GCS Newcastle Office
1 Karbochem Rd, Newcastle, 2940
Cell: +27 (0) 71 102 3819 **Fax:** +27 (0) 31 764 7140 **Web:** www.gcs-sa.biz

Geohydrological Assessment for the Proposed 132kV Karpowership Transmission Line - Richards Bay Port

Report

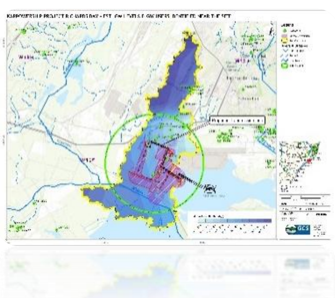
Version - Final 1

31 October 2022

Triplo4 Sustainable Solutions (Pty) Ltd

GCS Project Number: 22-0886

Client Reference: 22-0886_GW1



GCS (Pty) Ltd. Reg No: 2004/000765/07 Est. 1987
Offices: Johannesburg (Head Office) | Durban | Gaborone | Lusaka | Maseru | Windhoek | Ostrava| **Newcastle**
Directors: AC Johnstone (CEO) | H Botha | M Van Rooyen | W Sherriff (Financial) N Marday (HR) | L Pearce
Non-Executive Director: B Wilson-Jones
www.gcs-sa.biz

GEOHYDROLOGICAL ASSESSMENT FOR THE PROPOSED KARPOWERSHIP 132kV TRANSMISSION LINE - RICHARDS BAY PORT

Report
Version - Final 1

31 October 2022

Triplo4 Sustainable Solutions (Pty) Ltd

22-0886

DOCUMENT ISSUE STATUS

Report Issue	Final 1		
GCS Reference Number	GCS Ref - 22-0886_GW1		
Client Reference	22-0886_GW1		
Title	Geohydrological Assessment for the Proposed Karpowership 132kV Transmission Line - Richards Bay Port		
	Name	**Signature**	**Date**
Author (Technical Director)	Hendrik Botha (MSc, PriSciNat)	31/10/2022 8:13:59 Pr.Sci.Nat (400139/17)	31 October 2022
Proof-Reader	Lisa Botha (BSc, Hons)		31 October 2022

SECLARATION OF INDEPENDENCE

GCS (Pty) Ltd (GCS) was appointed to conduct this specialist groundwater study and to act as the independent hydrogeological specialist. GCS objectively performed the work, even if this results in views and findings that are not favourable. GCS has the expertise in conducting the specialist investigation and does not have a conflict of interest in the undertaking of this study. This report presents the findings of the investigations which include the activities set out in the scope of work.

APPENDIX 6 OF THE EIA REGULATION – CHECKLIST AND REFERENCE FOR THIS REPORT

Table 1 - Requirements from Appendix 6 of GN 326 EIA Regulation 2017

Requirements from Appendix 6 of GN 326 EIA Regulation 2017	Chapter
(a) Details of: (i) The specialist who prepare the reports; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Appendix B.
(b) Declaration that the specialist is independent in a form as may be specialities by the competent authority	Appendix B.
(c) Indication of the scope of, and purpose for which, the report was prepared	Sections 1 and 3.
(cA) Indication of the quality and age of base data used for the specialist report	Sections 1, 2 and 6.
(cB) A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 6.
(d) Duration, Date and seasons of the site investigation and the relevance of the season to the outcome of the assessment	Section 1.2.
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process include of equipment and modelling used	Section 4.
(f) Details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associate's structures and infrastructure, inclusive of a site plan identifying alternatives	Sections 2 and 5.
(g) Identification of any areas to be avoided, including buffers	Section 8.1.
(h) Map superimposing the activity and associated structures and infrastructure on environmental sensitivities of the site including areas to be avoided, including buffers	Sections 1, 2, 5 and 6.
(i) Description of any assumptions made and uncertainties or gaps in knowledge	Section 1.5. and 6.
(j) A description of the findings and potential implications of such findings on the impact of the proposed activity including identified alternatives on the environment or activities	Executive summary, Section 6.4 and 6.5.
(k) Mitigation measures for inclusion in the EMPr	Section 8.2.
(l) Conditions for inclusion in the environmental authorisation	Refer to recommendations in Section 8.
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Refer to recommendations in Section 8.
(n) Reasoned opinion – (i) as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, and avoidance, management, and mitigation measures should be included in the EMPr, and where applicable, the closure plan	Section 8.3.
(o) Description of any consultation process that was undertaken during preparing the specialist report	*None required.*
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto	*None required.*
(q) Any other information requested by the competent authority	*None required.*

CONTENTS PAGE

Seclaration of Independence 3
Appendix 6 of the EIA Regulation – CHECKLIST and Reference for this Report 4
CONTENTS PAGE v
List of Figures vi
List of Tables vi
List of Appendices vi
List of Acronyms vii
1 Introduction 8
1.1 Project background 8
1.2 Study relevance to the season in which it was undertaken 9
1.3 Objectives of this geohydrological study 10
1.4 The layout of this report 10
1.5 Gaps and study limitations 10
2 Area of Investigation 11
2.1 Climate 11
3 Scope of work 12
4 Methodology 14
4.1 Literature review and desktop study 14
4.2 Desktop hydrocensus 15
4.3 Field investigation 15
4.4 Groundwater recharge calculations 17
4.5 Groundwater quantity/availability assessment 17
4.5.1 Climate change considerations 18
4.5.2 Scale of abstraction 18
4.5.3 Water quantity stress index 19
4.6 Geohydrological risk assessment 20
4.7 Polycentric integrative approach to assessment 23
4.7.1 Polycentric integrated specialist reports considered in the assessment 23
4.7.2 Polycentric approach to the recommendations and conclusions 24
4.8 Water monitoring 25
4.9 Groundwater Management Plan 25
5 Prevailing groundwater conditions 26
5.1 Local geology and soils 26
5.2 Aquifer characteristics, classification and groundwater recharge 26
5.3 Saturated hydraulic conductivity 27
5.4 Depth to groundwater 27
5.5 Wetlands and recognised water courses 27
5.6 Present ecological state (PES) and Ecological Importance and Sensitivity 28
5.7 Groundwater quality 29
5.8 Groundwater quantity 29
5.8.1 Sub-catchment delineation 30
5.8.2 Existing groundwater usage (EU) 30
5.8.3 Basic human needs (BHN) 30
5.8.4 Proposed groundwater usage (PU) 30
5.8.5 Land use (LU) 30
5.8.6 Groundwater balance (base case) 31
5.8.7 Climate change considerations (by 2050) 32
6 Preliminary risk and impact assessment 33
6.1 Site conceptual model 33
6.2 Potential pollution migration velocities 34
6.3 Impact on reserve 34

6.4 Risk assessment associated with the proposed project 36
6.5 Cumulative Impacts associated with similar projects 38
7 Groundwater monitoring considerations 42
8 Conclusions 43
8.1 Identification of any areas that should be avoided 43
8.2 Mitigation measures for inclusion in the EMPr and EIA 44
8.3 Reasoned opinion on whether the activity should be authorized 44
9 Bibliography 45

