



SCIENTIFIC AQUATIC SERVICES

FRESHWATER ECOSYSTEM IMPACT AND COMPLIANCE STATEMENT

**CONSIDERING THE PROPOSED SOLAR PHOTO-
VOLTAIC (PV) DEVELOPMENT ON A PORTION OF
DOORNHOEK 372 IP KLERKSDORP, NORTH WEST
PROVINCE.**

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TABLE OF CONTENTS

TABLE OF CONTENTS	ii
LIST OF FIGURES	ii
1. INTRODUCTION AND BACKGROUND SETTING	1
2. PROJECT DESCRIPTION	3
3. APPLICATION OF THE DEPARTMENT OF ENVIRONMENTAL AFFAIRS (DEA) SCREENING TOOL	4
4. DEFINITIONS AND LEGISLATIVE REQUIREMENTS	4
4.1 Freshwater Ecosystem Definition	Error! Bookmark not defined.
5. DESKTOP INVESTIGATION FINDINGS	7
6. SITE SURVEY RESULTS	8
7. BUSINESS CASE, OPPORTUNITIES AND CONSTRAINTS APPLICABLE TO THE PROPOSED DEVELOPMENT OF THE SUBJECT PROPERTY	11
8. GENERAL GOOD HOUSEKEEPING AND MITIGATION MEASURES	12
9. REFERENCES	13
APPENDIX A - DASHBOARD AND PROJECT MAPS	14
APPENDIX B - INDEMNITY AND DECLARATION OF INDEPENDENCE	25
APPENDIX C - CV OF SPECIALISTS	28

LIST OF FIGURES

Figure 1: Representative photograph of the south-western portion of the study area	9
Figure 2: Representative photograph of a portion of the unchanneled valley bottom wetland located in the south-eastern corner of the investigation area.	10



DOCUMENT GUIDE

The table below provides the specialist report requirements for the assessment and reporting of impacts on areas with a **low sensitivity** to the aquatic biodiversity in terms of Government Notice 320 as promulgated in Government Gazette 43110 of 20 March 2020 in line with the Department of Environmental Affairs screening tool requirements, as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

No.	Requirements	Section in Report
3.1	The compliance statement must be prepared by a suitably qualified specialist registered with the SACNASP, with expertise in the field of aquatic sciences.	Appendix C
3.2	The compliance statement must:	-
3.2.1	be applicable to the preferred site and the proposed development footprint;	Section 1, 2, 7
3.2.2	confirm that the site is of "low" sensitivity for aquatic biodiversity; and	Section 7
3.2.3	indicate whether or not the proposed development will have an impact on the aquatic features.	Section 7
3.3	The compliance statement must contain, as a minimum, the following information:	-
3.3.1	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Appendix B, C
3.3.2	a signed statement of independence by the specialist;	Appendix B
3.3.3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 5.2, 7
3.3.4	a baseline profile description of biodiversity and ecosystems of the site;	Section 7
3.3.5	the methodology used to verify the sensitivities of the aquatic biodiversity features on the site including the equipment and modelling used where relevant;	Section 5, 6
3.3.6	in the case of a linear activity, confirmation from the aquatic biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;	N/A
3.3.7	where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr;	Section 9
3.3.8	a description of the assumptions made as well as any uncertainties or gaps in knowledge or data; and	Section 1.1
3.3.9	any conditions to which this statement is subjected.	N/A
3.4	A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP to ensure this requirement is met.



1. INTRODUCTION AND BACKGROUND SETTING

Scientific Aquatic Services (SAS) was appointed by Doornhoek PV (Pty) Ltd to verify the presence of potential freshwater ecosystems within the footprint of the Doornhoek 2 Solar Photovoltaic (PV) Facility (hereafter referred to as the “proposed Solar PV facility”) and if appropriate, prepare a freshwater ecosystem impact and compliance statement as part of the Environmental Authorisation (EA) process for the proposed Solar PV facility. The proposed Solar PV facility is located on Portion 18 of the farm Doornhoek 372 IP is located approximately 11 km north of Klerksdorp, North West Province in the agricultural district of Reebokfontein West, approximately 2.5 km west of the R30 provincial road and bordered by an un-named tar road to the east. The study area is utilised predominantly as grazing for cattle. A 500 m “zone of investigation” around the study area, (in accordance with General Notice (GN) 509 of 2016 (as it relates to the National Water Act (Act No. 36 of 1998)), was generated to determine potential risks to possible freshwater ecosystems associated with the study area. This will henceforth be referred to as the “investigation area”. (Appendix A, Figures A1 and A2).

SAS was required to report on aspects of the freshwater ecosystem biodiversity and provide input into any development constraints or enviro-legal constraints that may arise for the proposed solar PV facility within the study area in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the National Water Act, 1998 (Act No. 36 of 1998). SAS was required to, if necessary, assess the risk that the proposed solar PV facility may pose to the receiving freshwater environment.

1.1 Assumptions and limitations

The following assumptions and limitations are applicable to this report:

- The ground-truthing and delineation of potential freshwater ecosystems and the assessment thereof, are confined to a single site visit within the study area undertaken on the 8th of March 2022 during the summer rainfall season. All watercourses identified within the investigation area were delineated in fulfilment of GN 509 of the National Water Act, 1998 (Act No. 36 of 1998) using various desktop methods including use of topographic maps, historical and current digital satellite imagery and aerial photographs with limited site verification;
- The delineation of the freshwater ecosystems as provided in this report, is considered the best estimate taking into consideration the limitations and conditions at the time of assessment;
- Global Positioning System (GPS) technology is inherently somewhat inaccurate, and some inaccuracies due to the use of handheld GPS instrumentation may occur;



however, the delineations as provided in this report are deemed appropriately accurate to fulfil the authorisation requirements;

- Wetlands and/or riparian zones and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative wetland or riparian species. Within this transition zone, some variation of opinion on the watercourse boundaries may occur. However, if the Department of Water Affairs and Forestry (DWAF)¹ (2008)² method is followed, all assessors should get largely similar results; and
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked, especially given the disturbed nature of the study area. The study area has undergone significant anthropogenic influences as a result of historical agriculture and plantations which have altered the natural soil profiles and vegetation composition. The watercourse delineation as presented in this report is, however, regarded as the best estimate of the boundaries based on the site conditions present at the time of the site visit and are deemed appropriately accurate to guide any future development plans.

2. PROJECT DESCRIPTION

The Applicant, Doornhoek 2 (Pty) Ltd, is proposing the construction of a photovoltaic (PV) solar energy facility (known as the Doornhoek 2 PV facility) located on a site approximately 11km north of Klerksdorp in the North West Province. The solar PV facility will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 50MW. The development area is situated within the City of Matlosana Local Municipality within the Dr Kenneth Kaunda District Municipality. The site is accessible via an existing district road located adjacent to the east of the development area.

The proposed Doornhoek 2 PV facility and associated infrastructure will be located on Portion 18 of the Farm Doornhoek No. 372-IP. The project site is located within the Klerksdorp Renewable Energy Development Zones (REDZ), and therefore, a Basic Assessment (BA) process will be undertaken in accordance with GN R114 (as formally gazetted on 16 February 2018).

¹ The Department of Water Affairs and Forestry (DWAF) was formerly known as the Department of Water Affairs (DWA). At present, the Department is known as the Department of Water and Sanitation (DWS). For the purposes of referencing in this report, the name under which the Department was known during the time of publication of reference material, will be used.

² Although an updated manual is available since 2008 (Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas). This is still considered a draft document currently under review.



An additional up to 115MW PV facility (Doornhoek 1 PV Facility) is concurrently being considered on the same property and is being assessed through a separate Basic Assessment (BA) process.

The proposed Doornhoek 2 PV Facility will cover approximately 80ha and will include the following infrastructure:

- PV modules and mounting structures
- Inverters and transformers
- Battery Energy Storage System (BESS)
- Site and internal access roads (up to 8m wide)
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses and workshops for storage and maintenance.
- Temporary and permanent laydown area
- Grid connection infrastructure, including:
 - 33kV cabling between the project components and the facility substation
 - A 132kV facility substation
 - A 132kV Eskom switching station
 - A Loop-in-Loop out (LILo) overhead 132kV power line between the Eskom switching station and the existing Watershed–Klerksdorp 1 132kV power line.

