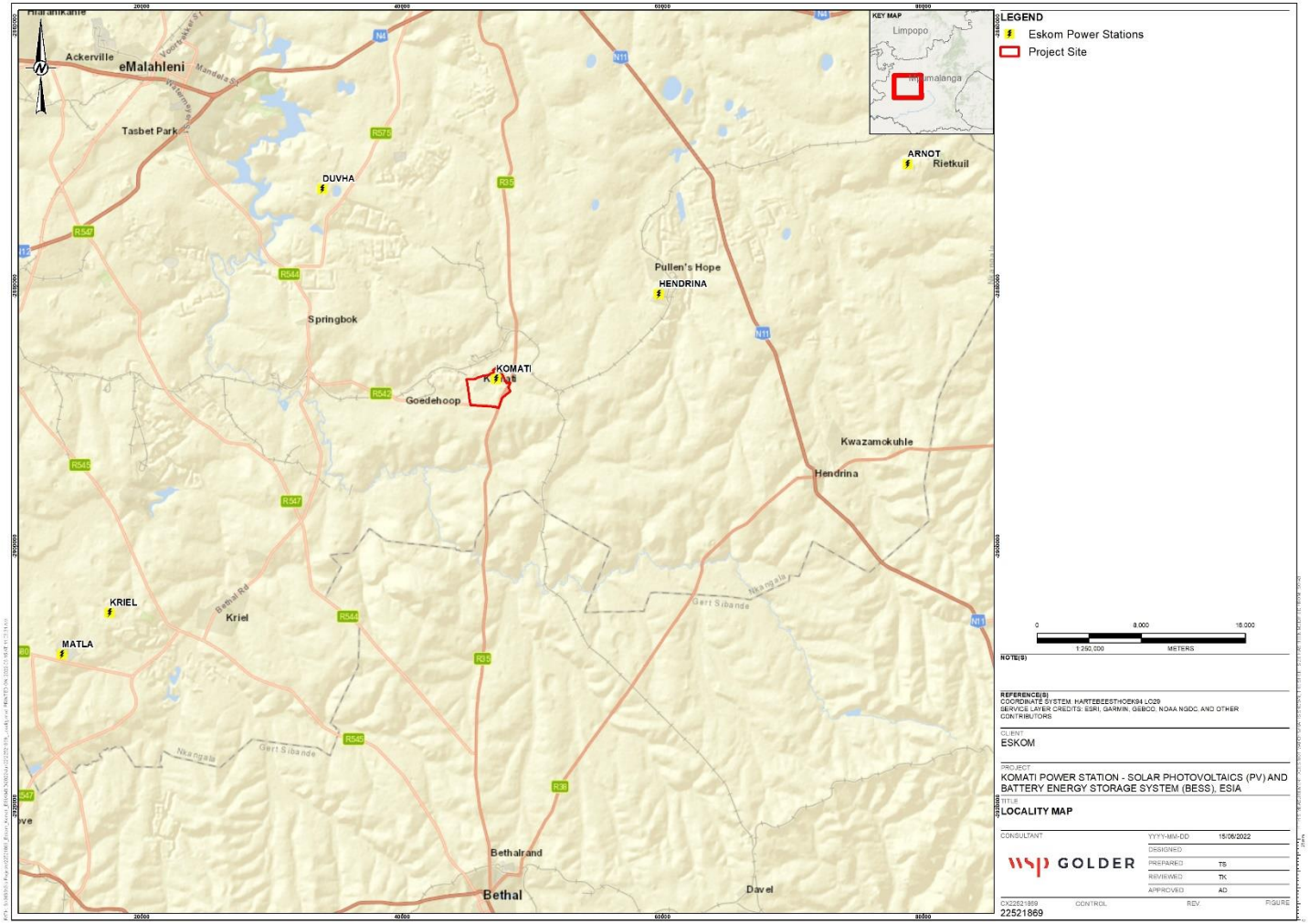

Figure 1: Locality Map- Eskom Komati Power Station

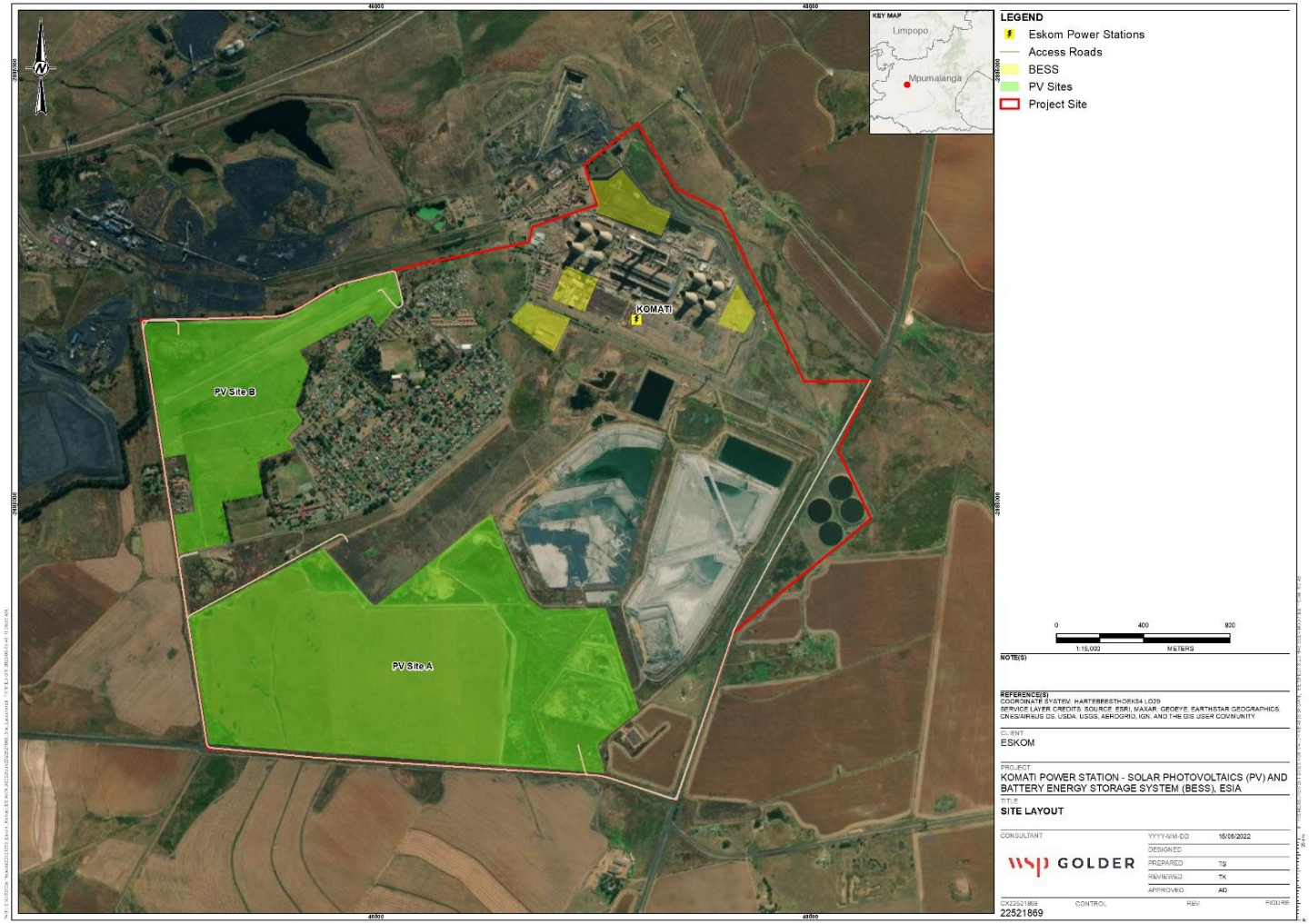

Figure 2: Proposed infrastructure overview

3.0 APPLICABLE LEGISLATION, POLICY AND STANDARDS

The ESIA must be aligned to the requirements of the World Bank Environmental & Social Framework; World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHSG) both for general and sector; the International Finance Corporation (IFC) Performance Standards; and Good International Industry Practices (GIIP) and South African legislation and applicable regulations.

Biodiversity-related South African legislation and policy, and international lender standard requirements that were used to guide this scoping assessment are summarized as follows.

3.1 South African Legislation and Policy

Applicable national and provincial legislation, associated regulations and policies that are pertinent to wetlands, which were used to guide the EIA, include:

- National Environmental Management Act (NEMA) (Act No. 107 of 1998) including Section 24, concerning Procedures for the assessment and minimum criteria for reporting on identified themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA, when applying for environmental authorisation;
    - Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity;
- National Water Act (Act No. 36 of 1998);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998);
- Mpumalanga Biodiversity Sector Plan (Lötter, 2015).
- National Protected Area Expansion Strategy (2016).

3.2 Lender requirements

The ESIA must be aligned to the requirements of the World Bank Environmental & Social Framework; World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHSG) both for general and sector; the International Finance Corporation (IFC) Performance Standards; and Good International Industry Practices (GIIP) and South African legislation and applicable regulations.

Biodiversity-related South African legislation and policy, and international lender standard requirements that were used to guide this scoping assessment are summarised as follows.

3.2.1 World Bank Environmental and Social Standard 6

The World Bank's (WB) Environmental and Social Standard 6 (ESS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources (World Bank, 2016) separates habitat into four categories for the purposes of implementing a differentiated risk management approach to habitats based on their sensitivity and values. The categories include 'Modified habitat', 'Natural habitat', 'Critical Habitat' and 'Legally protected and internationally and regionally recognized areas of biodiversity value'; each of which have varying levels of Borrower obligation in terms of biodiversity mitigation and management, and offset requirements.

Whilst the assessment of Modified and Natural habitats is largely based on the establishment of the ecological condition of mapped habitat/vegetation units, and the boundaries of legally protected and/or internationally recognised areas of high biodiversity value are generally defined; the identification and assessment of Critical Habitat requires additional, focussed effort – usually focussed on the presence of Critically Endangered, Endangered, range-restricted or migratory/congregatory species in significant numbers.

3.2.2 International Finance Corporation's Performance Standard 6

- The IFC's Performance Standard 6 also sets specific biodiversity protection and conservation standards relating to potential project impact; that are largely aligned with the ESS6 requirements. The specific requirements are separated according to the following categories:
- Modified Habitat: areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. PS6 relates to areas of modified habitat that have significant biodiversity value and requires that impacts on such biodiversity must be minimised, and mitigation measures implemented as appropriate.
- Natural Habitat: viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. In such areas, the conservation outcome required by PS6 is no-net-loss of biodiversity value achieved using the "like-for-like" or better principle of biodiversity offsets, where feasible.
- Critical Habitat: areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. When a project occurs in critical habitat supporting exceptional biodiversity value, a net gain in biodiversity value is required by PS6. This is achievable through appropriate biodiversity offsets.
- Legally Protected and Internationally Recognised Areas: such areas often have high biodiversity value; when this is the case these areas are likely to qualify as critical habitat. As such, the conservation outcome required by PS6 is also a net gain in biodiversity value, as well as obtaining the relevant legal permits, following standard governmental regulatory procedures, and engagement of affected communities and other stakeholders.
- Invasive Alien Species: the development project should not intentionally introduce any new alien species (unless carried out within the appropriate regulatory permits) and should not deliberate any alien species with a high risk of invasive behaviour under any circumstance. PS6 requires that any introduction of alien species be the subject of a risk assessment for potential invasive behaviour, and that the project should implement measures to avoid the potential for accidental or unintended introductions

3.3 Good International Industry Practices (GIIP)

Best practice guidelines that were taken into consideration in the development of the scoping report are listed below. These guidelines are generally accepted as the best practice standards for usage in wetland and riparian habitat assessment in South Africa:

- A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas", DWAF (2005) and updated by DWAF (2008),
- WET-Health Version 2.0: A refined suite of tools for assessing the present ecological state of wetland ecosystems- technical guide. Report No. TT 820/20 (Macfarlane, *et al*., 2008)
- WET-EcoServices Version 2.0: A technique for rapidly assessing ecosystem services supplied by wetlands and riparian areas. WRC Report No. TT 833/20. Water Research Commission, Pretoria, South Africa (Kotze, D., Macfarlane *et al*., 2020)

- Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0). WRC Report No. 1788/1/13. Water Research Commission, Pretoria (Rountree *et al*., 2013).