LIST OF FIGURES

Figure 1-1: Proposed transmission line route from KPS to the national grid 9
Figure 1-2: Generic Project Concept (Triplo4, 2022) 9
Figure 2-1: Average temperature and rainfall – Richards Bay (Meteoblue, 2022) 11
Figure 3-1: Site locality, local geology and hydrogeology 13
Figure 4-1: Groundwater users identified in the study area (2.5 km buffer of the proposed transmission line) 16
Figure 4-2: Monitoring Process 25
Figure 5-1: Wetland areas & watercourses identified by wetland specialists (Triplo4, 2022) 27
Figure 5-2: Groundwater baseflow concept (DWS, 2011) 28
Figure 5-3: Groundwater conductivity for the study area (King, et al., 1998) 29
Figure 6-1: Likely impacts and associated risk – SPR model 37
Figure 6-2: SCM 39

LIST OF TABLES

Table 4-1: Groundwater users within a 2.5 km radius of the site 15
Table 4-2: Guide for determining the level of stress of a groundwater resource unit 19
Table 4-3: Proposed Criteria and Rating Scales to be used in the Assessment of the Potential Impacts 21
Table 4-4: Explanation of Assessment Criteria 22
Table 5-1: Aquifer characteristics and classification 26
Table 5-2: Summarised Quaternary Catchment Information (Aquiworx, 2015) 29
Table 5-3: Groundwater reserve determination for the sub-catchment 31
Table 5-4: Water balance considering climate change 32
Table 6-1: Scale of abstraction and Level of the stress abstraction in sub-catchment (current setting) 35
Table 6-2: Scale of abstraction and Level of the stress abstraction in sub-catchment by 2050 35
Table 6-3: Risk rating scale 36
Table 6-4: Similar projects within a 30km radius 38
Table 6-5: Potential geohydrological risks and mitigation measures (construction phase) 40
Table 6-6: Potential geohydrological risks and mitigation measures (operational phase) 41

LIST OF APPENDICES

Appendix A: Disclaimer and declaration of Independence 47
Appendix B: Details of the specialist, declaration of interest and undertaking under oath 48
CV of Specialist 50

LIST OF ACRONYMS

Acronym	Description
µg	microgram
BA	Basic Assessment
BF	Baseflow
BH	Borehole
BHN	Basic Human Needs
CRT	Constant Rate Test
d	day
DMEA	Department of Mineral and Environmental Affairs
DTM	Digital Terrain Model
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
E	East
EC	Electrical Conductivity
EU	Existing Use
Fm	Formation
G3	Best Practice Guidelines: Monitoring
G4	Best Practice Guidelines: Impact Prediction
GCS	GCS Water and Environment (Pty) Ltd
GDE	Green Door Environmental
GPS	Global Positioning System
GRAII	Groundwater Resource Assessment Ver. 2
GRDM	Groundwater Resource Directed Measures
GRIP	Groundwater Resource Information Project
GW	groundwater
IGRD	Intermediate Groundwater Reserve Determination
IWULA	Integrated Water Use License Application
km	kilometre
K-value	hydraulic conductivity
KZN	KwaZulu-Natal
l	litres
m	metres
MAE	Mean Annual Evaporation
Mag	magnetometer
mamsl	metres above mean sea level
MAP	Mean Annual Precipitation
mbcl	metres below collar level
mbgl	metres below ground level
mg	Milligram
mm	Millimetres
mS	Milli Siemens
n	Porosity
N	North
NGA	National Groundwater Archive
nT	magnetic intensity
NWA	National Water Act, 1998
Re	Recharge
Rem	Remainder
s	second
S	South
SA	South Africa
SCM	Site Conceptual Model
SPR	Source-Pathway-Receptor
SRTM	Shuttle Radar Topography Mission
T	Transmissivity
W	West
WL	Water level
WMA	Water Management Area
WRC	Water Research Council
WULA	Water Use License Application

1 INTRODUCTION

GCS Water and Environment (Pty) Ltd (GCS) was appointed by Triplo4 Sustainable Solutions (Pt) Ltd (Triplo4) to undertake a geohydrological assessment for the proposed development of a transmission line, associated with the proposed gas to power via Powerships project in Richards Bay, KZN. As the mobile Powerships will be moored in the nearby bay, the project focused on the land-based activities which may result in groundwater impacts. The project is situated in Quaternary Catchment W21F of the Pongola -Mtamvuna (DWS, 2016) Water Management Area (WMA 4).

1.1 Project background

The Project Concept comprises gas engine powerships provided by Karpowership moored on a spread mooring close to the shore or in the protection of a harbour to export power via transmission cables to an Eskom transmission switching station on the shore (refer to Figure 1-1 and Figure 1-2).

The Project entails the generation of electricity by two Powerships moored in the Port of Richards Bay, fed with natural gas from a third ship, a Floating Storage & Regasification Unit (FSRU). The three ships will be moored in the port for the Project's anticipated 20-year lifespan. A Liquefied Natural Gas Carrier (LNGC) will bring in liquified natural gas (LNG) and offload it to the FSRU approximately once every 20 to 30 days, dependent on power demand which is determined by the buyer, ESKOM. The FSRU stores the LNG onboard and turns the liquid form into gaseous form (Natural Gas) upon demand from the Powership (Regassification). Natural gas will be transferred from the FSRU to the Powerships via a subsea gas pipeline. The Project's design capacity is 540MW. Electricity will be generated on Powerships by 27 reciprocating engines, each having a heat input in excess of 10MW (design capacity of 18.32MW each at full capacity). Heat generated by operation of the reciprocating engines is captured, and that energy is used to create steam to drive three steam turbines that each have a heat input of circa 15.45MW. The contracted capacity of 450MW, which cannot be exceeded under the terms of the RMIPPPP, will be evacuated via a 132kV transmission line over a distance of approximately 3km, from the Richards Bay Port tie-in point to the Eskom line, at a connection point (necessitating a new switching station) in proximity to the existing Bayside Substation, which feeds electricity into the national grid.

Figure 1-1: Proposed transmission line route from KPS to the national grid

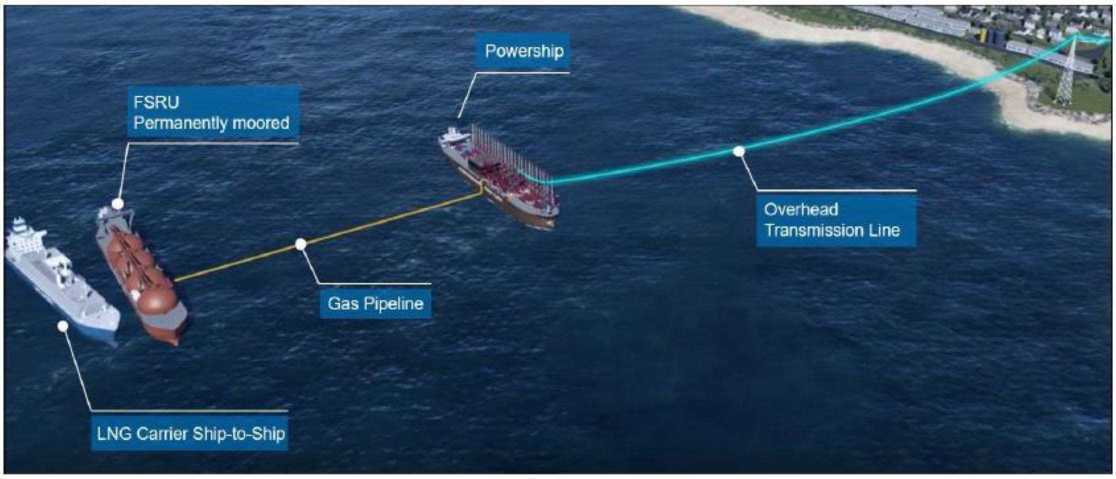


Figure 1-2: Generic Project Concept (Triplo4, 2022)

1.2 Study relevance to the season in which it was undertaken

This study was undertaken as a once-off study and relies on historical geohydrological and climate data for the site; as well as recognized geological and water resource databases for South Africa. Data generated during the time of this study is not seasonally bound as average yearly data was applied where required and as scientifically acceptable.