3. LEGISLATIVE REQUIREMENTS

The legislation considered during this investigation included the following:

- The Constitution of the Republic of South Africa, 1996³;
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Water Act (NWA), 1998 (Act No. 36 of 1998); and
- Government Notice 509 (GN 509) as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act (NWA), 1998 (Act No. 36 of 1998).

4. APPLICATION OF THE DEPARTMENT OF ENVIRONMENTAL AFFAIRS (DEA) SCREENING TOOL.

³ Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 1996'. It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.



The protocol for the assessment of freshwater and aquatic biodiversity prepared in support of the Department of Forestry, Fisheries and Environment (DFFE) (previously the Department of Environmental Affairs (DEA)) national web based environmental screening tool (2020), provides the criteria for the assessment and reporting of impacts on aquatic/freshwater biodiversity for activities requiring EA. For the aquatic/freshwater biodiversity theme, the requirements are for sites which support various levels of biodiversity. The relevant aquatic/freshwater biodiversity theme in the national web based environmental screening tool (2020) has been provided by the South African National Biodiversity Institute (SANBI). Based on the sensitivity rating, a suitably qualified specialist must prepare the relevant report or opinion memo which is to be submitted as part of the EA application.

As part of the process of the background information gathering, SAS applied the DFFE (previously DEA) screening tool (2020) to the study area. According to the guidelines, an applicant intending to undertake an activity on a site identified as being of “very high sensitivity” for an aquatic biodiversity theme must submit an Aquatic Biodiversity Impact Assessment or if the area is identified as being of “low sensitivity” then an Aquatic Biodiversity Compliance Statement must be compiled and submitted to the competent authority. It is noted, however, that during a site survey undertaken by a suitably qualified freshwater ecologist should the sensitivity be determined different from that assigned by the screening tool (i.e. that a high risk to the regional aquatic biodiversity or freshwater ecosystems in the area is likely even though it is assigned as a “low” sensitivity, or if it is assigned a high sensitivity, however, the proposed develop risk are deemed low) then the relevant assessment approach must be followed based on the site survey results and not the DFFE screening tool allocation. According to the national web based environmental screening tool, the study area is located within an area of **low aquatic/ freshwater biodiversity significance**, although an area indicated as being of **very high aquatic/ freshwater biodiversity significance is indicated outside of the study area** to the south east thereof, albeit within the investigation area (Figure 1).



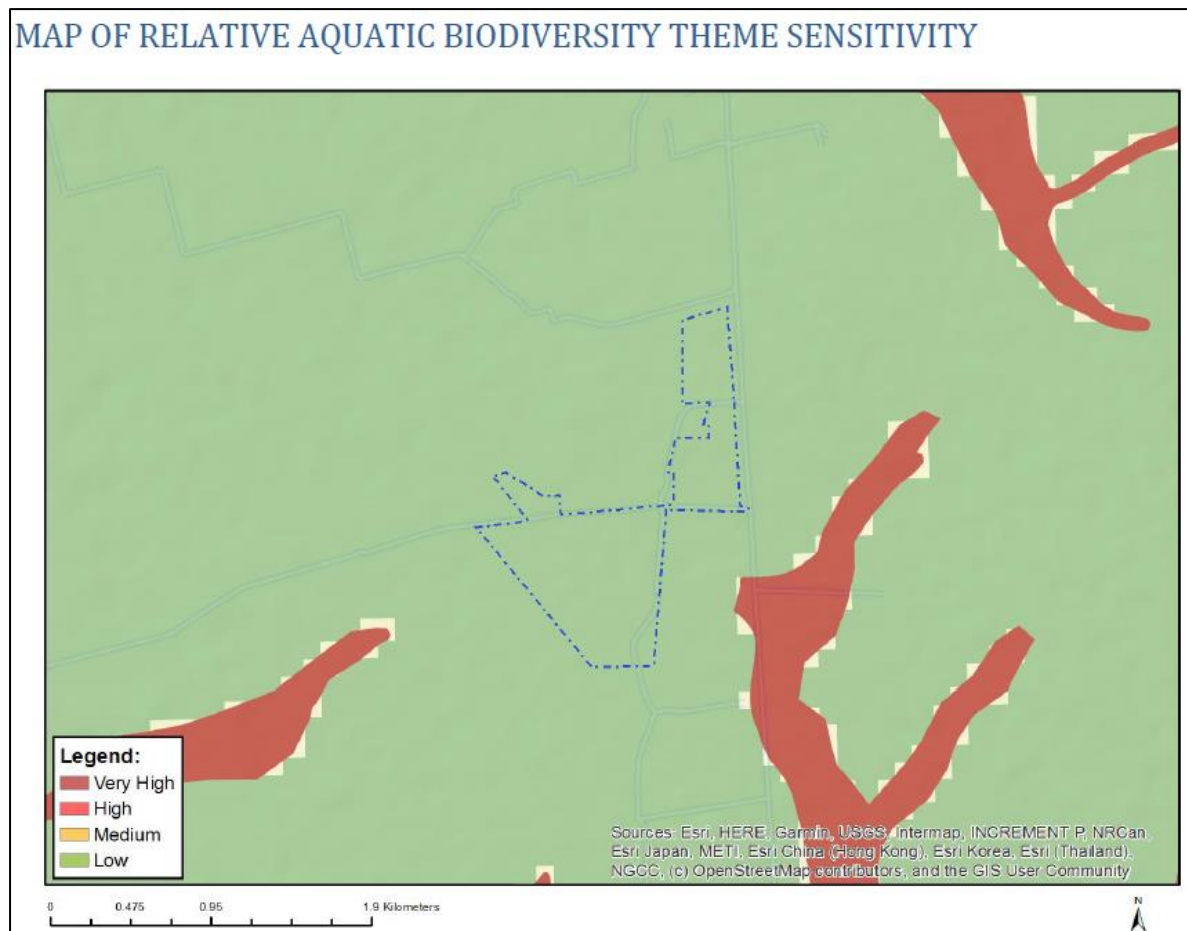


Figure 1: Map of relative aquatic biodiversity according to the DFFE Screening Tool, indicating 'low' sensitivity within the study area.

5. ASSESSMENT APPROACH

5.1 Freshwater Ecosystem Definition

The National Water Act, 1998 (Act No. 36 of 1998) is aimed at the protection of the country's water resources, defined in the Act as "a watercourse, surface water, estuary or aquifer". According to the National Water Act, 1998 (Act No. 36 of 1998) a watercourse means:

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare a watercourse.

The Act further provides definitions of wetland and riparian habitats as follows:

Wetland habitat is "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent area.

5.2 Freshwater Ecosystem Site Verification

Verification of potential freshwater ecosystems took place according to the method presented in the “Updated manual for the identification and delineation of wetland and riparian resources” (DWAF, 2008). The foundation of the method is based on the fact that freshwater ecosystems have several distinguishing factors including the following:

- Landscape position;
- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;
- Vegetation adapted to saturated soils; and
- The presence of alluvial soils in stream systems.

A field assessment was undertaken on the 8th March 2022 (late summer rainfall season, considered optimal for assessment of freshwater ecosystems in the North West Province) during which the presence of any riparian or wetland characteristics as defined by DWAF (2008) and by the NWA, were looked for (please refer to Section 7 of this report). It is important to note that no true wetland characteristics, meeting the definition contained in the National Water Act, 1998 (Act No. 36 of 1998), were observed during this site assessment.

6. DESKTOP INVESTIGATION FINDINGS

A background study of relevant national, provincial and municipal datasets (such as the National Freshwater Ecosystem Priority Areas [NFEPA] 2011 database; the Department of Water and Sanitation Research Quality Information Services [DWS RQIS PES/EIS], 2014 database, and National Biodiversity Assessment (NBA) 2018, the North West Biodiversity Sector Plan (NW BSP, 2015) was undertaken to aid in defining presence of any freshwater ecosystems prior to the site survey of the study area (see Appendix A, Table 1) as well as the associated 500 m investigation area.