4.0 METHODOLOGY

The aquatic biodiversity baseline description and preliminary impact assessment took cognisance of Government Notice No. 320, published in 2020 under the National Environmental Management Act (1998) concerning 'Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Theme in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (1998), when applying for Environmental Authorisation'.

In line with the assessment and reporting requirements set out in the protocol, the aquatic ecology assessment included two main study components; a desktop literature review, supplemented by a wetland delineation and assessment field survey conducted on the 31st of May and the 01st of June 2022. The objectives and tasks associated with these components are described below.

4.1 Study Area

The study area for the Aquatic Specialist Assessment was defined at two levels:

- Local study area: The proposed development footprint plus a 500 m buffer, so that the project interaction with any watercourses and their 'regulated zone' as defined by the National Water Act can be identified, since this is the area within which direct impacts on biodiversity receptors (i.e. wetlands / aquatic ecosystems) could occur (Figure 3);
- Regional study area: The catchment within which the proposed development is situated, which is considered to be an ecologically appropriate area of analysis within which indirect impacts on aquatic receptors (e.g. downstream water quality deterioration, alteration of sub-catchment hydrology, soil erosion, hydrological changes) could occur (Figure 4).

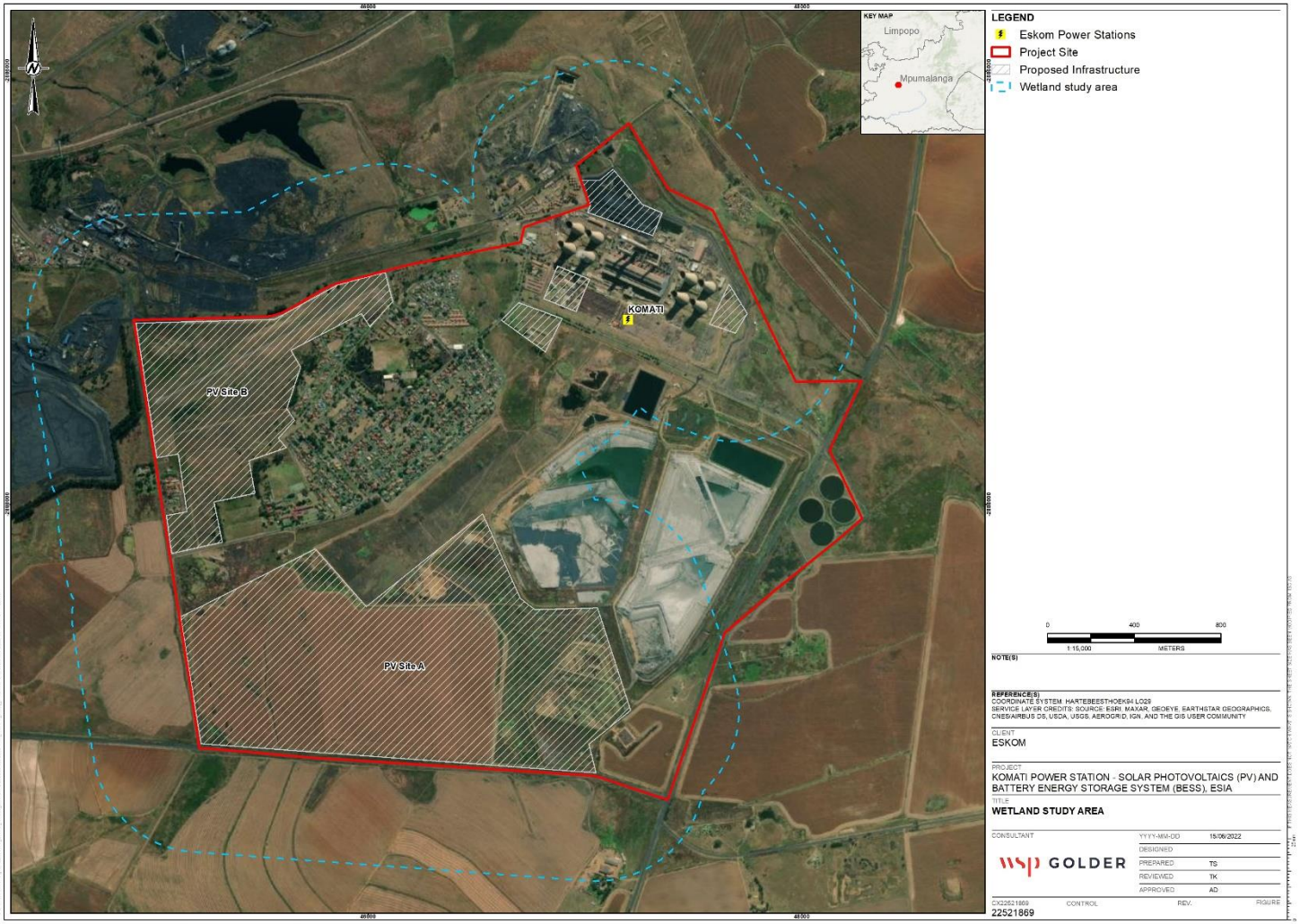

Figure 3: Aquatic biodiversity local study area

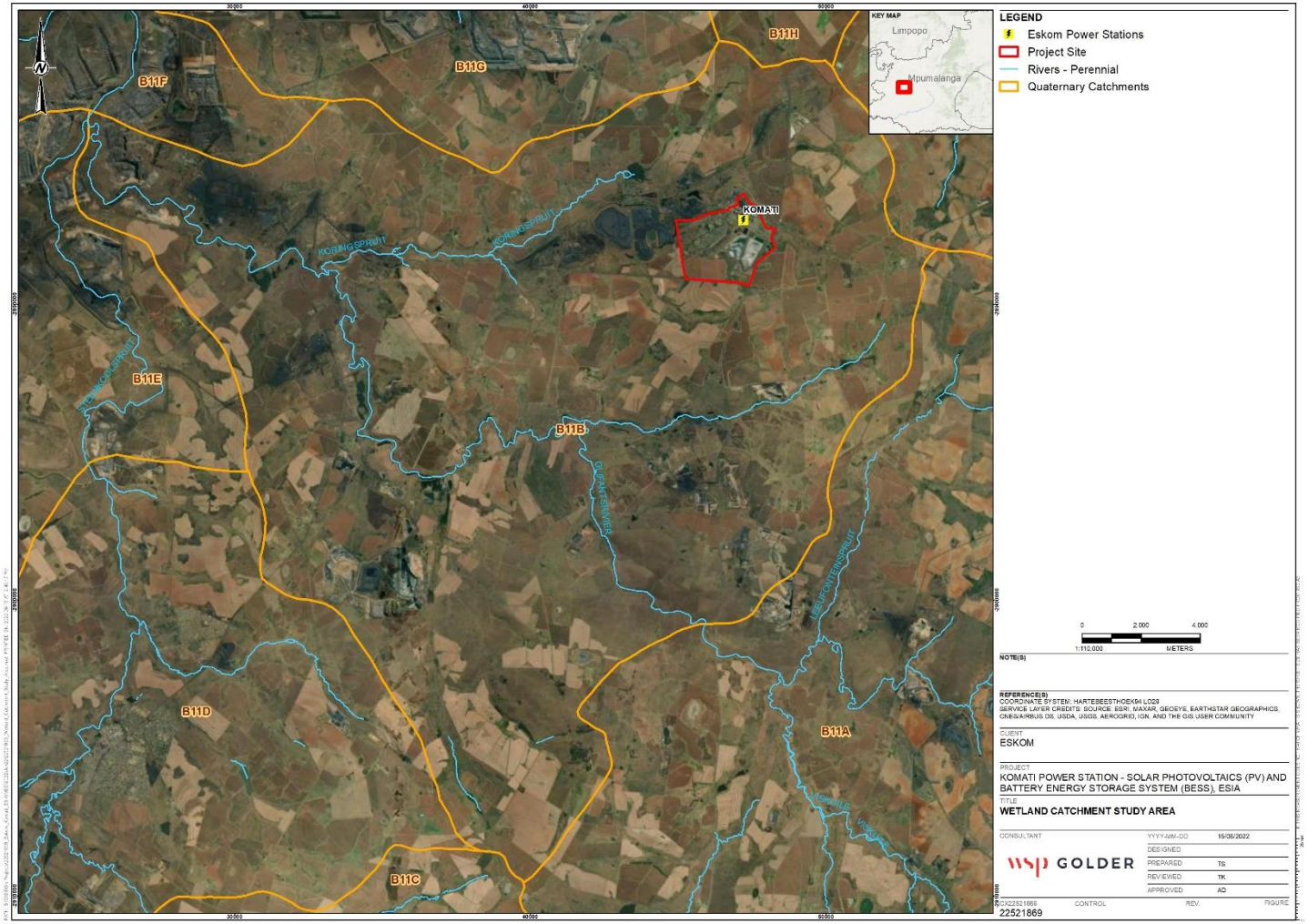

Figure 4: Aquatic biodiversity regional study area as defined by the quaternary catchment B11B

4.2 Literature Review

The aim of the desktop literature review component was to collate and review the extensive available ecological information related to important aquatic biodiversity features in the Eskom Komati power station area of influence, key wetland processes and function, and the likely composition and structure of local riparian and wetland communities.

The existing comprehensive specialist reports that were reviewed and consolidated to assess aquatic biodiversity include:

1) Komati Power Station Hydrological & Geohydrological Baseline Study December 2008 (GHT Consulting Services, 2009)

2) Construction and Operation of Ash Dam Extension 3 & The Deviation Of Transmission And Distribution Lines At Komati Power Station, Mpumalanga (Synergistics Environmental Services 2008).

Other sources that were also used in the description of the regional aquatic resources included:

1) Nationally-available datasets which were consulted to inform the site sensitivity verification for wetland and riparian habitat include the South African National Wetland Map version 5 (NWM5) (Van Deventer *et al.*, 2019), and the National Freshwater Ecosystem Priority Area database; and

2) The formal conservation context of the region at a provincial and national level was established based on the Mpumalanga Biodiversity Sector Plan (2019), the National List of Threatened Ecosystems (NEMBA Threatened Ecosystems, 2011), the South African Protected Areas Database (SAPAD), the South African Conservation Areas Database (SACAD) and the national protected area expansion strategy;

3) National spatial planning datasets, namely the Mpumalanga Biodiversity Sector Plan (freshwater), National Freshwater Ecological Priority Areas (NFEPA), National Wetland Map version 5 (NWM5), National Environmental Management Biodiversity Act (Act No 10 of 2004)) (NEMBA), Threatened Ecosystems, and national protected area expansion strategy, provide a regional/national context for assessing the biodiversity significance of the site.