1.3 Objectives of this geohydrological study

The geohydrological assessment focused on the proposed construction areas associated with the transmission lines and pylons (i.e. from the connection to the endpoint of the transmission line). The geohydrological study aimed to achieve the following objectives:

- Understand and characterize the geohydrological setting, to set a basis for evaluating potential impacts relating to the proposed activities.
- Produce a comprehensive geohydrological report which can be used for decision-making purposes, and input into the Environmental Impact Assessment (EIA) for the Richards Bay Site.

1.4 The layout of this report

The report has been structured, as far as possible, as per *Annexure D of the Government Gazette (GN267 of 24 March 2017)* applicable to geohydrological studies for environmental impacts assessment/water use license applications. The report further considers *Appendix 6 of EIA regulations.*

1.5 Gaps and study limitations

The following gaps and study limitations are recognized and not reported on:

- No numerical groundwater flow and transport model was constructed for the development. GCS believes that groundwater impacts associated with the proposed activities were sufficiently evaluated via conceptual and analytical models. A numerical model will not add value to the investigation.
- Limited groundwater quality and quantity data are available for the project area. Available groundwater data was extrapolated to conceptualise the best-case hydrochemistry and groundwater conditions of the site.

2 AREA OF INVESTIGATION

The proposed transmission line ("The Site") is situated near and in the port of Richards Bay, KwaZulu-Natal Province (refer to Figure 3-1). The site is situated in Quaternary Catchment W21F of the Pongola -Mtamvuna (DWS, 2016) Water Management Area (WMA 4).

One (1) sub-catchment was delineated for the project area and describes the natural drainage of the area. The site is bound to the south by a canal which drains to the Richards Bay harbour, and the Mhlatuze River is situated further downstream of the south (across the canal). Several non-perennial streams drain the site towards the north, and the southern portion is drained via several drainage lines. Elevations on the site typically range from 0 to 50 metres above mean sea level (mamsl).

2.1 Climate

The Köppen Climate Classification suggest Richards Bay is situated in a humid subtropical climate (class = Cfa) which receives rainfall in the summer months (Kottek, et al., 2006). The Mean Annual Precipitation (MAP) is in the order of 1 285 mm/annum and the Mean Annual Evapotranspiration (MAE) is in the order of 1300 mm/a (S-Pan) (WRC, 2015).

Based on the climate model reived (2021 - 2050 under the RCP 8.5 (CSIR, 2019), the following is noted:

- The projected increase in MAP by 2050 is – 53.24 mm/yr (less);
- Projected changes are at least 9.2 more hot days compared to 2022;
- Projected increase in temperatures by as much as 1.77°C; and
- Projected increase in extreme rainfall days to increase by 1.38 days.

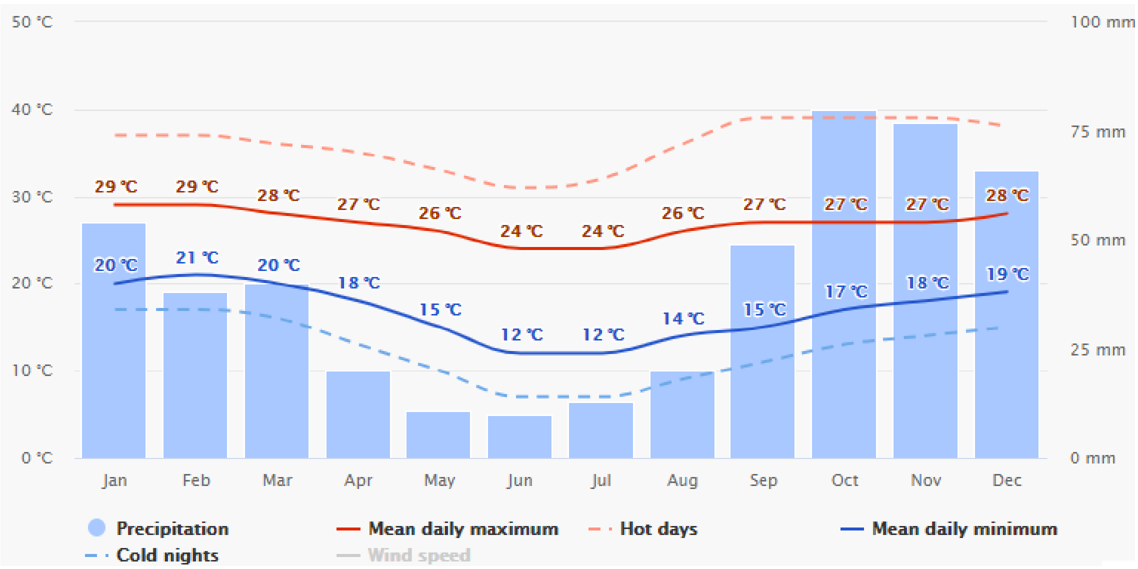


Figure 2-1: Average temperature and rainfall - Richards Bay (Meteoblue, 2022)

3 SCOPE OF WORK

The scope of work completed was as follows:

1. Desktop Assessment:
    a. All available reports relating to the site were assessed, including a review of all geohydrology, hydrology, hydrochemistry, and geology literature data.
    b. A desktop-level hydrocensus was conducted. The national groundwater archive (NGA, 2019) and groundwater resource information project (GRIP, 2016) databases were assessed to identify existing groundwater users in the area.
2. Field investigation:
    a. A site walkover and field borehole census was undertaken to identify groundwater users and sensitive groundwater areas.
3. Hydrogeological Risk and Impact Assessment:
    a. A hydrogeological and geological site conceptual model was developed with data obtained for the study area.
    b. A preliminary risk assessment was conducted based on the Source-Pathway-Receptor (SPR) model.
4. Monitoring Plan:
    a. A groundwater and surface water monitoring plan, with mitigation measures, was developed for the site based on the baseline assessment of the site conditions.
5. Reporting:
    a. A geohydrological report encompassing all work done as well as a preliminary groundwater risk assessment and monitoring plan were compiled.