The results are summarised in the points below with the relevant maps presented in Appendix A.

- According to the NFEPA (2011) and the NBA (2018) databases, there are no wetlands nor rivers within the study area. The NFEPA (2011) database does not indicate any wetlands or rivers within the investigation area, however the NBA (2018) database indicates a seep wetland (indicated to be in a ‘largely modified’ ecological condition) in



the south-east of the investigation area (Figure A4) which correlates with the area of 'very high' aquatic biodiversity indicated by the DFFE screening tool (2020);

- The NWSBP (2015) similarly indicates an Ecological Support Area (ESA) 1 that corresponds with the seep wetland identified by the NBA (2018) database and the DFFE screening tool (Figure A5);
- The seep wetland indicated by the NBA (2018), NWBSP (2015) and the DFFE screening tool (2020) is indicated by the topographic data as being an ephemeral flow path outside the investigation area (Figure A2); and
- The majority of the study area and south-eastern portion of the investigation area fall within the C24H quaternary catchment (i.e. within the same quaternary catchment as the indicated seep wetland) whilst the remaining extents of the study and investigation area to the north and west fall within the C24G quaternary catchment (Figure A3).

7. SITE SURVEY RESULTS

A site investigation of the study area was undertaken on the 8th of March 2022 during the late summer rainfall season, using visual assessment methods as well as digital satellite imagery. In addition, a 'Dutch' (also known as an Edelman) soil auger was used to verify soil characteristics that may indicate the presence, or lack thereof of any potential wetland features within the study area and associated investigation area. Figure 1 below depicts a portion of the study area.



Figure 2: Representative photograph of the south-western portion of the study area.

7.1 Study Area Characteristics

No wet response areas or features meeting the definition of a watercourse as contained in the National Water Act, 1998 (Act No. 36 of 1998) were identified within the study area, nor within the majority of the investigation area.

The vegetation composition was largely dominated by graminoid species, particularly *Themeda triandra* (red grass) and *Setaria sphacelata var. sphacelata* (Common Bristle Grass) with sporadic distribution of small shrubs, low in density. According to van Oudtshoorn (2012) *S. sphacelata var. sphacelata* prefers “well-drained, sandy soils” although is often found growing adjacent to waterbodies such as streams (van Oudtshoorn, 2012), whilst *T. triandra* prefers fertile soil but is found in most soil types (van Oudtshoorn, 2012). Soil samples were not taken within the study area as the floral assemblages did not indicate any areas of wet response or increased moisture, nor were any potential watercourses indicated by the various databases, topographic data or digital satellite imagery consulted during preparation for the site visit. **Thus, it was concluded that no watercourses (as defined by the National Water Act, 1998, Act No. 36 of 1998) are present within the study area.**

A single unchanneled valley bottom wetland (indicated as a seep wetland by the NBA, 2018) was identified in the south-eastern portion of the investigation area (Figure 2). The wetland flows north to south, and forms an unnamed tributary of the Rietgatspruit River, situated

approximately 7.6 km south of the study area. A formal assessment of the wetland was not undertaken as it is situated further than 500 m from the study area and is protected from the development of the proposed Solar PV facility within the study area by the tar road forming part of the eastern border of the study area, as well as by several paddocks and grazing areas which provide a robust buffer between the proposed development and the wetland. Nevertheless, the wetland is likely to be in a moderately to largely modified ecological condition, considering the dominant land use (grazing of domestic livestock) and the impoundment thereof both upstream and downstream of the study area.



Figure 3: Representative photograph of a portion of the unchanneled valley bottom wetland located in the south-eastern corner of the investigation area.

Although the unchanneled valley bottom wetland is located outside of the investigation area, the applicable zones of regulation (32 m in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and a 500 m zone of regulation under GN509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)) were generated. As illustrated in Figure A7, the study area does not encroach on the regulated zones around the unchanneled valley bottom wetland. Furthermore, it is the specialist's opinion that a negligible quantum of risk to the unchanneled valley bottom wetland is anticipated due to the robust buffer between the proposed Solar PV facility and the wetland

provided by approximately 107 ha of grassland, and by the tar road which forms the eastern boundary of the study area.

8. BUSINESS CASE, OPPORTUNITIES AND CONSTRAINTS APPLICABLE TO THE PROPOSED DEVELOPMENT OF THE SUBJECT PROPERTY.

A site investigation considering the proposed Solar PV facility within the study area and the 500 m investigation area was undertaken on the 8th of March 2022, using visual assessment methods as well as digital satellite imagery supplemented with topographic data and applicable national and provincial databases. In addition, a 'Dutch' soil auger was used to verify soil characteristics that may indicate the presence or absence of any potential wetland/riparian features within the study area.

During the field assessment, no freshwater ecosystems were identified within the study area, nor were any identified by the NFEPA (2011), NBA (2018) or NWBSP (2015) databases, or by the topographic data available for the study area. **Therefore it was concluded from an aquatic (freshwater ecosystem) perspective, that the study area is of 'low' sensitivity (Figure A8).** An unchanneled valley bottom wetland was identified immediately adjacent to but outside of the south-eastern corner of the investigation area (Figure A6).

The unchanneled valley bottom wetland is subject to a 32 m zone of regulation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and a 500 m zone of regulation under GN509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) (refer to Figure A7). Notwithstanding the legal requirements for the application of these zones of regulation, the perceived quantum of risk to the unchanneled valley bottom wetland arising from the proposed Solar PV facility is negligible owing to the distance of the wetland from the study area. Nevertheless, it is recommended that general 'good practice' mitigation measures, as provided below, be implemented during all phases of the proposed Solar PV facility to ensure that indirect impacts to the receiving environment are minimised and avoided as much as possible.



9. GENERAL GOOD HOUSEKEEPING AND MITIGATION MEASURES

Based on the location of the unchanneled valley bottom in the east in relation to the proposed solar PV facility, direct impacts are not anticipated and edge effects associated with the proposed development are considered negligible. In particular, it is important that the pattern, quantity and timing of water in the landscape is not significantly altered as a result of increased impermeable surfaces in the catchment. If necessary, as determined by a suitably qualified hydrologist, the inclusion of stormwater management structures such as swales to spread, attenuate flow and trap sediment within the developed area is recommended, to ensure that post development, flow, pattern and timing of water within the landscape is not greatly altered.

In addition to the above, general mitigation measures that are to be implemented during construction within the study area include the following:

- All development footprint area associated with the proposed Solar PV facility should remain as small as possible and the boundaries of footprint area, must be clearly defined and it should be ensured that all activities remain within defined footprint area;
- Existing roads must be utilised by construction vehicles during the construction phase of the project;
- All waste management should take place according to best practice guidelines and principles;
- All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil; and
- Any sheet runoff from compacted area should be slowed down by the strategic placement of berms.

Yours Faithfully,

Stephen van Staden⁴

SACNASP REG.NO: **400134/05 (Ecology)**

Declaration of independence and CV included in Appendix B and C respectively

⁴ Co-authored by A. Mileson and peer reviewed by K. Marais (Pr. Sci. Nat)



10. REFERENCES

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APPENDIX A- DASHBOARD AND PROJECT MAPS



Table A1: Desktop data relating to the characteristics of the freshwater ecosystems associated with the study and investigation area.