4.3 Wetland Baseline Assessment

A field survey to identify and delineate the wetlands within 500 m of the proposed Project infrastructure footprint was conducted on 31 May and 01 June 2022. The methods used in the identification, delineation, classification and assessment of wetlands in the study area are described in the sections that follow.

4.3.1 Wetland Delineation

The delineation procedure originally set out in “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”, DWAF (2005) and updated by DWAF (2008), describes the following four indicators of wetland presence that can be used to define the boundary of a wetland:

1) The position in the landscape, which helps identify those parts of the landscape where wetlands are more likely to occur;

2) The type of soil form (i.e. the type of soil according to a standard soil classification system), since wetlands are associated with certain soil types;

3) The presence of wetland vegetation species, and

4) The presence of redoxymorphic soil features, which are morphological signatures that appear in soils with prolonged periods of saturation (due to the anaerobic conditions which result).

These indicators were used in the field to delineate the outer boundary of wetland systems encountered within the study area.

4.3.2 Wetland Classification

To allow for the differentiation between wetland systems and the prioritisation of systems either for conservation or management purposes, the wetlands were classified in accordance with each hydrogeomorphic (HGM) unit for assessment purposes according to (Kotze et al., 2008). Six major inland HGM types are recognised for the purposes of wetland classification (Table 2), and these criteria were applied to the current assessment.

Table 2: Wetland Hydrogeomorphic Units (after Kotze *et al*., 2008)

Wetland Hydro-geomorphic type	Description	Source of water maintaining the wetland1	
		Surface	Sub-surface
Floodplain	Valley bottom areas with a well-defined stream channel, gently sloped and characterised by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Channelled valley bottom	Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterised by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/***
Unchannelled valley bottom	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterised by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/***
Hillslope seepage with channelled outflow	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.	*	***
Hillslope seepage without channelled outflow	Slopes on hillsides, which are characterized by the colluvial movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes pans)	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/***	*/***

1 Precipitation is an important water source and evapotranspiration an important output in all of the above settings.
*Water source: * Contribution usually small; *** Contribution usually large; **** Contribution may be small or important depending on the local circumstances*

4.3.3 Present Ecological State (PES)

WET-Health (Macfarlane *et al*., 2020) provides an appropriate framework for undertaking an assessment to indicate the ecological integrity of each of the wetland systems being assessed. The outcome of the assessment also highlights specific impacts, therefore highlighting issues that should be addressed through mitigation and rehabilitation interventions. A level 2 Wet-Health approach was applied for this study, which assesses wetlands using four characteristics, namely hydrology, geomorphology, vegetation and water quality. Each of these modules follows a broadly similar approach and is used to evaluate the extent to which anthropogenic changes have an impact on wetland functioning or condition.

The purpose of WET-Health is to aid users in understanding the ecological condition of the wetland and to identify the causes of degradation. The four drivers are assessed by taking into account the extent, intensity and magnitude of an impact which then produces a health score. Evaluation scores within each driver are then combined to produce an overall impact of activities on the wetland system which corresponds to a Present State health category that provides an impact score scale of 0-10 and associated health category (ecological state) from A-F (Table 3).

Table 3: Impact scores and categories of Present Ecological State used by WET-Health for describing the integrity of wetlands (Macfarlane *et al.*, 2020)

Impact Category	Description	Impact Score Range	Present Ecological State Category
None	Unmodified, or approximates natural condition	0 – 0.9	A
Small	Largely natural with few modifications, but with some loss of natural habitats	1 – 1.9	B
Moderate	Moderately modified, but with some loss of natural habitats	2 – 3.9	C
Large	Largely modified. A large loss of natural habitat and basic ecosystem function has occurred	4 – 5.9	D
Serious	Seriously modified. The losses of natural habitat and ecosystem functions are extensive	6 – 7.9	E
Critical	Critically modified. Modification has reached a critical level and the system has been modified completely with almost complete loss of natural habitat	8 – 10.0	F

4.3.4 Wetland Ecosystem Services

Wetlands are specialised systems that perform ecological functions vital for human welfare and environmental sustainability. The WET – Ecoservices tool (Kotze *et al*., 2020), a technique for rapidly assessing ecosystem services supplied by wetlands, was used to determine the key ecological services provided by each wetland in the study area. The rapid field assessment (version 2) approach was applied, and the following services were examined and rated:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Toxicant assimilation;
- Carbon storage;
- Biodiversity maintenance;
- Food for livestock;
- Cultivated foods;
- Tourism and recreation;

- Erosion control;
- Phosphate assimilation;
- Nitrate assimilation;
- Water supply for human use;
- Harvestable resources;
- Education and research; and
- Cultural & spiritual significance.

Each of the above-listed services was scored according to the following general level of service provided.

Table 4: Ecosystem services classes and descriptions (Kotze *et al*., 2020).

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

4.3.5 Ecological Importance and Sensitivity

The EIS was determined using the methodology developed by Rountree *et al.* (2013). It is a rapid scoring system to evaluate:

- Ecological Importance and Sensitivity;
- Hydrological Functions; and
- Direct Human Benefits.

The scoring assessment incorporates:

- EIS score derived using aspects of the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999);
- Hydro-function importance score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze *et al.* (2020); and
- Direct human benefits score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze *et al.* (2020).

The highest score of the three derived scores (each with range 0 – 4) was then used to indicate the overall importance category of the wetland (Table 5).

Table 5: Ecological importance and sensitivity categories

Ecological Importance and Sensitivity Category Description	Range of EIS score
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers	> 3 and ≤ 4
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	> 2 and ≤ 3
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers	> 1 and ≤ 2
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	> 0 and ≤ 1

4.4 Scoping Level Screening of Impacts and Mitigation

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase (Table 6). The screening tool is based on two criteria; namely probability (Table 7) and consequence (Table 8), where the latter is based on general consideration to the intensity, extent, and duration.

Table 6: Significance screening tool

	CONSEQUENCE SCALE				
PROBABILITY SCALE		1	2	3	4
	1	Very Low	Very Low	Low	Medium
	2	Very Low	Low	Medium	Medium
	3	Low	Medium	Medium	High
	4	Medium	Medium	High	High

Table 7: Probability scores and descriptors

SCORE	DESCRIPTOR
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur

1	**Improbable:** The possibility of the impact occurring is very low

Table 8: Consequence score descriptions

SCORE	NEGATIVE	POSITIVE
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e. beneficial) or negative (-ve) (i.e. harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (Table 9) has been applied according to the nature and significance of the identified impacts.

Table 9: Impact Significance Colour Reference System to Indicate the Nature of the Impact

Negative Impacts (-ve)	Positive Impacts (+ve)
Negligible	**Negligible**
Very Low	**Very Low**
Low	**Low**
Medium	**Medium**

Negative Impacts (-ve)	Positive Impacts (+ve)
High	High

4.5 Study Assumptions and Limitations

4.5.1 Data used for Specialist Assessments

- The field survey for the aquatic biodiversity assessment was conducted on 31 May – 01 June 2022, which coincides with the dry season period; however, following a summer of exceptional rainfall, flows in the channelled valley bottom wetland remained high, and dominant wetland vegetation was discernible.
- This scoping report was prepared on the basis of the site sensitivity verification process undertaken in response to the national web-based screening report. The site sensitivity verification was completed via desktop analysis of the existing baseline knowledge of riparian or wetlands systems in the study area, supplemented by the findings of the field survey conducted on 31 May – 01 June 2022.
- It is therefore considered that there are no sampling or information limitations pertaining to riparian or wetlands systems impacting on this assessment and the recommendations contained in this report.

4.5.2 Assumptions, uncertainties, or gaps in knowledge

- The results of the analysis of the diatom samples gathered on 31 May – 01 June 2022 were not yet available at the time of writing; these will be included in the updated baseline report at ESIA stage.
- Since the watercourses in the study area are wetland systems, no assessment of macroinvertebrates or fish is included in the baseline description.

5.0 BASELINE DESCRIPTION

This section summarises the baseline biodiversity environment of the local and regional study areas. It draws upon existing studies, published information, local knowledge and scoping site visits.

5.1 Regional Biodiversity Context

The study area is located within the B11B quaternary sub-catchment of the upper Olifants Water Management Area (WMA) (Figure 4). An unnamed tributary of the Koringspruit passes immediately to the north of the study area, while a small drainage line runs through the centre of the study area, eventually reporting to the Koornfontein River via the Gras Dam, and ultimately draining into the Olifants River (Synergistics Environmental Services, 2008).

5.1.1 Environmental Screening Tool

The proposed infrastructure footprint was assessed at desktop level using the National Web-based Environmental Screening Tool. According to the Tool, the Aquatic Biodiversity Theme for the study area is rated 'Very High Sensitivity' due to the presence of wetlands features in and around the study area (Figure 5). Since the watercourses in the study area are wetland systems, no assessment of macroinvertebrates or fish is included in the baseline description.

5.1.2 Freshwater Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

The proposed development site was compared to available relevant spatial biodiversity planning datasets in order to assess the local and regional biodiversity context of the site. The following datasets were considered:

1) Mpumalanga Biodiversity Sector Plan Freshwater Assessment (2011).

The MBSP (2011) freshwater assessment spatial dataset includes various areas mapped as ‘other natural areas’ throughout the local study area (Figure 6), as well as part of the channelled valley bottom wetland associated with the Koringspruit which was classified as ‘Ecological Sensitivity Area (ESA): wetland’.

It is important to note that the MPSBP freshwater assessment was based largely on remotely sensed imagery, and thus some wetlands are not included (e.g. historic wetlands lost through drainage or ploughing); similarly, some features have been mapped as wetlands, which, once examined in the field, are not defined as wetlands. The most up-to-date spatial dataset at the national level is now considered to be the National Wetland Map 5 (see Figure 9), which displays a more accurate representation of actual wetland conditions on site.

5.1.3 Strategic Water Source Areas (SWSAs)

No strategic water source areas occur in the region of the proposed development footprint; as such these are not included as receptors for the current scoping impact assessment or considered further here.

5.1.4 Freshwater Ecosystem Priority Area (FEPA) sub-catchments

The proposed development footprint in relation to FEPA sub-catchments and mapped National Freshwater Ecosystem Priority Areas (NFEPA) wetlands is illustrated on Figure 7 and Figure 8 respectively. As mentioned above, the National Wetland Map version 5 (NWM5) (Van Deventer *et al.*, 2019), is the most up-to-date and accurate representation of spatial extent and type of inland wetland ecosystem types at desktop level in South Africa. The NWM5 dataset indicates the presence of channelled valley bottom and seep wetland habitat within the LSA (Figure 9); these systems were prioritised for confirmation of delineation, and assessment of wetland health and ecological importance, during the wetland field survey.