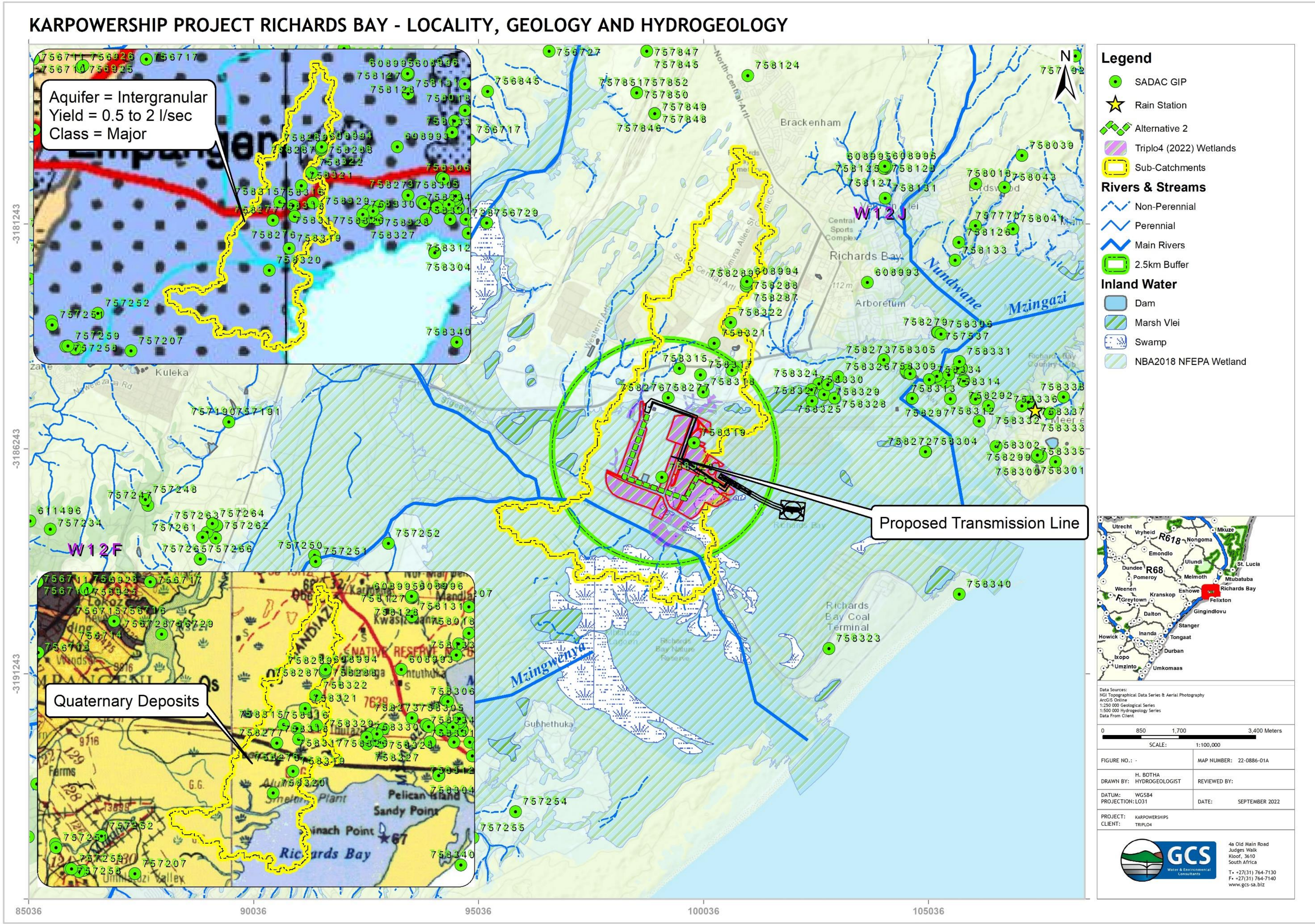
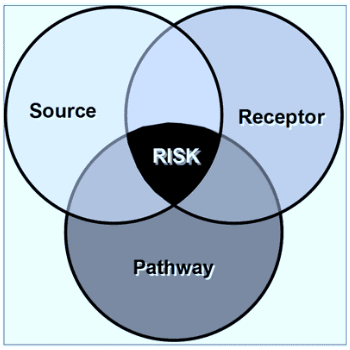


Figure 3-1: Site locality, local geology and hydrogeology

4 METHODOLOGY

A logical and holistic approach was adopted to assess the study area. The Best Practice Guidelines for Impact Prediction (G4) (Department of Water Affairs and Forestry [DWAF], 2008), were considered to define and understand the three basic components of the geohydrological risk associated with the site activities:



- **Source term** - The source of the risk;
- **Pathway** - The pathway along which the risk propagates; and
- **Receptor** - The target that experiences the risk.

The approach was used to assess:

1. How the existing/proposed site activities could impact groundwater *Quality*; and
2. How the existing/proposed site activities could affect the groundwater *Quantity*.

4.1 Literature review and desktop study

The following sources supply an overview of the geohydrological conditions of the project area, as per the desktop information reviewed for this assessment:

- Groundwater Resource Information Project (GRIP, 2016), National Groundwater Database Archives (NGA, 2019) borehole data, and SADAC GIP borehole data (SADAC GIP, 2022).
- 2730 Vryheid – 1:500 000 Hydrogeological map series (King, et al., 1998);
- 2732 St. Lucia – 1:250 000 Geological map series (DMEA, 1998);
- Literature on similar geology and hydrogeology:
  - A South African Aquifer System Management Classification (Parsons, 1995);
  - Aquifer Classification of South Africa (DWA, 2012);
  - Karoo Aquifers: Their Geology, Geometry, and Physical Properties. Water Research Council (WRC) Report No: 457/1/98 (Botha, 1998);
  - Karoo Groundwater Atlas Volume 2 (Woodford, 2013); and
  - The relationship between South African geology and geohydrology (Lourens, 2013).
- Site field investigation data.

4.2 Desktop hydrocensus

According to National Groundwater Archive (NGA) and SADAC GIP borehole data for the project area, seven (7) groundwater users within a 2.5 km radius of the proposed transmission line – refer to Figure 4-1. Groundwater boreholes and surface water users fall within other drainage zones, and will likely not be impacted by the activities at the site (drainage for the site is towards the Mshwati River). The SADAC GIP boreholes are listed in Table 4-1.

Table 4-1: Groundwater users within a 2.5 km radius of the site

Site ID	Latitude (WGS84)	Longitude (WGS84)	Elevation (mamsl)	Water Level (mbgl)
758276	-28.77679349	-28.77679349	24	No Data
758277	-28.77679349	-28.77679349	24	No Data
758315	-28.77091324	-28.77091324	32	No Data
758317	-28.77212322	-28.77212322	28	No Data
758318	-28.77557334	-28.77557334	19	No Data
758319	-28.78575374	-28.78575374	5	No Data
758320	-28.79274409	-28.79274409	10	No Data

4.3 Field investigation

The field investigation was undertaken on 22 and 23 September 2020. The following summarises the findings and work completed:

- A site walkover was completed within a 2.5 km buffer of the transmission lines, to verify groundwater-surface water interactions and to verify the existence of boreholes in the project area.

No boreholes could be located within the 2.5 km buffer, and desktop-identified boreholes could not be located. It was observed that the proposed transmission line will cross or be constructed near 3 non-perennial drainage lines.