Aquatic ecoregion and sub-regions in which the study and investigation areas are located		Detail of the study and investigation areas in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
Ecoregion	Highveld	FEPACODE	The majority of the study and investigation area falls within a sub quaternary catchment currently not considered important in terms of fish or freshwater ecology. The northern portions of the study and investigation areas falls within a Phase2FEPA identified in moderately modified rivers, only in cases where it was not possible to meet biodiversity targets for river ecosystems in rivers that were still in good condition. The condition of these rivers should not be degraded further, as they may in future be considered for rehabilitation once FEPAs in good condition are considered fully rehabilitated and well managed.
Catchment	Vaal		
Quaternary Catchment (Figure A3)	C24G (western) and C24H (eastern portion)		
WMA	Middle Vaal		
subWMA	Middle Vaal		
Dominant characteristics of the Highveld Ecoregion Level II (11.08) (Kleynhans <i>et al.</i>, 2007)			
Dominant primary terrain morphology	Plains, moderate relief, Lowlands, Hills and Mountains; moderate and high relief		
Dominant primary vegetation types	Moist Cold Highveld Grassland	NFEPA Wetlands	According to the NFEPA Database, no wetlands occur within the study or investigation areas.
Altitude (m a.m.s.l.)	1300-1700		
MAP (mm)	400-500		
Coefficient of Variation (% of MAP)	25-60	Wetland Vegetation Type	The study and investigation area is situated within the Dry Highveld Grassland Group 5 (vulnerable) wetland vegetation group. The threat status of the wetland vegetation group is provided by Mbona <i>et al.</i> (2015).
Rainfall concentration index	60- >65		
Rainfall seasonality	Mid to Late Summer		
Mean annual temp. (°C)	14-18		
Winter temperature (July)	-2-18		
Summer temperature (Feb)	12-28		
Median annual simulated runoff (mm)	5 to 10 (limited); 10 to 80	NFEPA Rivers	According to the NFEPA Database, no rivers occur within the study or investigation areas.
Ecological Status of the most proximal sub-quaternary reach (DWS, 2014)			
Sub-quaternary reach	C24H-01745 (Rietgatspruit)	National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Figure A4) According to the NBA SAIIE (2018) database, no wetlands occur within the study area. A seep wetland falls within the eastern portion of the investigation area. The seep wetland is classified as being in a largely modified ecological condition (WETCON D/E/F). The Ecosystem Threat Status (ETS) of the seep wetland is Critically Endangered (CR) and the Ecosystem Protection Level (EPL) is Not Protected (NP).	
Distance from the study area	Approximately 5.40 km		
Assessed by an expert?	Yes		
PES Category Median	Seriously modified (E)		
Mean EI Class	Moderate		
Mean ES Class	Moderate		
Stream Order	1		
Default Ecological Class (based on median PES and highest EI or ES mean)	C (Moderate)		
Importance of the study area according to the North West Biodiversity Sector Plan (2015) (Figure A5).			
Ecological Support Areas	According to the NWBSP (2015) database, a single feature within the south-eastern portion of the investigation area is located within a category 1 ESAs. These features correspond to those features identified by the NBA (2018) database. ESAs are terrestrial and aquatic areas that are not essential for meeting biodiversity representation targets (thresholds), but which nevertheless play an important role in supporting the ecological functioning of Critical Biodiversity Areas (CBAs) and/or		



	<p>in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree or extent of restriction on land use and resource use in these areas may be lower than that recommended for CBAs.</p>
<p>National Web Based Environmental Screening Tool (2020).</p>	
<p>The Screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed residential development footprint to avoid sensitive areas.</p>	<p>The features identified by the NBA (2018) and NWBSP (2015) databases are classified as being of very high sensitivity for aquatic CBAs as well as wetlands and estuaries. The rest of the study area is classified as being of low aquatic sensitivity.</p>

CBA = Critical Biodiversity Area; DWS = Department of Water and Sanitation; EI = Ecological Importance; ES = Ecological Sensitivity; EPL = Ecosystem Protection Level; ESA = Ecological Support Area; ETS = Ecosystem Threat Status; m.a.m.s.l = Metres Above Mean Sea Level; MAP = Mean Annual Precipitation; NBA = National Biodiversity Assessment; NFEPA = National Freshwater Ecosystem Priority Areas; PES = Present Ecological State; SAIIE = South African Inventory of Inland Aquatic Ecosystems; WMA = Water Management Area.



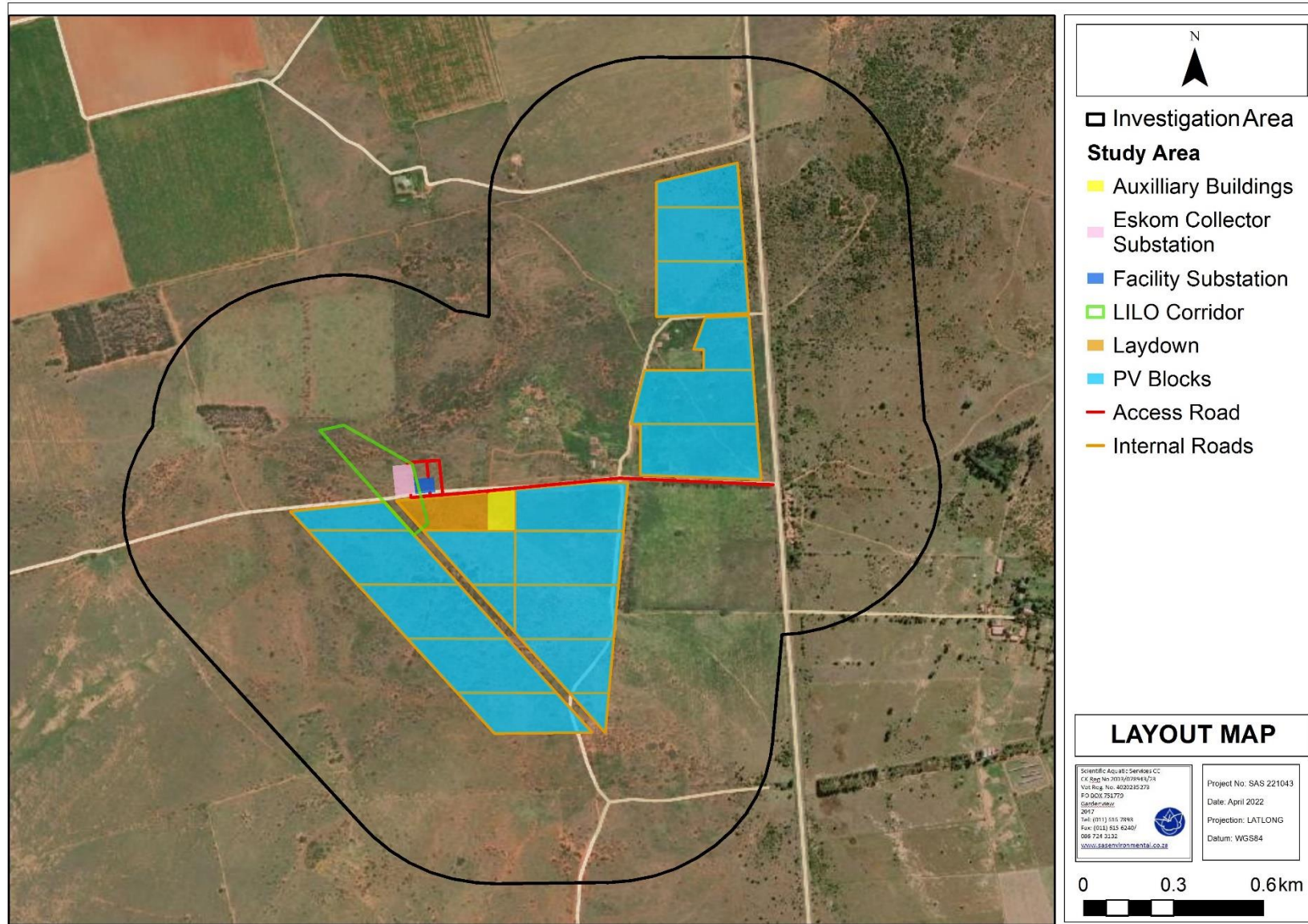


Figure A1: A digital satellite image depicting the location of the study area and associated investigation area in relation to the surrounding area.