Figure 5: Map of relative Aquatic Biodiversity Theme Sensitivity (Environmental Screening Tool, 2022)

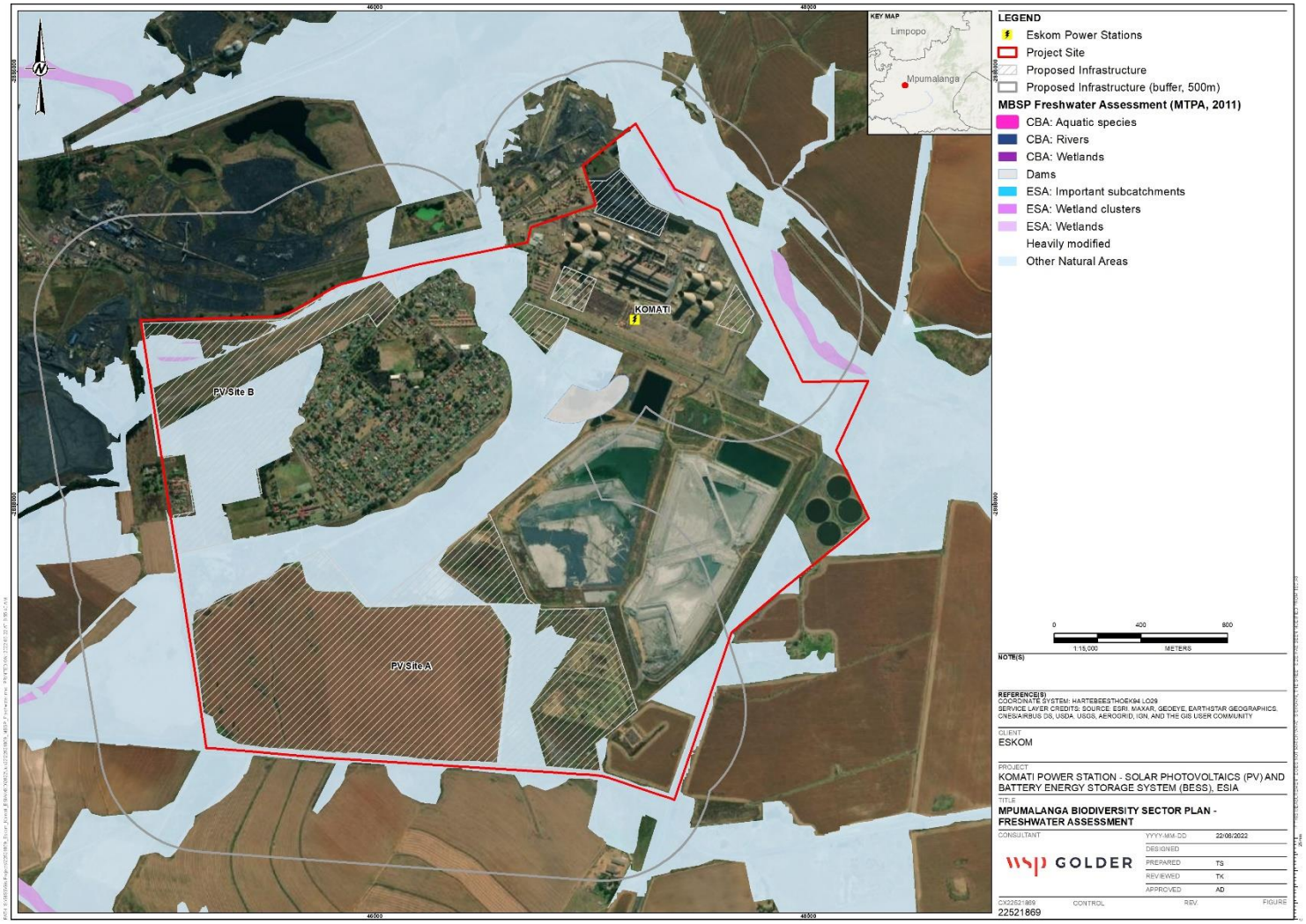

Figure 6: MBSP Freshwater Assessment (MTPA, 2011)

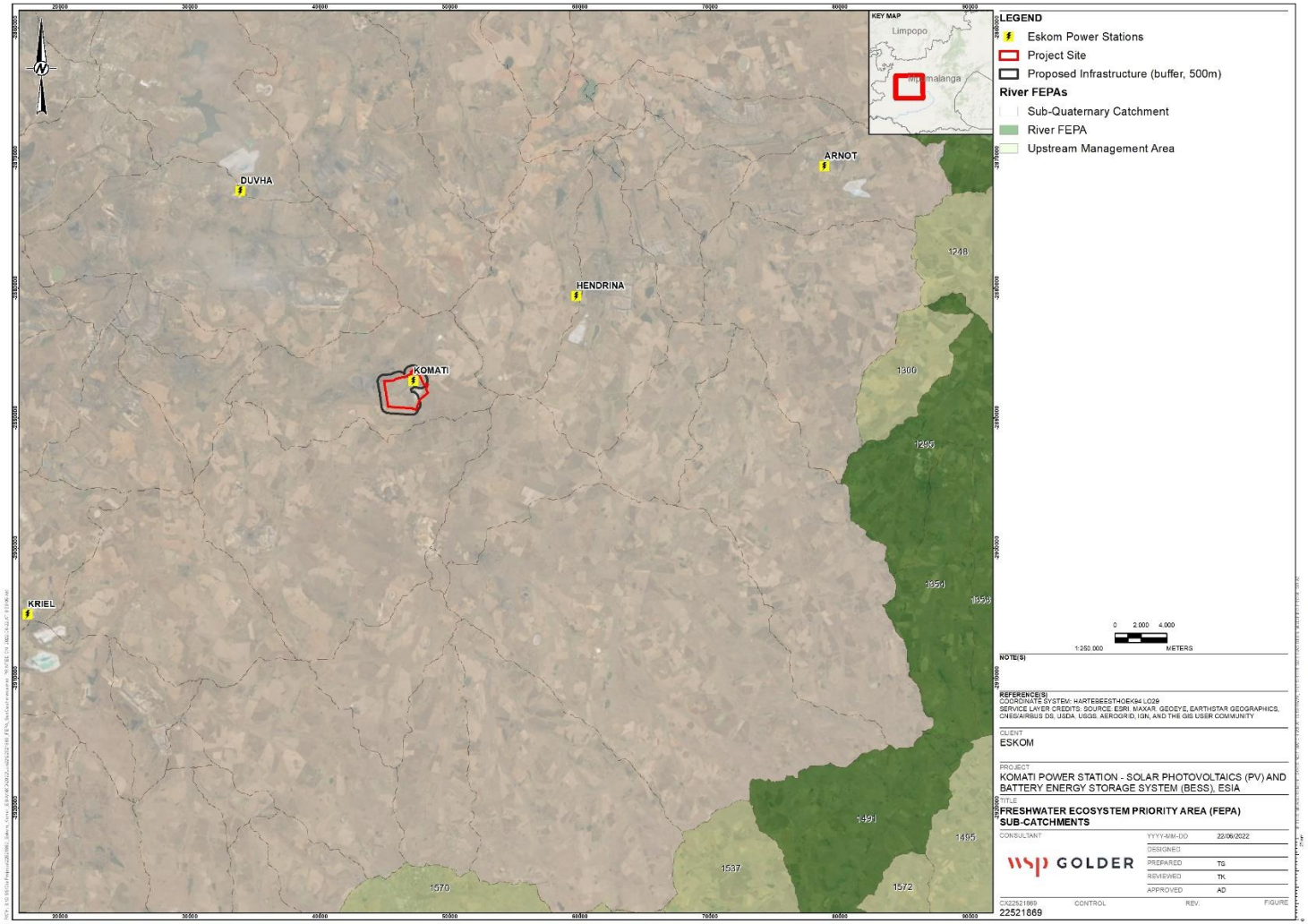

Figure 7: Study area in relation to FEPA sub-catchments

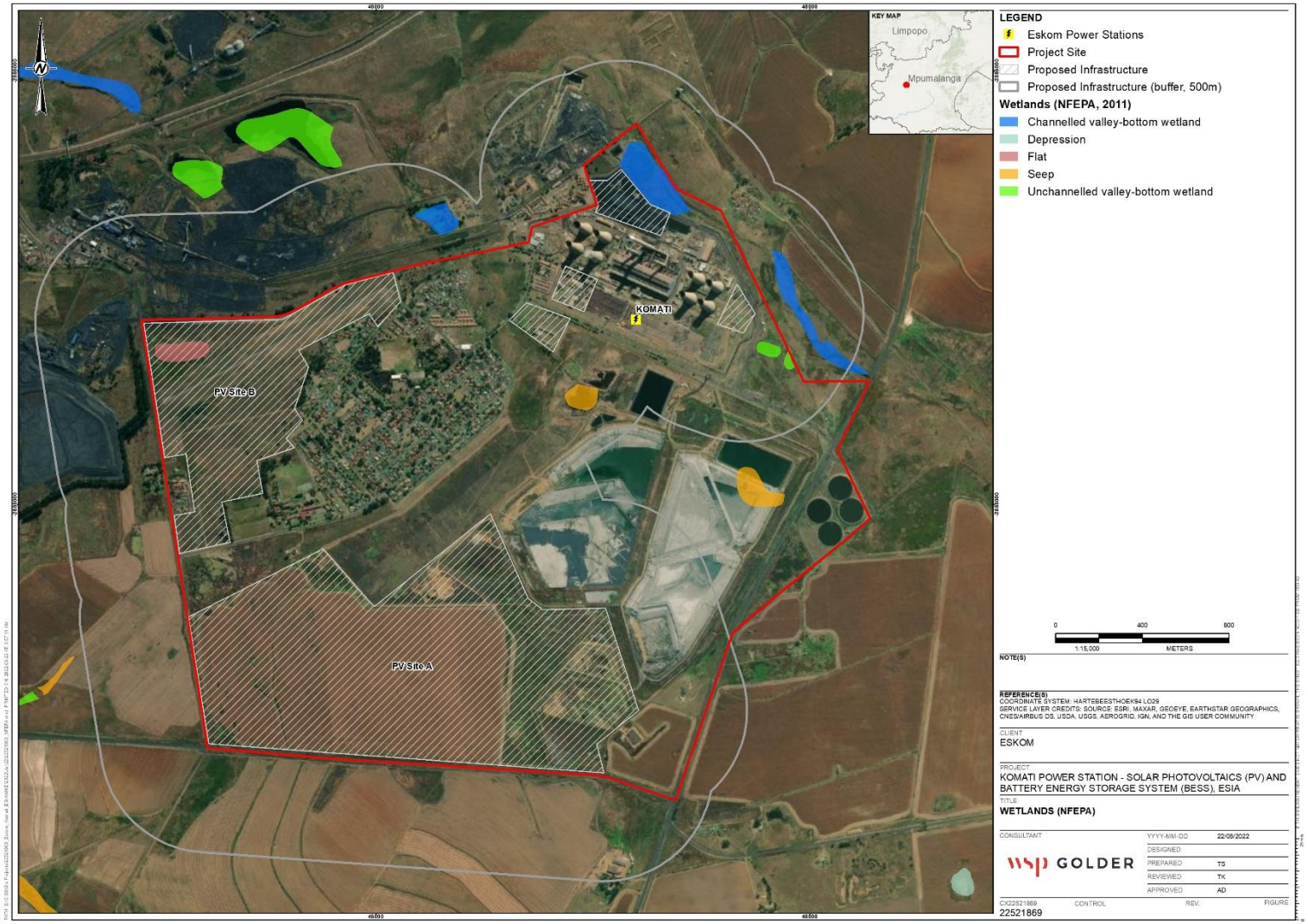

Figure 8: Proposed development in relation to NFEPA wetlands (2011)