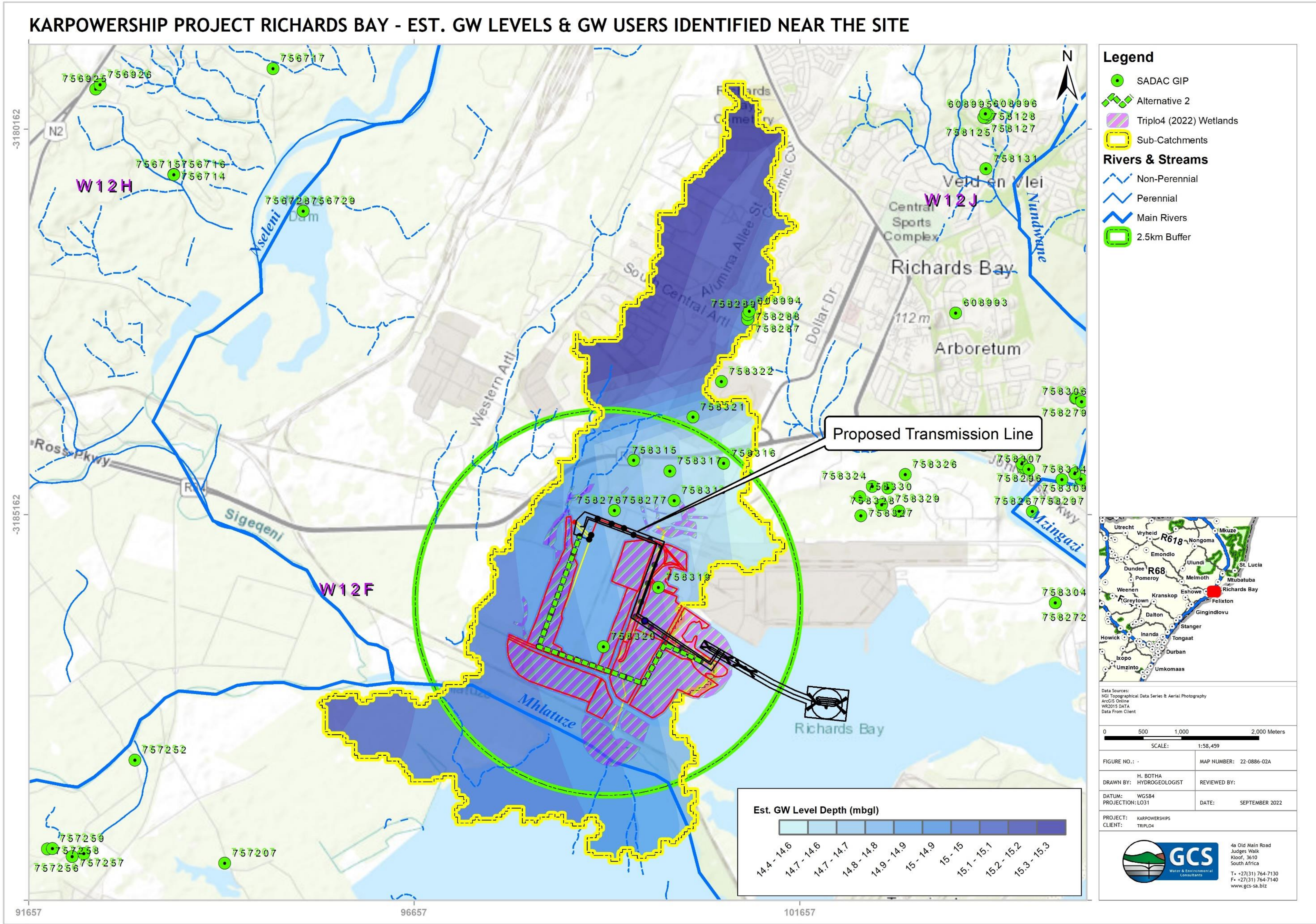


Figure 4-1: Groundwater users identified in the study area (2.5 km buffer of the proposed transmission line)

4.4 Groundwater recharge calculations

Recharge is defined as the process by which water is added from outside to the zone of saturation of an aquifer, either directly into a formation, or indirectly by way of another formation. The effective rainfall recharge is dependent on catchment geology, soils and surface run-off and stream morphology. Seepage from onsite infrastructure such as the return water dams and/or pollution control dams may contribute a small proportion of recharge to the system.

Groundwater recharge was estimated from the literature and geohydrology maps for the study area. The groundwater recharge (Re) for the local area was also calculated using the chloride method (Bredenkamp, et al., 1995) and is expressed as a percentage of the MAP. The method is based on the following equation:

$$\boldsymbol{R} = \frac{\textit{Chloride concentration in rainfall}}{\textit{Chloride concentration in ground water}}\ \boldsymbol{x\ 100} \qquad \textit{Equation 1}$$

The recharge to the aquifer was further refined and determined by running qualified guess analyses using the RECHARGE model developed by IGS (Van Tonder & Xu, 2000); (Vegter, 1995).

4.5 Groundwater quantity/availability assessment

An Intermediate Groundwater Reserve Determination (IGRD) (Parsons & Wentzel, 2007) was conducted for the study area to fulfil the requirements of the Water Use License concerning groundwater use, in terms of Section 21a of the National Water Act (No. 36 of 1998) (NWA, 1998). The IGRD aims to establish the groundwater reserve thereby quantifying the safe aquifer yield, which is required to determine aquifer dewatering impacts.

It is necessary, from a groundwater point of view, to determine the groundwater quantity and likely future impacts on quantity. Moreover, the groundwater balance gives an estimate of how much groundwater can safely be abstracted on a sub-catchment level (i.e. groundwater dewatering or wellfield dewatering).

The IGRD considers the following parameters:

- Effective recharge from rainfall and specific geological conditions;
- Basic human needs for the sub-catchment;
- Groundwater contribution to surface water (baseflow);
- Existing and proposed abstraction; and
- Surplus reserve.

The groundwater balance and the reserve determination on a sub-catchment scale are summarised below:

- $GW_{available}$ = (Re) - (EU + BHN + BF + PU)

Where:

- $GW_{available}$ = Available groundwater for use.
- Re = Effective recharge to the aquifer.
- BF = Baseflow to surface water streams.
- EU = Existing groundwater abstraction/use (identified on sub-catchment, excluding applicant).
- PU = proposed use/likely dewatering use.
- BHN = Basic Human Needs.

4.5.1 Climate change considerations

In the anticipated impacts on the groundwater, the reserve was further assessed by evaluating future rainfall changes and the impacts on groundwater recharge (CSIR, 2019). Projected changes in MAP for 2021 - 2050 under the RCP 8.5 were used to evaluate potential future impacts.

4.5.2 Scale of abstraction

Based on the DWS Requirements for Water Use License Application: Groundwater Abstraction [S21(a)], the license application must be evaluated in terms of three possible categories. Categories A, B, and C, each have an applicable list of information requirements for the license application. The categories are as follows:

Small-scale abstractions (< 60% recharge)	**Category A**
Medium-scale abstractions (60-100% recharge)	**Category B**
Large-scale abstractions (> 100% of recharge)	**Category C**

The scale of abstraction for the sub-catchment, and depending on if there is an abstraction in the sub-catchment or if groundwater abstraction is proposed for this project that may impact the overall abstraction scale, were evaluated as per above. A base case and climate change scenario was evaluated.

4.5.3 Water quantity stress index

The status of a groundwater resource unit can be assessed in terms of sustainable use, observed ecological impacts, or water stress. As no ecological reserve is available for the affected catchment, the impact of the proposed abstraction on the ecological reserve cannot be determined.

The concept of stressed water resources is addressed by the National Water Act, 1998 (Act No. 36 of 1998) (NWA) but is not defined. Part 8 of the Act gives some guidance by providing the following qualitative examples of 'water stress':

- Where water demands are approaching or exceed the available supply.
- Where water quality problems are imminent or already exist; or
- Where water resource quality is under threat.

To provide a quantitative means of defining stress, a groundwater stress index was developed by dividing the volume of groundwater abstracted from a groundwater unit by the estimated recharge to that unit (Parsons and Wentzel, 2007). However, this concept does not take cognisance of the impact of other land-use practices on groundwater and surface water resources. It is therefore proposed to modify the stress index by taking the groundwater contribution to baseflow into account.

The modified stress index is as follows:

Stress Index = Proposed Abstraction / (Recharge - Baseflow)

The stress index and classes described in Table 4-2 are a guide for determining the level of stress of a groundwater resource unit, based on abstraction, baseflow, and recharge (modified after (Parsons & Wentzel, 2007)).