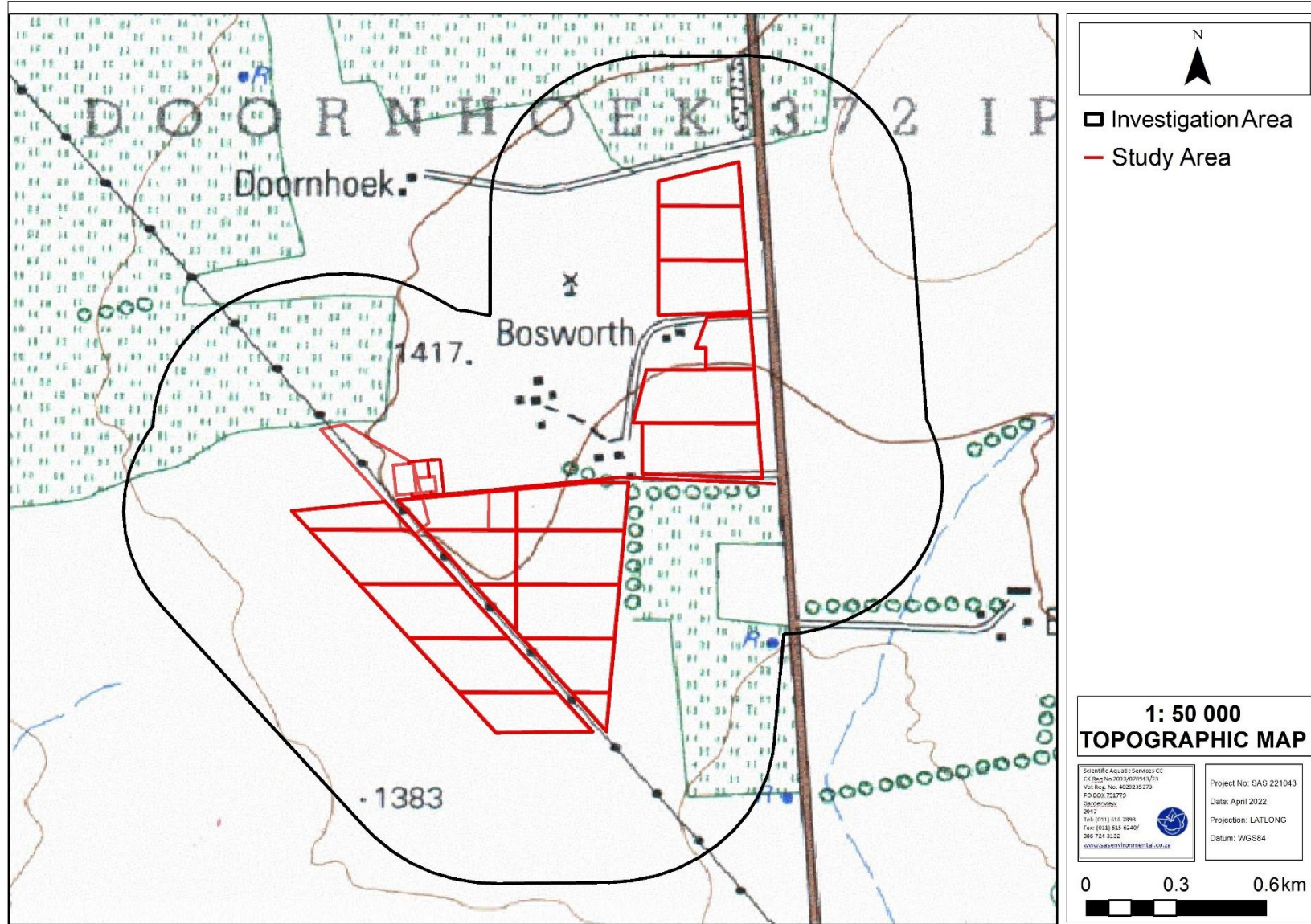


Figure A2: The study and investigation areas depicted on a 1:50 000 topographical map in relation to the surrounding area.



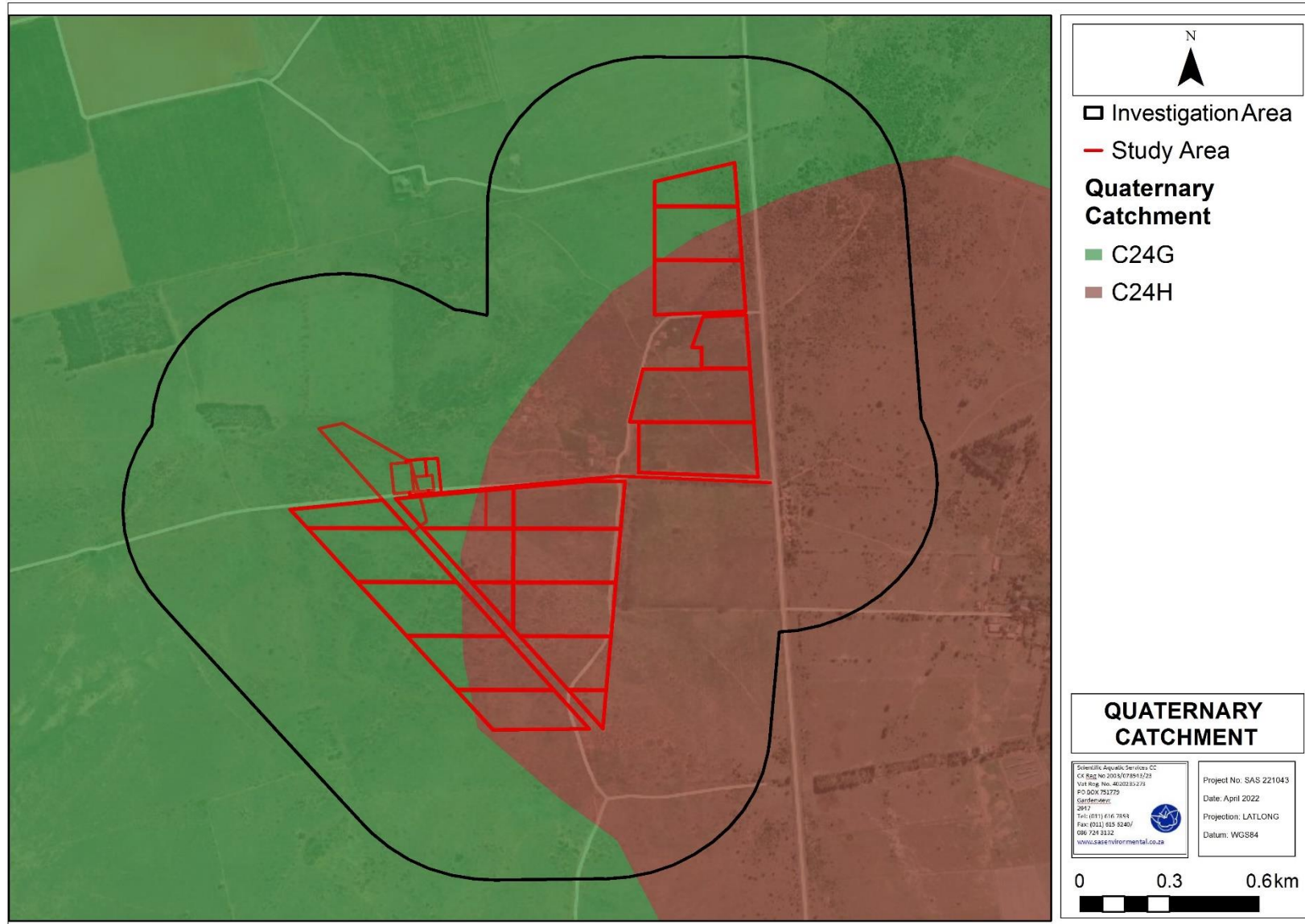


Figure A3: Quaternary catchments applicable to the study and investigation areas.