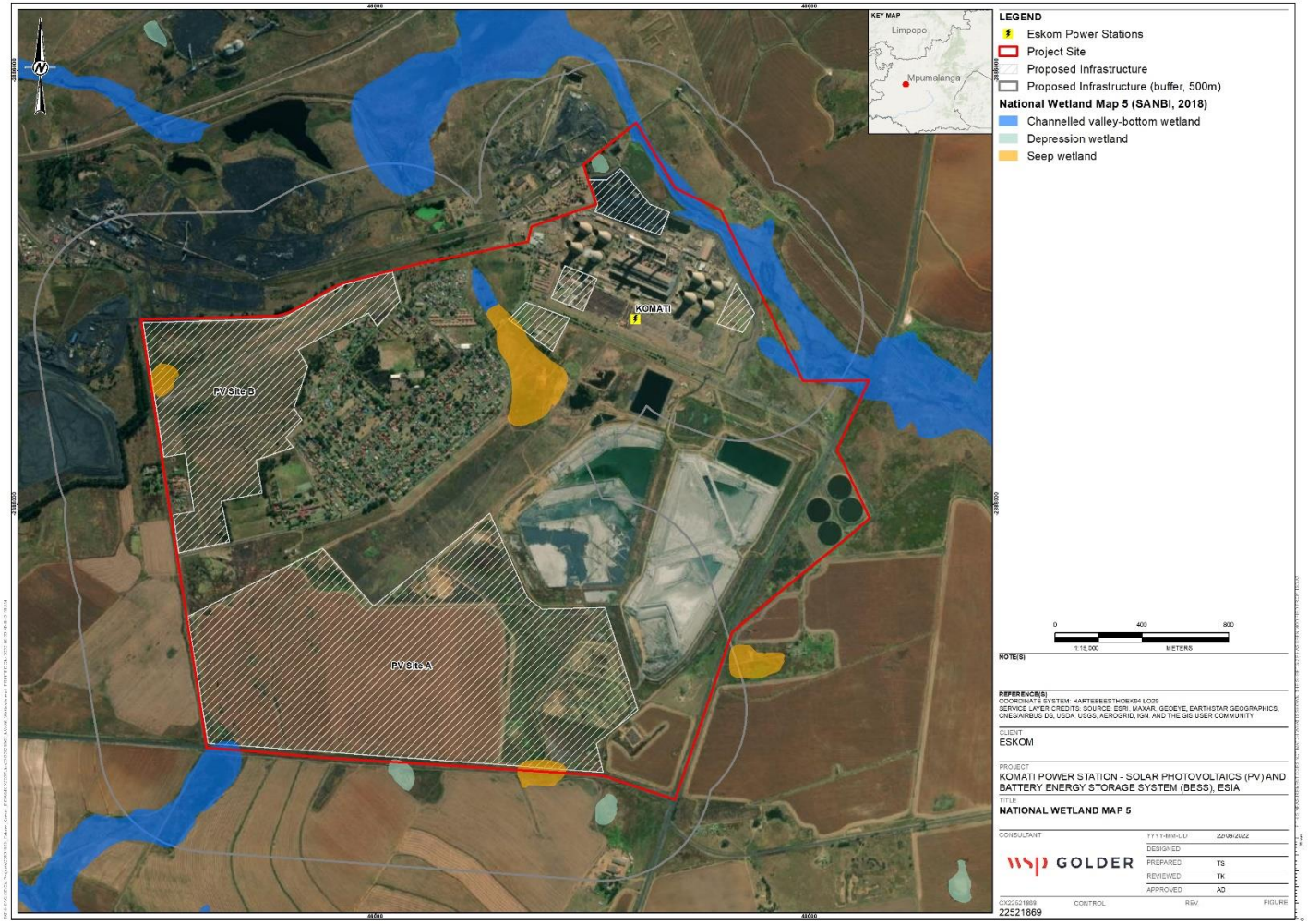

Figure 9: Proposed development in relation to NWM5 wetlands (2019)

5.2 Wetlands

5.2.1 Delineation and classification

Four wetlands have been identified to occur within a 500m of the proposed Project development (Figure 15). The infield sampling of soil and vegetation in conjunction with the recording of diagnostic topographical /terrain indicators and features, enabled the delineation of the following distinct watercourse units:

- A Channelled valley bottom wetland (CVB),
- Two isolated seepage wetlands (Seep 1 and Seep 2), and
- Depression wetland

Several areas of highly disturbed grassland were also identified within the study area. Excavations and earthworks in these areas have resulted in high levels of disturbance of the soil profile, with some ephemeral accumulation of water during periods of high rainfall enabling *Imperata cyclindrica* (which although it occurs in wetlands, is not a reliable wetland indicator, since it can proliferate in disturbed terrestrial areas with high rainfall) to proliferate; however water is not retained in these disturbed soils for long enough to sustain hydrophytic plant species, or soil form indicators to develop, These areas were therefore not classified as wetland habitat

5.2.1.1 Channelled Valley Bottom wetland

A channelled valley bottom wetland associated with the Koringspruit occurs within the study area (Figure 10 and Figure 15). Channelled valley bottoms wetlands (CVB) are characterised by having a well-defined stream channel but lacking characteristic floodplain features, which was the case for the CVB wetland on site. These systems receive water inputs from the main channel and from adjacent slopes (Kotze *et al*., 2008). The CVB wetland was dominated by permanent and seasonal wetland plant species including *Typha capensis, Phragmites australis, Schoenoplectus paludicola,* and *Cyperus latifolius* as well as hygrophilous grassland community such as *Eragrostis rotife*r. The wetland was also characterised by temporary and seasonal hydromorphic soil characteristics (Figure 11), indicating brown wetland soils.

The wetland is highly impacted and appears to receive effluent discharge from the Power Station. The wetland channel shows signs of extensive flows during large storm events and also lateral inputs from surrounding land uses. The CVB is situated adjacent to the proposed Battery Energy Storage System (BESS) footprint.

Figure 10: An overview of the Channelled valley Bottom wetland (upstream and downstream)

Figure 11: Soil Sample taken at 50-60 cm in the seasonal zone of the wetland

5.2.1.2 Seep 1

A seep wetland of approximately 24.5 ha traverses the eastern extent of the proposed PV site A footprint. The wetland is bordered by the Ash dam facility towards the north-east and crop fields to the south-west (Figure 15). The hydrology of the seep wetland is largely impacted by flow input from surrounding activities, particularly the seepage from the Ash dam, as evidenced by the soil sample taken at the permanent zone of the wetland (Figure 12). Furthermore, a dam which has been excavated in the wetland HGM, which has resulted in impounding and pooling of water in the wetland (Figure 12). Dominant wetland vegetation at this site includes *Typha capensis, Phragmites australis* which dominated the permanent wet area and *Imperata cylindrica,* which dominated much of the seasonal zone.

Figure 12: a) An overview of Seep 1 wetland and pooling of water at dam, b) Soil sample taken in the permanent zone of the seep wetland indicating signs of soil contamination from the ash dam

5.2.1.3 Seep 2

A second seep wetland of approximately 20 ha in extent was identified in the northern extent of the study area (Figure 15). This wetland is located downslope of Eskom's pollution control dams and is bordered by the Komati village to the west. The wetland is dominated by seasonal to permanent hydromorphic soil characteristics (Figure 14), with sedges and obligate wetland vegetation including *Typha capensis, Phragmites australis and Cyperus latifolius* occurring in the permanent zone, and *I. cylindrica* occurring in temporary-seasonally wet areas. Evidence of significant levels of disturbance in the form of small drains and berms diverting the water from the Eskom property into the receiving environment was observed in the seep.

Figure 13: An overview of the seep wetland: upstream and downstream view

Figure 14: Soil sample taken at the permanent zone of the wetland

5.2.1.4 Depression

A shallow depression wetland is located within a crop field in the southern extent of the study area, outside of the Project site boundary. The wetland is approximately 3 ha in extent and is cut off from the Project site by the tarred R542 (Figure 15). The wetland appears to be geomorphologically intact (other than loss likely sustained to the R542 construction) and driven entirely by rainfall accumulation. The wetland considered to be ephemeral in nature.

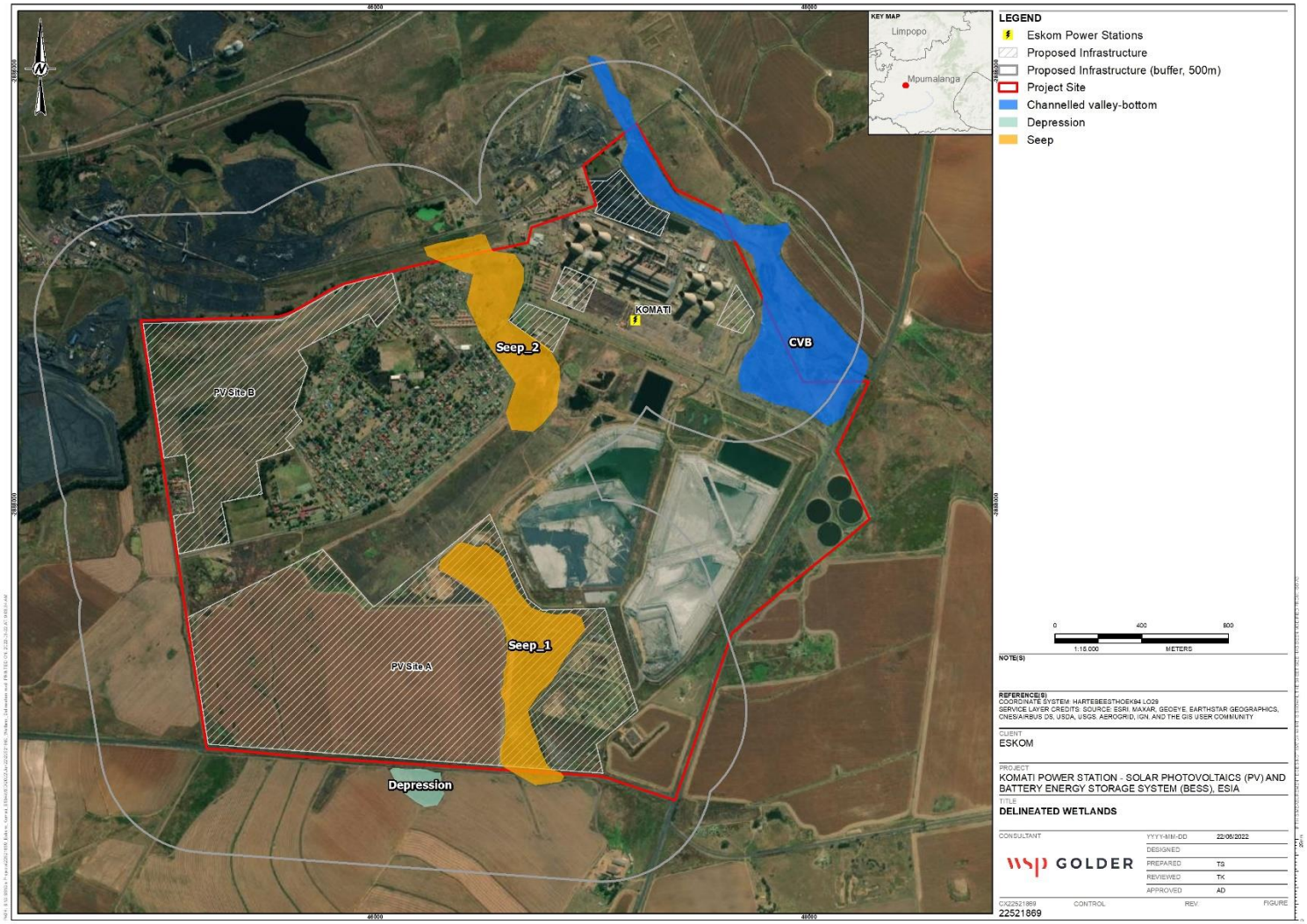

Figure 15: Wetland delineation and classification

5.2.2 Present Ecological State

The most significant drivers of change currently present in the study area include industrial operations (seepage from ash dam, increased water inflow from Eskom operations) impoundment of water at dams, road crossings, mining operations in the catchments, spread of alien invasive species as well formal and informal settlements within the wetland's catchment. The Present Ecological State (PES) score for the wetlands in the study area are presented in Table 10, and discussed in greater detail in the paragraphs that follow.