Table 4-2: Guide for determining the level of stress of a groundwater resource unit

Present Status Category	Description	Stress Index
A	Unstressed or low level of stress	< 0.05
B		0.05 - 0.2
C	Moderate levels of stress	0.2 - 0.5
D		0.5 - 0.75
E	Stressed	0.75 - 0.95
F	Critically stressed	> 0.95

The stress on the groundwater resource for a base case and climate change scenario was estimated based on the guidelines above and depending on if groundwater abstraction is proposed.

4.6 Geohydrological risk assessment

Due to the assessment forming part of a larger risk assessment for the study area, the potential impacts and the determination of impact significance were assessed. The process of assessing the potential impacts of the project encompasses the following four activities:

1. Identification and assessment of potential impacts.
2. Prediction of the nature, magnitude, extent, and duration of potentially significant impacts.
3. Identification of mitigation measures that could be implemented to reduce the severity or significance of the impacts of the activity; and
4. Evaluation of the significance of the impact after the mitigation measures have been implemented i.e., the significance of the residual impact.

Per GNR 982 of the EIA Regulations (2014), the significance of potential impacts was assessed in terms of the following criteria:

I. Cumulative impacts.
II. Nature of the impact.
III. The extent of the impact.
IV. Probability of the impact occurring.
V. The degree to which the impact can be reversed.
VI. The degree to which the impact may cause irreplaceable loss of resources; and
VII. The degree to which the impact can be mitigated.

Table 4-3 provides a summary of the criteria used to assess the significance of the potential impacts identified. An explanation of these impact criteria is provided in Table 4-4.

The net consequence is established by the following equation:

Consequence = (Duration + Extent + Irreplaceability of resource) x Severity

And the environmental significance of an impact was determined by multiplying consequence by probability.

Table 4-3: Proposed Criteria and Rating Scales to be used in the Assessment of the Potential Impacts

Criteria	Rating Scales	Notes
Nature	Positive (+)	An evaluation of the effect of the impact related to the proposed development.
	Negative (-)	
Extent	Footprint (1)	The impact only affects the area in which the proposed activity will occur.
	Site (2)	The impact will affect only the development area.
	Local (3)	The impact affects the development area and adjacent properties.
	Regional (4)	The effect of the impact extends beyond municipal boundaries.
	National (5)	The effect of the impact extends beyond more than 2 regional/provincial boundaries.
	International (6)	The effect of the impact extends beyond country borders.
Duration	Temporary (1)	The duration of the activity associated with the impact will last 0-6 months.
	Short-term (2)	The duration of the activity associated with the impact will last 6-18 months.
	Medium-term (3)	The duration of the activity associated with the impact will last 18 months - 5 years.
	Long-term (4)	The duration of the activity associated with the impact will last more than 5 years.
Severity	Low (1)	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected.
	Moderate (2)	Where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive, or vulnerable systems or communities are negatively affected.
	High (3)	Where natural, cultural, or social functions and processes are altered to the extent that the natural process will temporarily or permanently cease; and valued, important, sensitive, or vulnerable systems or communities are substantially affected.
Potential for impact on irreplaceable resources	No (0)	No irreplaceable resources will be impacted.
	Yes (1)	Irreplaceable resources will be impacted.
Consequence	Extremely detrimental (-25 to -33)	A combination of extent, duration, intensity, and the potential for impact on irreplaceable resources.
	Highly detrimental (-19 to -24)	
	Moderately detrimental (-13 to -18)	
	Slightly detrimental (-7 to -12)	
	Negligible (-6 to 0)	
	Slightly beneficial (0 to 6)	
	Moderately beneficial (13 to 18)	
	Highly beneficial (19 to 24)	
	Extremely beneficial (25 to 33)	
Probability (the likelihood of the impact occurring)	Improbable (0)	It is highly unlikely or less than 50 % likely that an impact will occur.
	Probable (1)	It is between 50 and 70 % certain that the impact will occur.
	Definite (2)	It is more than 75 % certain that the impact will occur, or the impact will occur.
Significance	Very high - negative (-49 to -66)	A function of Consequence and Probability.
	High - negative (-37 to -48)	
	Moderate - negative (-25 to -36)	
	Low - negative (-13 to -24)	
	Neutral - Very low (0 to -12)	
	Low - positive (0 to 12)	
	Moderate - positive (13 to 24)	
	High-positive (37 to 48)	
	Very high - positive (49 to 66)	

Table 4-4: Explanation of Assessment Criteria

Criteria	Explanation
Nature	This is an evaluation of the type of effect the construction, operation, and management of the proposed development would have on the affected environment. Will the impact of change on the environment be positive, negative, or neutral?
Extent or Scale	This refers to the spatial scale at which the impact will occur. The extent of the impact is described as footprint (affecting only the footprint of the development), site (limited to the site), and regional (limited to the immediate surroundings and closest towns to the site). The extent of scale refers to the actual physical footprint of the impact, not to the spatial significance. It is acknowledged that some impacts, even though they may be of a small extent, are of very high importance, e.g., impacts on species of very restricted range. To avoid “double counting, specialists have been requested to indicate spatial significance under “intensity” or “impact on irreplaceable resources” but not under “extent” as well.
Duration	The lifespan of the impact is indicated as temporary, short, medium, and long-term.
Severity	This is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. Does the activity destroy the impacted environment, alter its functioning, or render it slightly altered?
Impact on irreplaceable resources	This refers to the potential for an environmental resource to be replaced, should it be impacted. A resource could be replaced by natural processes (e.g., by natural colonization from surrounding areas), through artificial means (e.g., by reseeding disturbed areas or replanting rescued species) or by providing a substitute resource, in certain cases. In natural systems, providing substitute resources is usually not possible, but in social systems, substitutes are often possible (e.g., by constructing new social facilities for those that are lost). Should it not be possible to replace a resource, the resource is essentially irreplaceable e.g., red data species that are restricted to a particular site or habitat to a very limited extent.
Consequence	The consequence of the potential impacts is a summation of the above criteria, namely the extent, duration, intensity, and impact on irreplaceable resources.
Probability of occurrence	The probability of the impact occurring is based on the professional experience of the specialist with environments of a similar nature to the site and/or with similar projects. It is important to distinguish between the probability of the impact occurring and the probability that the activity causing a potential impact will occur. Probability is defined as the probability of the impact occurring, not as the probability of the activities that may result in the impact.
Significance	Impact significance is defined to be a combination of the consequence (as described below) and the probability of the impact occurring. The relationship between consequence and probability highlights that the risk (or impact significance) must be evaluated in terms of the seriousness (consequence) of the impact, weighted by the probability of the impact occurring. In simple terms, if the consequence and probability of an impact are high, then the impact will have a high significance. The significance defines the level to which the impact will influence the proposed development and/or environment. It determines whether mitigation measures need to be identified and implemented and whether the impact is important for decision-making.
Degree of confidence in predictions	Specialists and the EIR team were required to indicate the degree of confidence (low, medium, or high) that there is in the predictions made for each impact, based on the available information and their level of knowledge and expertise. The degree of confidence is not taken into account in the determination of consequence or probability.
Mitigation measures	Mitigation measures are designed to reduce the consequence or probability of an impact or to reduce both consequence and probability. The significance of impacts has been assessed both with mitigation and without mitigation.

4.7 Polycentric integrative approach to assessment

A polycentric approach to the proposed project requires the holistic consideration of all relevant factors, inclusive of potential impacts that the proposed Project could have on the local as well as the broader community. Section 2(4)(b) of NEMA states that Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option. Sustainable development as per NEMA requires the integration of social, economic, and environmental factors in the planning, implementation, and evaluation of proposed projects, to ensure that development serves the needs of present and future generations.