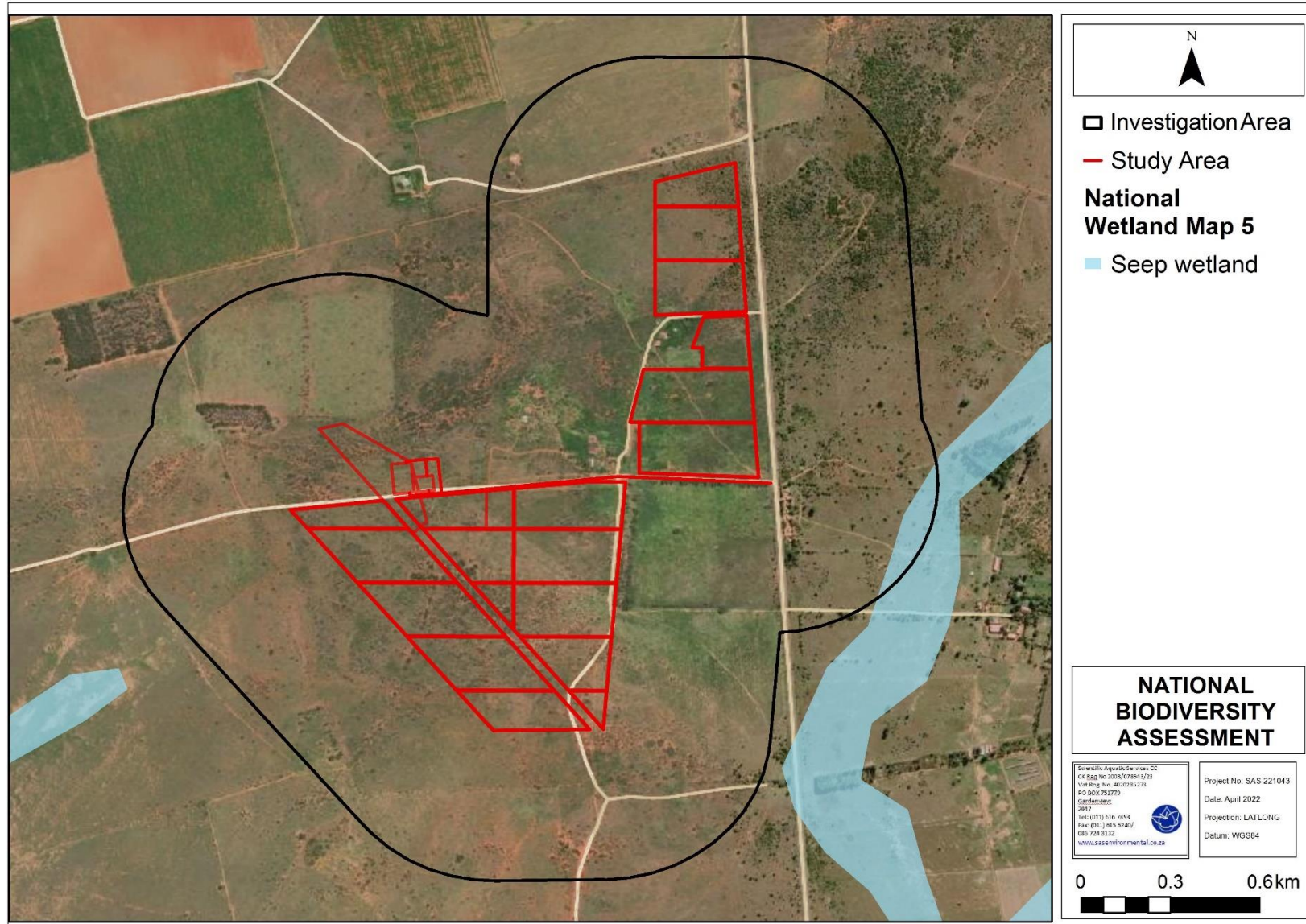


Figure A4: Wetlands within the investigation area indicated by the National Biodiversity Assessment, 2018.



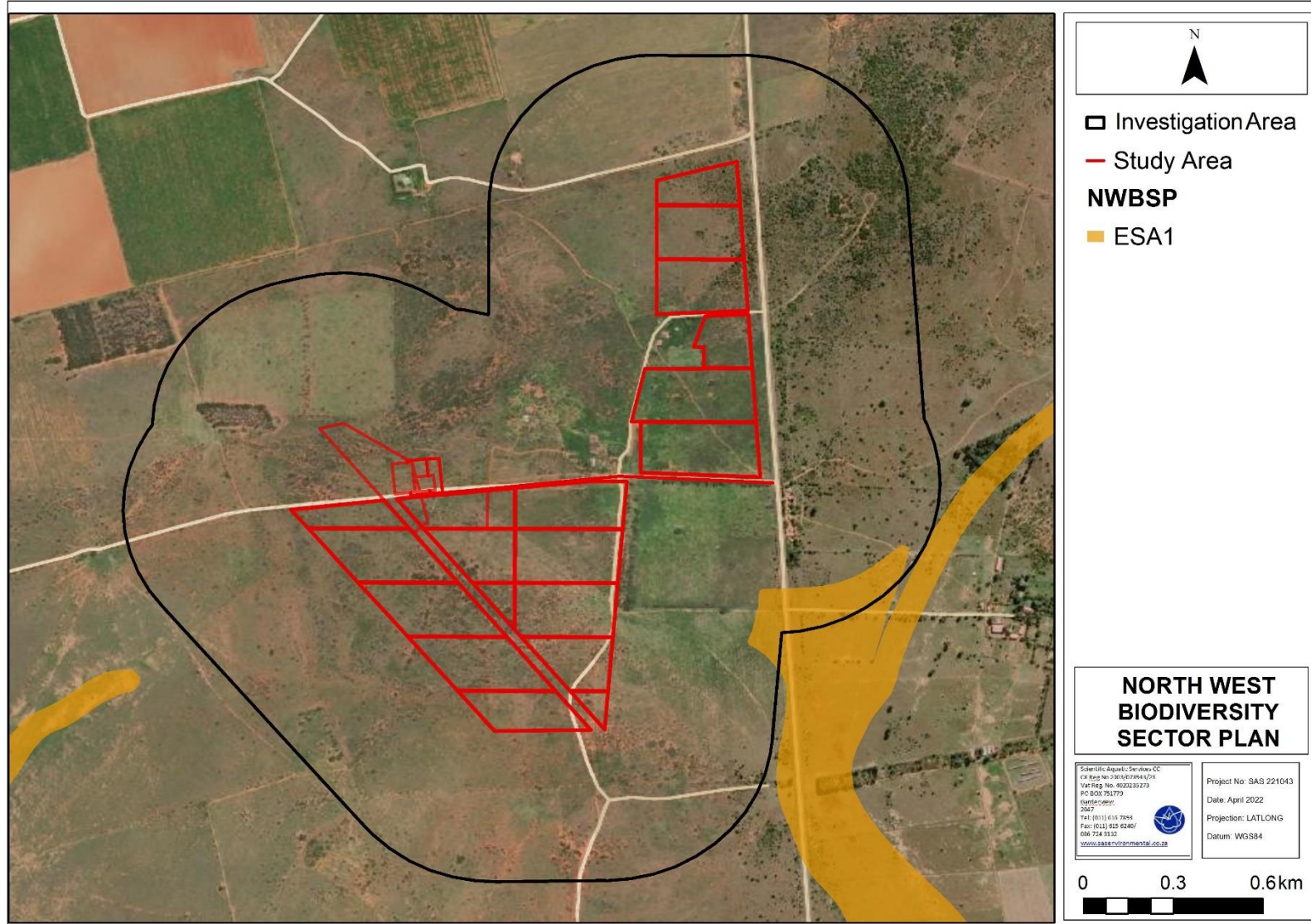


Figure A5: Ecological Support Areas (ESAs) applicable to the study and investigation areas as indicated by the North West Biodiversity Sector Plan, 2015.