Table 10: Summary of Impact Scores and PES Class

Unit	Hydrology Impact Rating	Geomorphology Impact Rating	Water Quality Impact Score	Vegetation Impact Score	Overall PES Score & Class	
CVB	4.8	3.8	6.0	4.0	4.6	D
Seep 1	5.0	3.9	6.0	3.5	4.6	D
Seep 2	5.0	4.2	5.8	5.0	5	D
Depression	3.0	3.0	4.6	4.0	3.5	C

5.2.2.1 Channelled Valley Bottom

Major impacts identified within the channelled valley bottom wetland include head cut erosion, impoundment of flow in dams and at road crossings, cattle farming and crop farming, and effluent discharge from industrial operations (Power Station). These impacts resulted in a Largely Modified Impact category (PES D), with the hydrology and water quality component contributing substantially to the modified state of the wetland.

Figure 16: Impacts: a) Soil Erosion at CVB main channel; b) pooling of water in dam; c)effluent discharge into the wetland; d) crop farming and cattle grazing in wetland

5.2.2.2 Seep 1

The Present Ecological Status of the Seep 1 wetland was considered Largely Modified (PES D), on account of the hydrological state and the water quality of the wetland. The wetland appears to be substantially impacted by the adjacent infrastructure and activities, particularly the ash dam facility. As seen in Figure 12 the wetland soils are contaminated by sediment inputs from the ash dam. Furthermore, the increased surface water input from the ash dam facility and the impoundment of flow in the excavated dam (Figure 17) have changed the hydrological regime of the wetland.

Figure 17: Ash dam facility and pooling of water at dam

5.2.2.3 Seep 2

Major impacts identified in the Seep 2 wetland include increased water inputs into the wetland system from the PCD, spread of alien invasive species, impoundment of flow along roads and dams, and the presence of drains and trenches. These disturbances, together with the likely impact on water quality as a result of seepage from the PCDs, have contributed to the Largely Modified state (PES Category D) of the wetland.

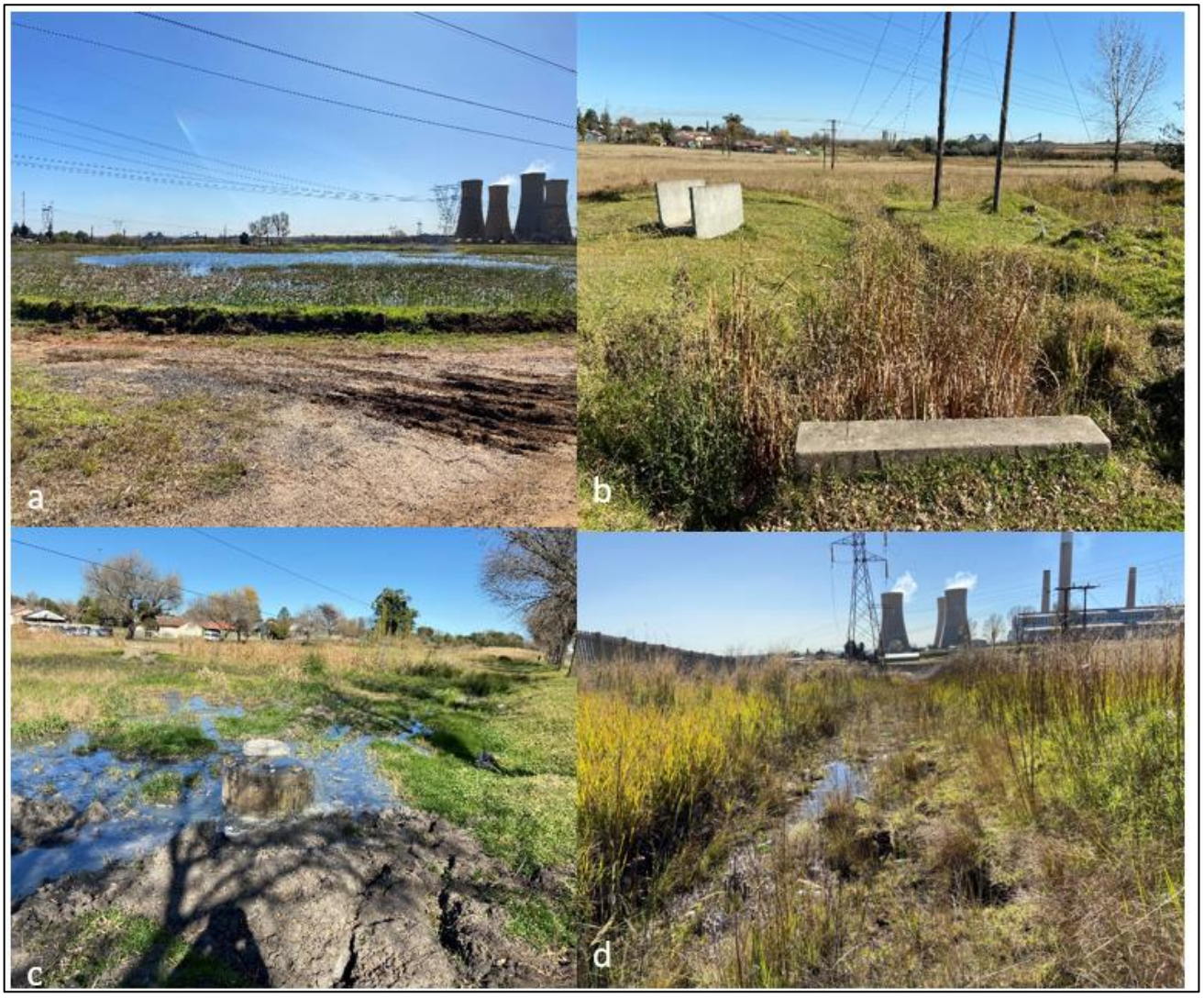

Figure 18: Impacts: a) pooling of water at dam; b) trenches and berms in wetland; c) effluent discharge into the wetland from a leaking pipe; d) impoundment of water at roads in wetland

5.2.2.4 Depression

The present ecological state of the depression wetland was considered Moderately modified (PES category C). although the wetland is considered to sustain impacts from the surrounding crop farming and the tarred R542 road, the wetland was still considered moderately modified, due to the fact that depression wetlands are mostly rainfall driven and may also receive sub-surface water, therefore the presence of the R542 and crop fields may not have a substantial impact on the hydrology of the wetland.

5.2.3 Ecological Importance and Sensitivity

All wetlands in the study area were assessed as being of Low /Marginal EIS, with the exception of the CVB wetland which was assessed as being of Moderate EIS (Table 11). The moderate EIS of the CVB was attributed to its hydrological functional importance as this wetland performs a role in landscape connectivity at the regional level, providing regulating and supporting benefits such as streamflow regulation and flood attenuation.

Table 11: Summary of wetland EIS scores and ratings.

Wetland Unit	Ecological Importance and Sensitivity Score	Hydrological Functions Score	Direct Human Benefits Score	Integrated EIS Score	Integrated EIS Rating
CVB	1.2	1.0	0.0	1.2	Moderate
Seep 1	0.8	0.9	0.0	0.9	Low/Marginal
Seep 2	0.8	0.9	0.0	0.9	Low/Marginal
Depression	0.8	0.9	0.0	0.9	Low/Marginal

5.2.4 Ecoservices

The importance scores for the ecosystem services provided by wetlands within the study area are illustrated in the spider diagrams presented in Figure 19, Figure 20 and Figure 21. The majority of the ecosystem services were rated as very low in terms of their overall importance. Regulating and supporting services such as sediment trapping, phosphate assimilation, nitrate assimilation and toxicant assimilation were determined as moderate, particularly for the CVB wetland which is also important in terms of streamflow regulation and flood attenuation.

The CVB was also assessed as having a Moderately High importance in terms of the biodiversity maintenance (Figure 19). This was attributed to the likelihood of the African Grass Owl (*Tyto capensis*) to occur on site based on the result of the national screening tool as well as the avifauna survey undertaken on 17 June 2022 to confirm habitat suitability for the Grass Owl to occur. Furthermore, based on the MBSP freshwater (2011), the CVB was mapped as biodiversity ecological support area.

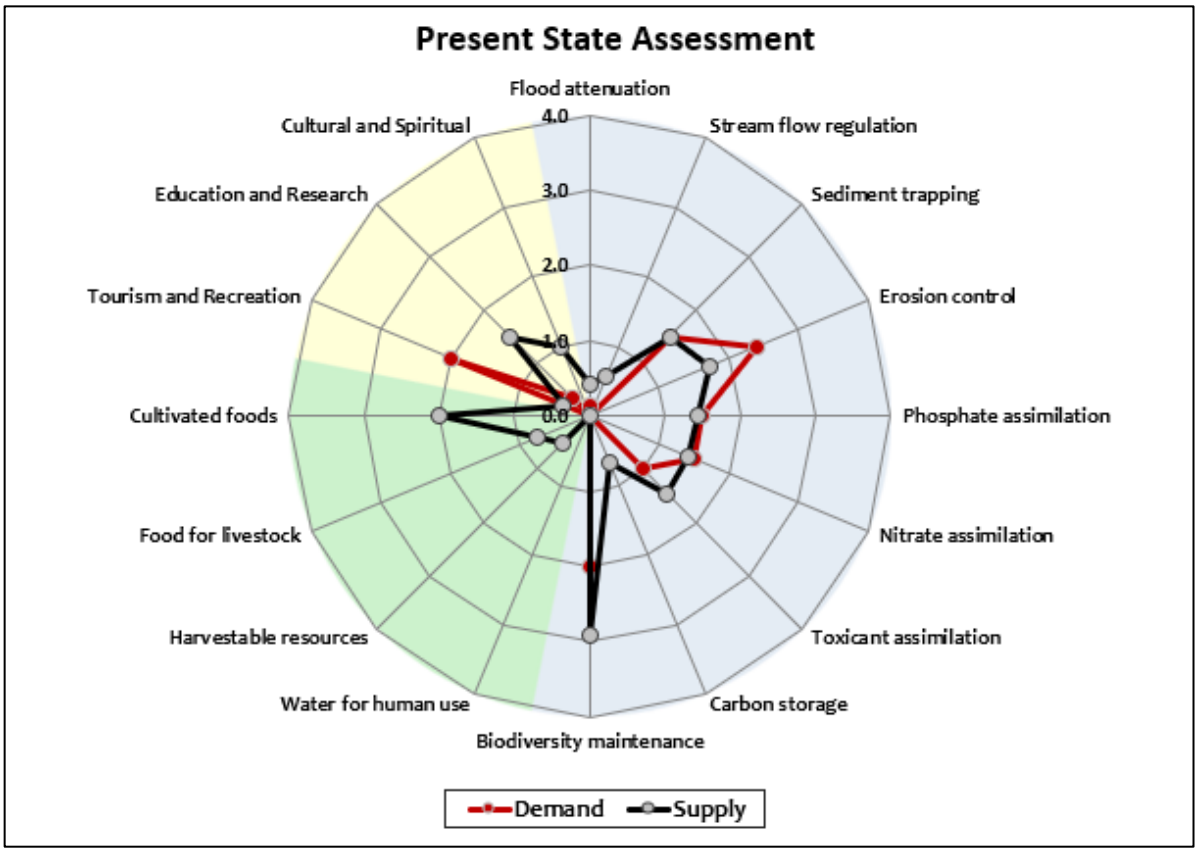

Figure 19: Ecosystem Services supplied by/demanded from the CVB wetland.