This specialist assessment considered both the positive and negative impacts of actual and potential impacts on the geographical, physical, biological, social, economic, and cultural aspects of the environment in a polycentric and holistic approach:

- To ensure that all aspects are weighed up against each other;
- To identify the risks and consequences of alternatives and options for mitigation of activities, to minimise negative impacts, maximise benefits, and promote compliance with the principles of environmental management as set out in section 2 of NEMA.

A specialist integrative workshop and weekly meetings were held during the EIA process where specialists raised matters to be considered by the specialist team and also verified technical information to prevent any discrepancies and where relevant, to coordinate approaches.

This approach ensured that there are no gaps contained between the various specialist reports and provides a holistic picture of the project and allows a polycentric assessment of environmental and socio-economic impacts and the identification of appropriate mitigations and recommendations for potential negative impacts and the maximisation of positive impacts and the value of the project to society.

4.7.1 Polycentric integrated specialist reports considered in the assessment

For this investigation, the following specialist reports were considered to verify potential cumulative impacts and sources in the receiving surface-groundwater environments.

- GCS (2022) Aquatic Assessment for the Richards Bay Port; and
- Triplo4 (2022) Wetland Delineation & Functional Assessment for the Proposed Transmission Lines from the Port of Richards Bay to the proposed Switching Station, uMhlathuze Local and Uthungulu District Municipalities, KwaZulu-Natal.

It was found that the sources and receivers as identified in this investigation, align with those of the reports reviewed and information brought forward weekly meetings held during the EIA process. The wetland report provided input in terms of verified wetland units that may be at risk, as indicated in the wetland and recognised water courses section of this report. The wetland report was further used to derive verified responsive soil types in the project area.

4.7.2 Polycentric approach to the recommendations and conclusions

The following specialists considered the geohydrology findings and recommendations and internalised these within their reports to ensure a polycentric integrative approach to evaluations, assessment and recommendations:

- Aquatic Assessment; and
- Wetland Assessment.

4.8 Water monitoring

The monitoring network is based on the principles of a monitoring network design as described by the DWAF Best Practice Guidelines: G3 Monitoring (DWAF, 2007). The methodological approach that the monitoring plan follows is represented in Figure 4-2, below.

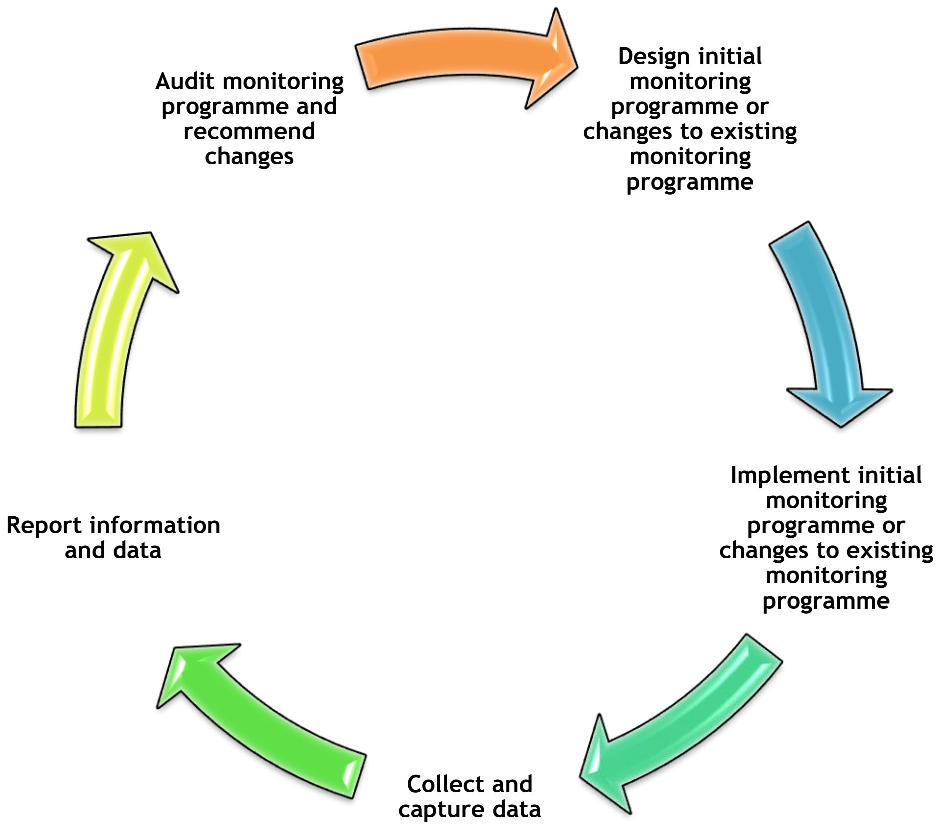


Figure 4-2: Monitoring Process

A groundwater monitoring improvement, or full monitoring plan, was developed based on available site information and risks identified.

4.9 Groundwater Management Plan

Groundwater management measures were formulated based on the results of the groundwater impact assessment. A groundwater monitoring network was proposed based on existing and predicted groundwater impacts.

5 PREVAILING GROUNDWATER CONDITIONS

The following section supplies an overview of the prevailing geohydrological conditions encountered in the area for the proposed development. The data were derived from available literature sources and completed fieldwork.

5.1 Local geology and soils

According to the 2732 Durban-1:250 000 Geological map series (DMEA, 1998), the local geology at the site is characterised by undifferentiated quaternary sands, underlain by older Swazian aged Gneiss (refer to Figure 3-1).

According to the Land types of South Africa database (ARC, 2006), the soils in the area predominantly consist of sandy soils classified as reclaimed land, associated with the Ia74 land type [Freely drained, yellow, eutrophic, apedal soils comprise > 40% of the land type (red soils comprise <10%)].

5.2 Aquifer characteristics, classification and groundwater recharge

The general aquifer characteristics and aquifer classification are summarised in Table 5-1, below.

Table 5-1: Aquifer characteristics and classification

Aquifer Characteristics	Aquifer Classification
The aquifers underlying the site consist of undifferentiated sand. The aquifer has a low to medium hydraulic conductivity (K-value) and porosity (n-value). The aquifer can be referred to as being primarily fractured, with intergranular occurrences associated with the sand deposits (King, et al., 1998). The aquifer's weathered zone is reported to be approx. 20 m thick, with the fractured zone approx. 16 m thick (DWAF, 2006). The combined aquifer thickness is estimated to be in the order of 177 m. Groundwater is typically encountered in: • Saturated sands; and • Karstic weathering in calcareous Uloa Formation (King, et al., 1998). Recharge to the underlying aquifer is estimated to range from 4.7 to 12% which falls within quaternary catchment W21F (DWAF, 2006). The aquifer is an important contributor to groundwater baseflow to streams and rivers (King, Maritz, & and Jonck, 1998)	The aquifer present is classified as a Major Aquifer system (Parsons, 1995). The aquifer is typically targeted for groundwater production (i.e. in areas where high yields occur). Two (2) aquifer systems are envisaged: • An unconfined aquifer associated with the unconsolidated sands; and • A confined and fractured aquifer network associated with deeper and older granite/gneiss rock. The aquifer underlying the site can be considered a moderate-yielding aquifer (King, et al., 1998) with reported yields ranging from 0.5 to 2 l/sec (Class A3-A4 aquifer).