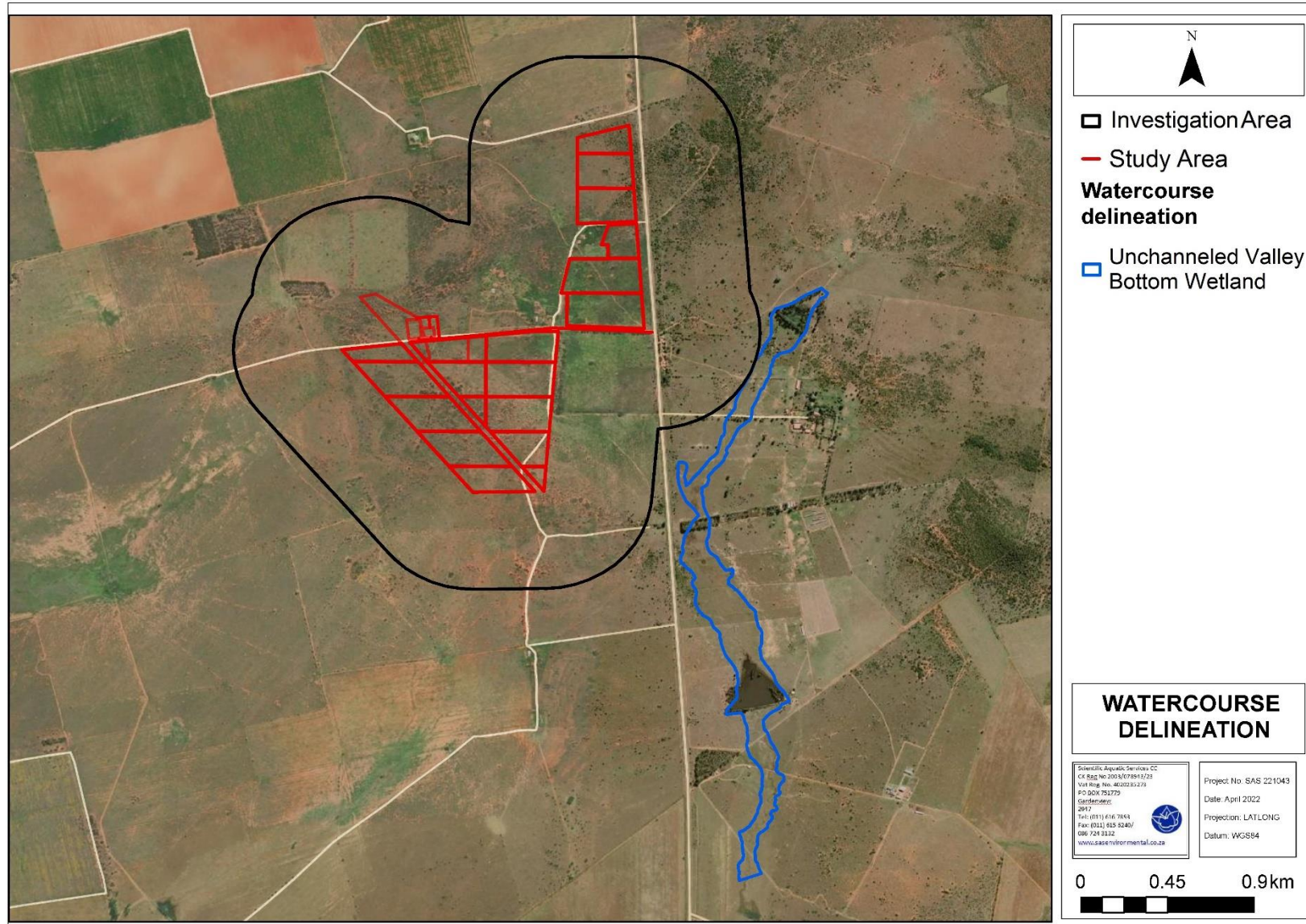


Figure A6: Location of the unchanneled valley bottom wetland in relation to the study and investigation areas.



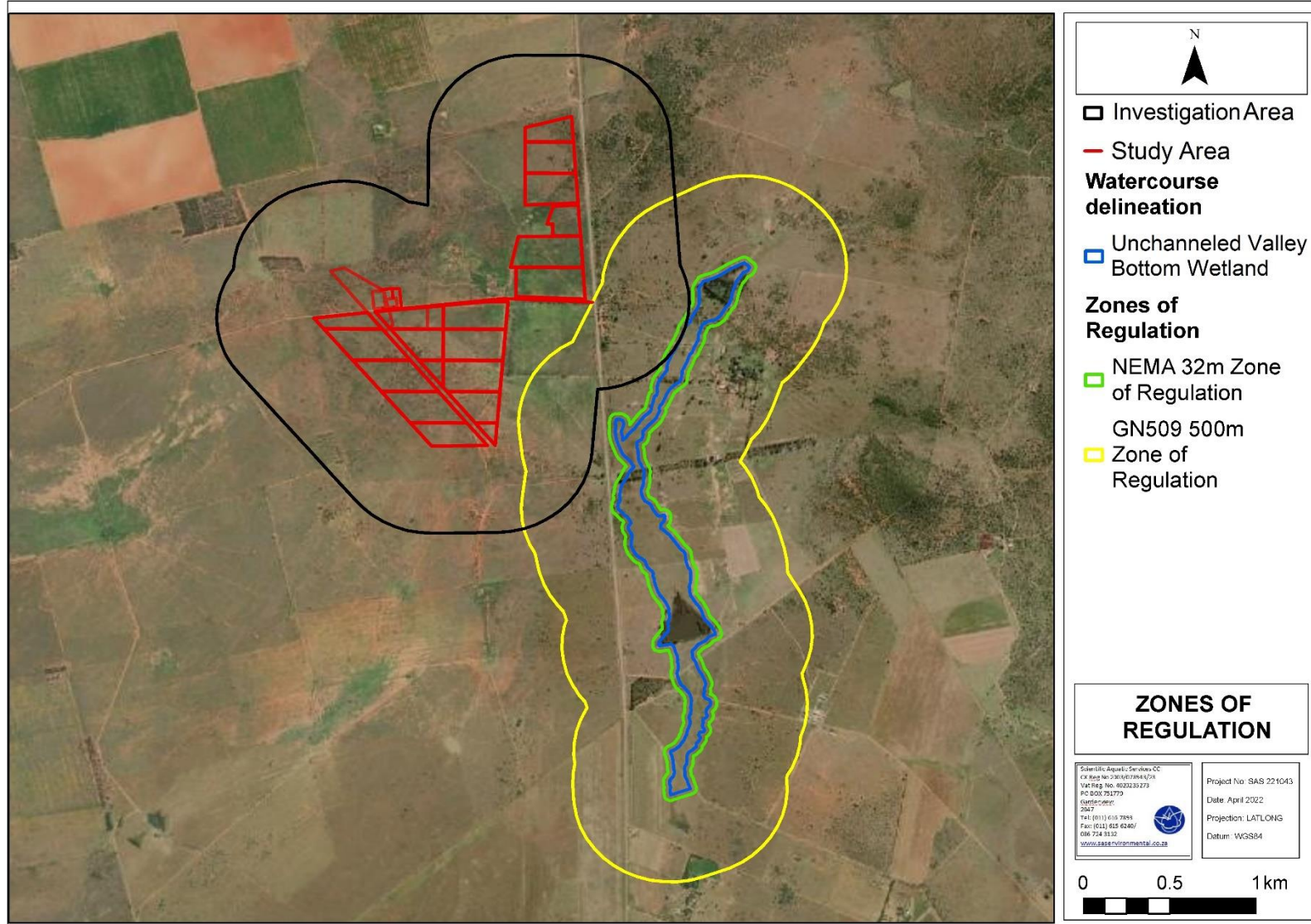


Figure A7: Zones of Regulation applicable to the unchanneled valley bottom wetland adjacent to the south-eastern boundary of the investigation area.