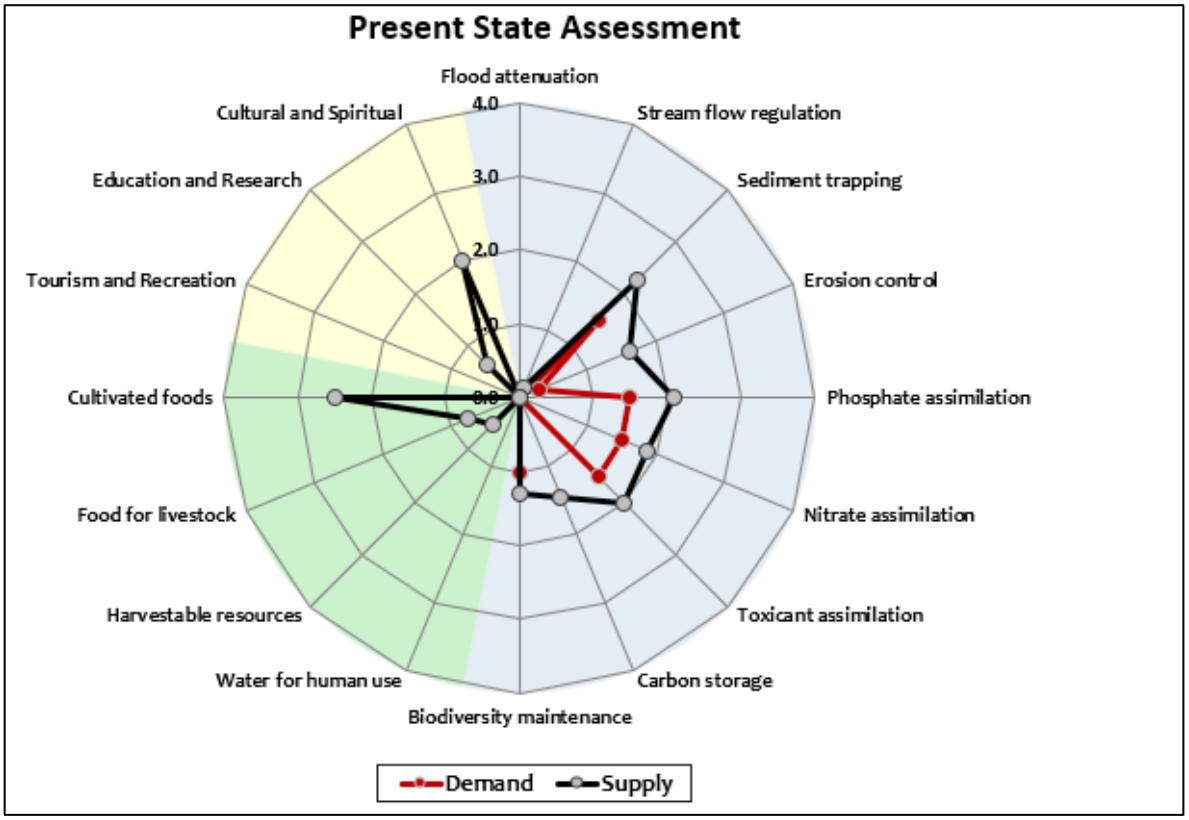

Figure 20: Ecosystem Services supplied by/demanded from seep wetlands

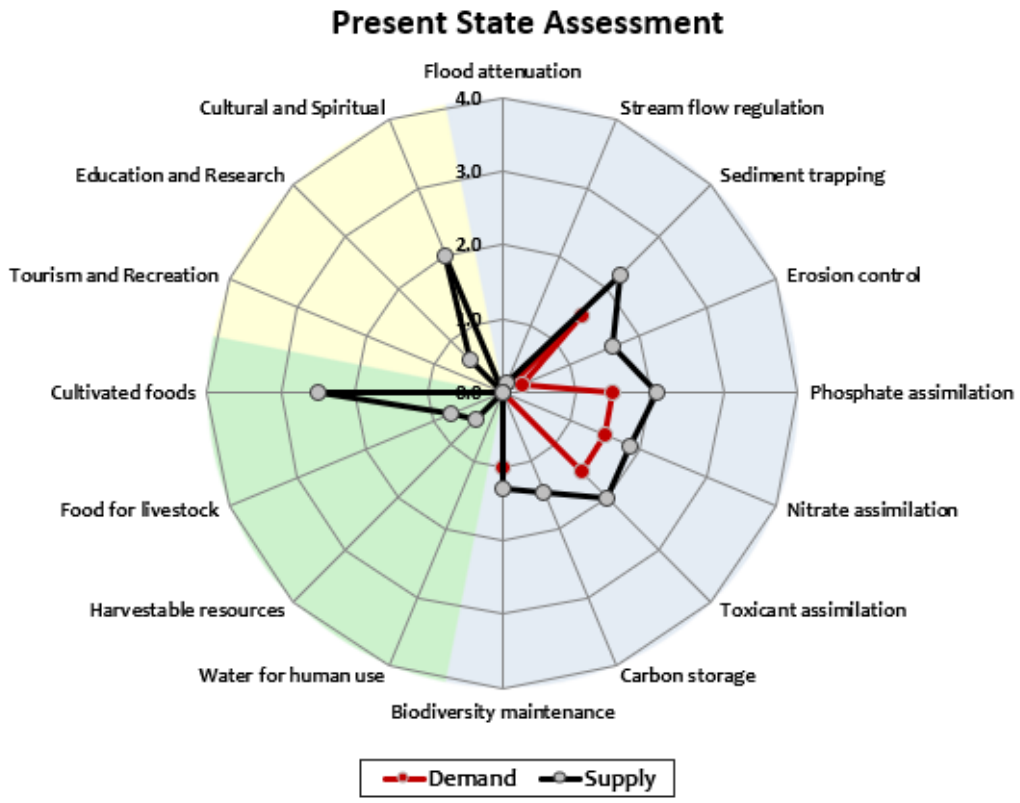

Figure 21: Ecosystem Services supplied by/demanded from Depression wetland

5.3 Existing Impacts on Biodiversity and Drivers of Change

The proposed project infrastructure will be situated in close proximity to the existing power generation facilities and activities. All areas visited are currently experiencing some level of impact from the surrounding agricultural activities primarily through habitat transformation, and disturbance arising from power generation facilities and activities.

The presence of the existing facilities within close proximity to the proposed development footprint is expected to have an established impact on the interruption of surface hydrology in wetlands and potentially exacerbate erosion in the study area due to increased surface water runoff as a result of increased hardened surfaces in the study area.

5.4 Natural, Modified and Critical Habitats

The study area is dominated by agricultural cultivation, power station infrastructure and residential/industrial areas, interspersed with some remnant wetland habitat. While some very disturbed wetland habitat has been identified in the eastern extent of PV Site A, it is no longer considered to constitute 'Natural' habitat as defined by WB ESS6 or IFC PS6, due to its heavily degraded state and loss of ecological function. The channelled valley bottom wetland to the north east of the site, and the seep wetland that crosses the northern boundary of the site, while moderately modified/disturbed, still support biodiversity and deliver ecological services to an extent that enables them both to be considered 'Natural' habitat (Figure 22) as defined by the lender standards.

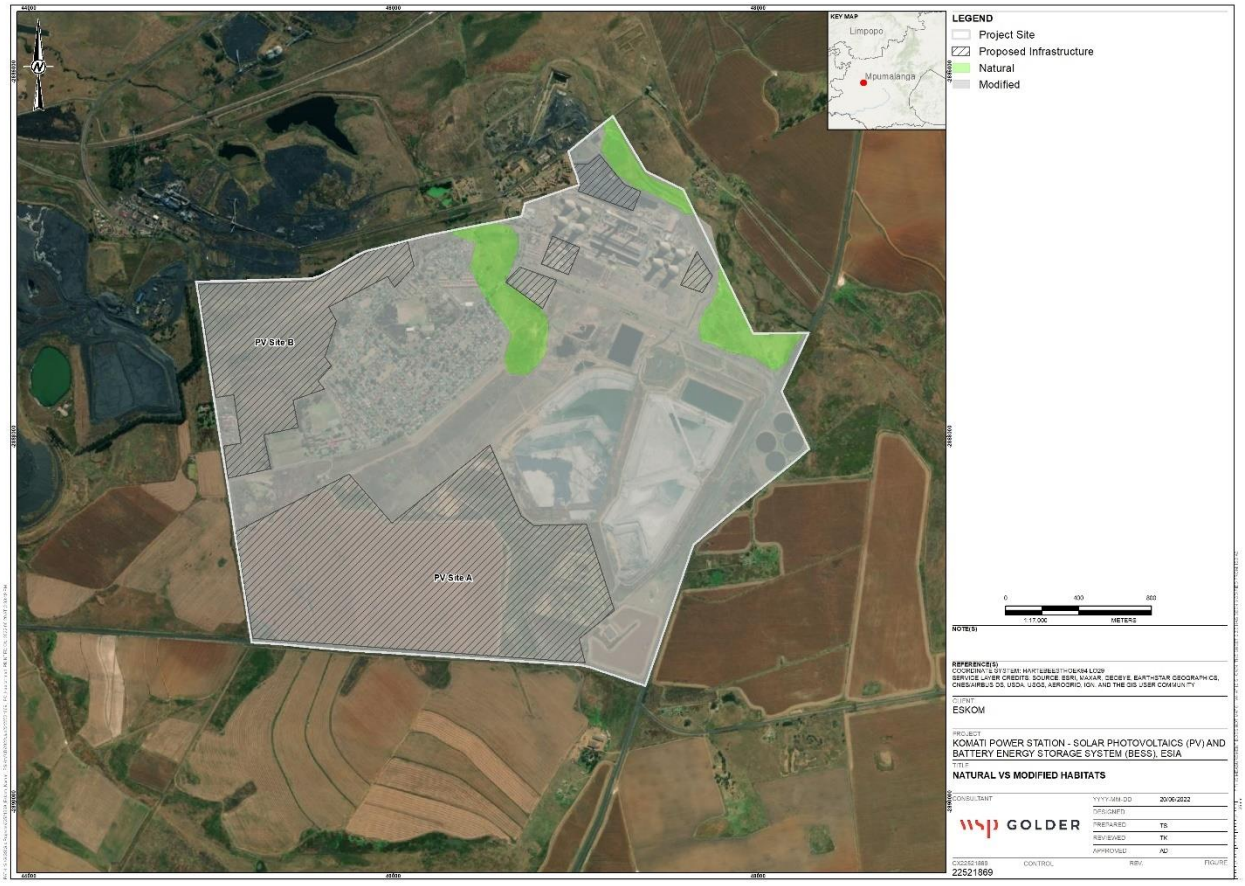

Figure 22: Natural, modified and critical habitat

At present, no areas of potentially Critical Habitat, as defined by IFC and WB standards, have been identified within the study area.

6.0 SCREENING OF POTENTIAL IMPACTS

The construction and operation of the proposed new infrastructure is anticipated to result in the following key impacts on wetland receptors:

1) Direct impacts through clearing of land and resultant loss of associated biodiversity.
2) Loss of wetland habitat
3) Interruption to surface hydrology.
4) Establishment and spread of alien and invasive species.
5) Increased sediment movement into wetlands
6) Increased potential for erosion in wetlands.

The outcomes of the screening of the potential impacts are summarised in Table 12 and described in detail in the following sections.

6.1 Construction Phase

Construction phase impacts on aquatic (wetland and riparian systems) largely arise as a result of direct impacts on the receiving environment due to clearing of land within wetlands or their immediate catchments in advance of project development, and resultant loss of wetland habitat. The earthworks and activities involved during the construction phase of the Project can potentially exert negative impacts on sensitive ecosystems including loss of wetland habitat, catchment landcover changes resulting in increased sediment entry to downstream systems, construction of wetland/riparian system crossings causing impoundments/barriers to movement for aquatic species, contamination of water bodies by construction materials / vehicles (hydrocarbons etc), increased potential of erosion due to surface runoff and soil disturbances and the establishment and spread of alien and invasive species (AIS).

The preliminary list of predicted construction phase impacts are outlined in the sections that follow, and summarised on Table 12.

6.1.1 Loss of wetland habitat

Site establishment and construction of the proposed project infrastructure, particularly PV Site A which overlaps with Seep 1, could lead to the permanent loss of wetland habitat within the project footprint. This impact has a high probability of occurrence and a high impact consequence. The impact significance is of High significance prior to the implementation of mitigation measures and can be reduced to a Medium significance with the application of recommended mitigation measures. Significant residual impacts (Medium/High) will need to be addressed via modification of the final layout to ensure that wetland loss is avoided, or design of an appropriate offset for unavoidable habitat loss.

6.1.2 Changes in wetland health/functioning

Bulk earthworks involved in site development in the immediate catchment of wetlands have the potential to cause indirect impacts on wetland habitat through compaction/removal of recharge or interflow soils, as well as increased sediment deposition to downslope wetland ecosystems in stormwater runoff. If not carefully managed, the potential impact could be moderately severe, and the likelihood highly probable, resulting in an impact of Medium significance. Mitigation measures to address the potentially reduced wetland functioning, such as diffuse distribution of clean stormwater runoff around the PV and BESS foundations and road crossing

to affected downslope wetland systems could reduce the consequence of the potential impacts and likelihood of occurrence of the potential impact.

6.1.3 Contamination of riparian systems

Stripping of topsoil and civil works activities, resulting in a decrease in water quality due to erosion, sedimentation and the alteration in the distribution and quantity of surface water runoff, is considered highly probable during the construction phase, and could be moderately severe, resulting in an impact of Medium significance. The residual impact can be reduced to Low significance with the application of the recommended mitigation measures, since the likelihood of the impact occurring as predicted would be reduced.

6.1.4 Soil erosion

The removal of wetland vegetation for the construction of the proposed development could result in an increase of bare soil/surfaces in the study area which could lead to increased runoff, ultimately resulting in soil erosion. The occurrence of soil erosion is considered moderately probable during construction and could have a moderate consequence on wetland soil, resulting in a Medium impact significance without mitigation. With the implementation of mitigation measures it is anticipated that the probability and consequence of this impact can be reduced, ultimately resulting in a residual impact of Low significance.

6.1.5 Establishment and spread of alien invasive species

Disturbances caused by vegetation clearing and earth works during construction will exacerbate the establishment and spread of alien invasive vegetation. Alien plant infestations can spread exponentially, suppressing, or replacing indigenous vegetation. This may result in a breakdown of ecosystem functioning and a loss of wetland wbiodiversity. Consequently, the potential impact is considered moderately severe, while the possibility of the impact occurring is highly probable, amounting to a potential impact of Medium significance.

With the development of an auditable AIS Management Plan for the project, and the strict implementation of the recommended active control and monitoring measures throughout the construction phase, the probability of the impact occurring can be reduced, resulting in a residual impact of Low significance

6.2 Operational Phase

Operational phase impacts relate to the possible exacerbation of the construction-phase impacts, including soil erosion, surface water and soil contamination and ongoing risk of spread of the alien and invasive plant species that may have colonised new areas during the construction phase.

6.2.1 Spread of alien and invasive species

The potential establishment of alien invasive species in, and immediately adjacent to, wetlands in the vicinity of the proposed development footprint will continue to be an impact of concern during the operational phase. Without mitigation, the consequence of the potential impact is considered moderately severe, while the possibility of the impact occurring is highly probable, amounting to a potential impact of Medium significance.

With the development of an auditable AIS Management Plan for the project, and the strict implementation of the recommended active control and monitoring measures throughout the operational phase, the probability of the impact occurring can be reduced, resulting in a residual impact of Low significance.

6.2.2 Soil Erosion

The increased presence of hardened surfaces in the study area could potentially exacerbate soil erosion, through increased and concentrated surface run off. This impact is assessed as having a medium probability of occurrence with a medium impact severity resulting in an impact of Medium significance prior to mitigation. With the implementation of the recommended mitigation measures, this impact may have a residual impact of Low significance on wetland soils.

6.2.3 Water quality deterioration and contamination of wetland soils

Quarterly washing and maintenance of the PV panels could potentially have a negative impact on water quality and wetland soils, due to inputs of detergents, and possible erosion paths forming in the soils of adjacent wetland areas, should large amounts of water be discharged to the environment. The probability of the impact occurring during operation is considered medium, with a medium consequence, which could result in an impact of Medium significance prior to the application of the recommended mitigation measures. The application of proposed mitigation measures could reduce both the probability of the impact occurring as well as the likely consequence, amounting to a residual impact of Low significance.

Table 12: Wetland Impact Assessment summary

ACTIVITY	POTENTIAL IMPACT	AFFECTED RECEPTORS	PHASE In which impact is anticipated	Probability	Consequence	Significance without Mitigation	Probability	Consequence	Significance with Mitigation
Bulk earthworks and clearance of vegetation in construction footprint	Direct loss of wetland habitat	Wetland habitats	Construction	4	4	High	2	4	Medium
	Erosion	Wetland soils	Construction	3	3	Medium	2	2	Low
	Establishment and spread of AIS	Wetland habitat	Construction	3	2	Medium	2	2	Low
	Catchment land use changes and activities	Changes in wetland health/ functioning	Construction, operation	3	3	Medium	2	2	Low
		Contamination of riparian systems	Construction, operation	3	3	Medium	2	2	Low
Indirect loss/disturbance of natural habitat	Habitat quality reductions due to stormwater runoff, land use changes	Wetland habitat	Operation	3	2	Medium	2	2	Low
Quarterly washing of PV panels	Spread of AIS	Wetland habitat	Operation	3	3	Medium	2	2	Low
	Increased run-off, Erosion	Wetland soils	Operation	3	3	Medium	1	2	Low
	Water quality deterioration and contamination of wetland soils	Wetland soils and water quality	Operation	3	3	Medium	2	2	Low

6.3 Mitigation Measures

Mitigation measures that are designed to avoid and minimise the loss and degradation of the wetland habitat and function on the site are summarised in the sections that follow.

6.3.1 Identification of areas to be avoided (including buffers)

- Areas of undisturbed, natural grassland and wetland habitat should be avoided to the extent possible. Areas of direct loss that cannot be avoided must be addressed via additional conservation actions/offsets as required.
- A loss/disturbance buffer zone of at least 100 m should be maintained between the maximum extent of construction works and the outer boundary of wetlands and riparian zones

6.3.2 Minimisation

- To prevent loss of natural habitat in wetlands beyond the direct disturbance footprint, prior to any vegetation clearing, the development footprints should be clearly marked out with flagging tape/posts in the field. Vegetation clearing should be restricted to the proposed project footprints only, with no clearing permitted outside of these areas.
- The extent of disturbance should be limited by restricting all construction activities to the servitude as far as practically possible.
- Locate all stockpiles, laydown areas and temporary construction infrastructure at least 50 m from the edge of delineated wetlands.
- Wetland/river crossings should be constructed utilizing designs that ensure that hydrological integrity of the affected wetlands is preserved, and natural flow regimes are maintained (i.e. no impoundment upstream of crossings, or flow concentration downstream of crossings.
- Ideally construction activities within wetlands should take place in winter (during the dry season). Where summer construction is unavoidable, temporary diversions of the streams might be required.
- Install erosion prevention measures prior to the onset of construction activities. Measures should include low berms on approach and departure slopes to crossings to prevent flow concentration, sediment barriers along the lower edge of bare soil areas, placement of hay bales around the within wetland construction areas, and re-vegetation of disturbed areas as soon as possible

6.3.3 Alien and Invasive Species Management

- An alien and invasive species management plan should be developed for the Project, which includes details of strategies and procedures that must be implemented on site to control the spread of alien and invasive species. A combined approach using both chemical and mechanical control methods, with periodic follow-up treatments informed by regular monitoring, is recommended.

6.3.4 Biodiversity Management Plan

- Specific provision for biodiversity conservation, including details of any required offsets, should be made in the project BMP/BAP, in alignment with the objectives of the MBSP (2011).
- Inclusion of a practical framework and schedule, details of key performance indicators, and recommended monitoring protocols for the delivery of existing and currently recommended mitigation measures in the BMP is recommended.

6.4 Monitoring Requirements

The following monitoring requirements are anticipated:

- Monitoring of wetland health to be conducted within one year of completion of construction, to measure any changes to the baseline status and ensure that recommended mitigation measures are sufficient to address any significant impacts.
- Follow up monitoring of wetland health PES/EIS every three years throughout the operating period.

6.5 Cumulative Impacts

The landscape within which the proposed infrastructure is located is almost completely modified and fragmented as a consequence of the existing surrounding land uses (i.e., power station, mining, agricultural practices, residential areas, and informal settlement).

While the currently proposed project infrastructure largely avoids the loss of significant areas of natural habitat due to active avoidance of these areas as part of the ongoing planning process, vegetation clearing would result in loss of additional 24.5 ha of moderately/largely modified seep habitats (Seep 1), contributing to cumulative impacts in terms of direct loss of seep wetlands at the landscape level.

7.0 ADDITIONAL PLANNED STUDIES TO BE COMPLETED DURING ESIA

Additional baseline data gathering surveys and impact assessments that will be conducted at ESIA phase will include the following:

- Aquatic Biodiversity Specialist Assessment:
  - Update of the wetland baseline description with scientifically-determined buffer zones, and revision of the EIS scores in the context of the completed flora and fauna study findings, as required
  - Diatom sample results and analysis.
  - Updated impact assessment, using NEMA-prescribed methods.
  - Finalised mitigation measures for inclusion in the Project EMPr.

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APPENDIX A

Document Limitations

APPENDIX B

Specialist CV