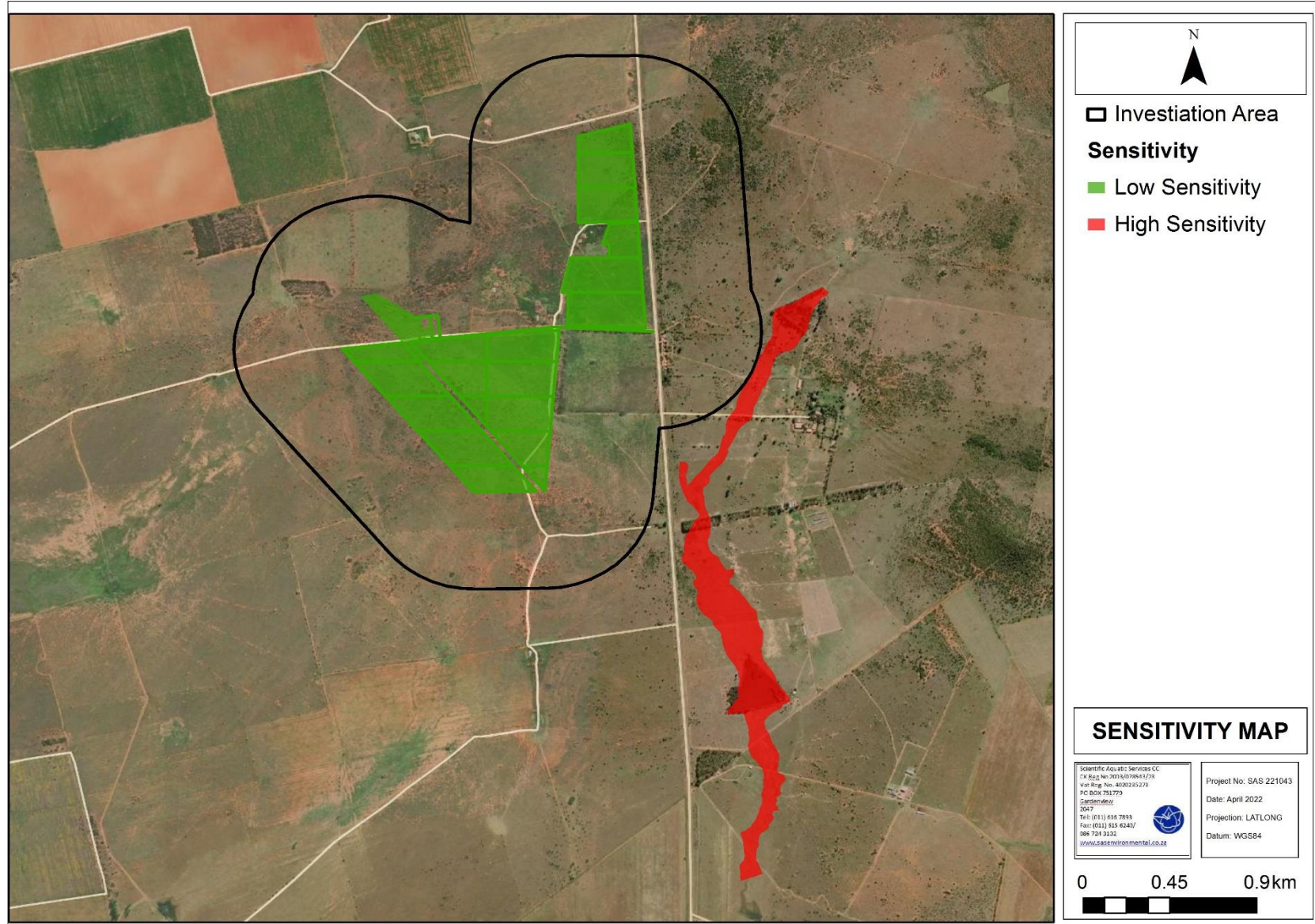


Figure A8: Site verified aquatic sensitivity of the study area.



APPENDIX B - INDEMNITY AND DECLARATION OF INDEPENDENCE

INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although SAS CC exercises due care and diligence in rendering services and preparing documents, SAS CC accepts no liability and the client, by receiving this document, indemnifies SAS CC and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by SAS CC and by the use of the information contained in this document.

This report must not be altered or added to or used for any other purpose other than that for which it was produced without the prior written consent of the author(s). This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

1. (a) (i) Details of the specialist who prepared the report

Stephen van Staden	MSc (Environmental Management) (University of Johannesburg)
Kim Marais	BSc Hons (Zoology) (University of Witwatersrand)
Amanda Mileson	Advanced Diploma: Nature Conservation (UNISA)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

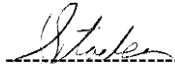
Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	1401	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Natural Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health Practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		



1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority.

I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.



Signature of the Specialist

I, Kim Marais, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.



Signature of the Specialist

I, Amanda Mileson declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct.



Signature of the Specialist

APPENDIX C - CV OF SPECIALISTS





**SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION**

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource Discipline Lead, Managing Member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
 Accredited River Health Practitioner by the South African River Health Program (RHP)
 Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
 Member of the Gauteng Wetland Forum
 Member of International Association of Impact Assessors (IAIA) South Africa;
 Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000

Short Courses

Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Tools for Wetland Assessment (Rhodes University)	2017
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2018
Wetland Management: Introduction and Delineation (WLID1502S) (University of the Free State)	2018
Hydropedology and Wetland Functioning (TerraSoil Science and Water Business Academy)	2018

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
 Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
 Eastern Africa – Tanzania Mauritius
 West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
 Central Africa – Democratic Republic of the Congo

DEVELOPMENT SECTORS OF EXPERIENCE



1. Mining: Coal, chrome, Platinum Group Metals (PGMs), mineral sands, gold, phosphate, river sand, clay, fluorspar
2. Linear developments (energy transmission, telecommunication, pipelines, roads)
3. Minerals beneficiation
4. Renewable energy (Hydro, wind and solar)
5. Commercial development
6. Residential development
7. Agriculture
8. Industrial/chemical

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Offset Plans
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Biodiversity Offset Plan

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Hydropedological Assessment

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments





**SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION**

CURRICULUM VITAE OF **KIM MARAIS**

PERSONAL DETAILS

Position in Company	Senior Scientist
	Water Resource Manager
Joined SAS Environmental Group of Companies	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)
Member of the Western Cape Wetland Forum (WCWF)

EDUCATION

Qualifications

BSc (Hons) Zoology (University of the Witwatersrand)	2012
BSc (Zoology and Conservation) (University of the Witwatersrand)	2011

Short Courses

Aquatic and Wetland Plant Identification (Crispis Environment)	2019
Tools for Wetland Assessment (Rhodes University)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, KwaZulu-Natal, Northern Cape, Eastern Cape,
Africa - Uganda

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Freshwater Offset Plan



Aquatic Ecological Assessment and Water Quality Studies

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions
- Public Participation processes





**SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION**

CURRICULUM VITAE OF AMANDA MILESON

PERSONAL DETAILS

Position in Company	Senior Ecologist: Wetland Ecology
Joined SAS Environmental Group of Companies	2013

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Wetland Society (SAWS)
Member of the International Society of Wetland Scientists
Member of the Gauteng Wetland Forum (GWF) and Northern Cape Wetland Forum (NCWF)

EDUCATION

Qualifications

N. Dip Nature Conservation (UNISA)	2017
Advanced Diploma Nature Conservation (UNISA)	2020
Postgraduate Diploma Nature Conservation (UNISA)	In progress

Short Courses

Wetland Management: Introduction and Delineation (University of the Free State)	2018
Tools for Wetland Assessment (Rhodes University)	2017
Wetland Rehabilitation (University of the Free State)	2015

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Free State, North West, Limpopo, Northern Cape, Eastern Cape

Africa – Zimbabwe, Zambia

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Freshwater Ecosystem Delineation
- Freshwater Ecosystem Verification Assessment
- Freshwater Ecosystem (wetland / riparian) Delineation and Assessment
- Freshwater Ecosystem EcoService and Status Determination
- Freshwater Ecosystem Rehabilitation Assessment / Planning
- Freshwater Ecosystem Maintenance and Management Plans
- Freshwater Ecosystem Plant Species Plans
- Freshwater Ecosystem Offset Plans

Biodiversity Assessments

- Biodiversity Ecological Assessments
- Biodiversity Offset Plans