5.3 Saturated hydraulic conductivity

Literature suggests that the saturated hydraulic conductivity (K-values) of the undifferentiated sand varies between 1 x 10^{-1} and 1 x 10^{-3} m/day (Botha *et al.*, 1998); (Lourens, 2013).

5.4 Depth to groundwater

According to DWAF (2006), the groundwater depth on a quaternary scale is in the order of 16.5 mbgl. WRC (2015) data suggest that the groundwater table ranges from 3 to 15 mbgl, for the sub-catchment (refer to Figure 4-1). The literature further suggests that the groundwater table mimics the surface topography. Shallower groundwater levels will typically be associated with low-lying areas near the Mhlatuze River.

5.5 Wetlands and recognised water courses

The site falls within an area classified as a subtropical wetland (estuary) (Van Deventer, 2018). The estuary is classified as being poorly protected.

Triplo4 (2022) undertook a wetland assessment and identified wetlands within a 500 m buffer of the proposed transmission line. The wetland areas and water courses are shown in Figure 5-1.

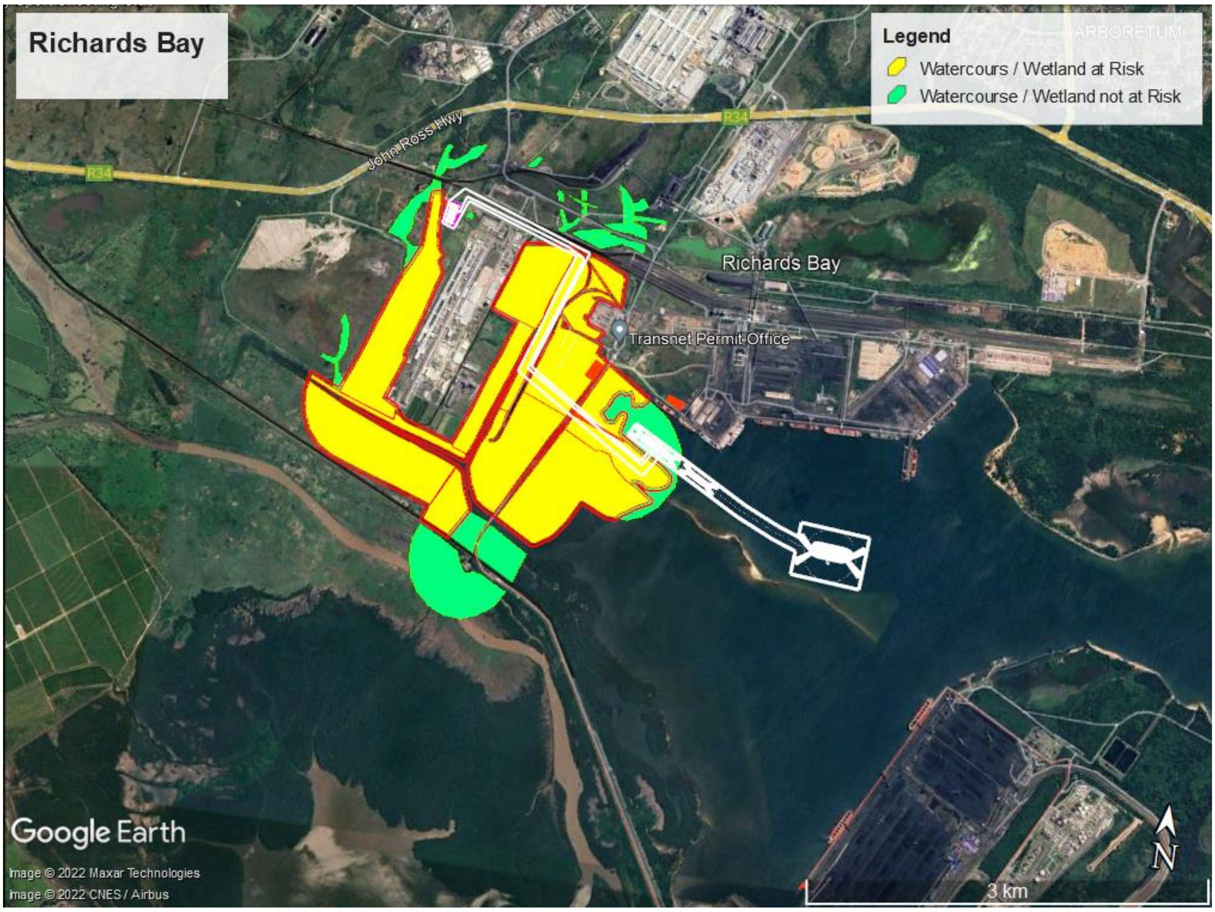


Figure 5-1: Wetland areas & watercourses identified by wetland specialists (Triplo4, 2022)

In terms of wetland geo-hydrology, baseflow is considered the most important contributor to wetland health. Baseflow (refer to Figure 5-2) is a non-process-related term to signify low amplitude high-frequency flow in a river during dry or fair-weather periods. Baseflow is not a measure of the volume of groundwater discharged into a river or wetland, but it is recognised that groundwater contributes to the baseflow component of river or wetland flow.

Available literature (WRC, 2015; DWAF, 2006) suggests groundwater contribution to baseflow ranges from 51.12 mm/yr [Pitman Model] to 131.37 mm/yr [Hughes Model], which relates to about 4 to 10% of the MAP.

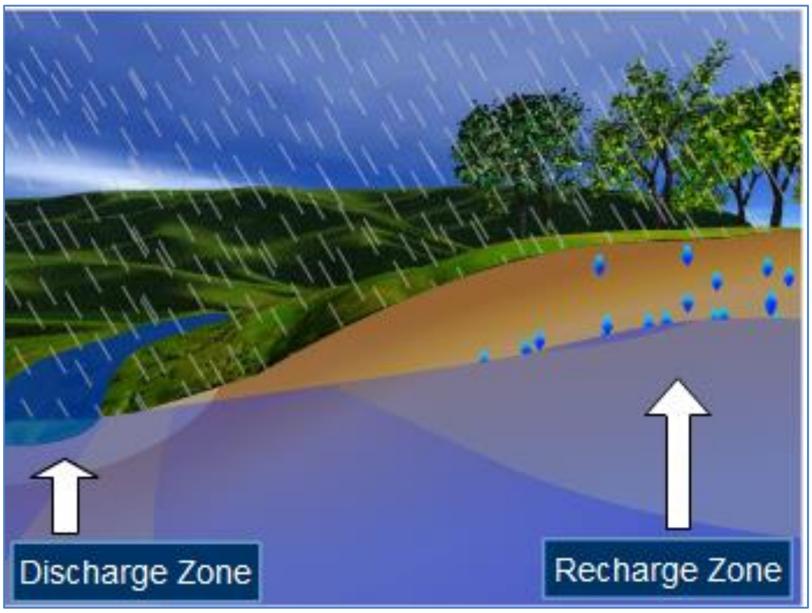


Figure 5-2: Groundwater baseflow concept (DWS, 2011)

5.6 Present ecological state (PES) and Ecological Importance and Sensitivity

The PES for quaternary catchment W21F is classified as Class C: Moderately modified and the Ecological Importance and Sensitivity (EIS) as moderately sensitive (SANBI, 2011).

5.7 Groundwater quality

No groundwater boreholes were discovered during the field hydrocensus. Hence, no groundwater samples could be obtained.

Literature suggests that the electrical conductivity (EC) for the underlying aquifer generally ranges between 0 – 70 mS/m (milli Siemens/metre) and the pH ranges from 6 to 8 – refer to Figure 5-3. This means that groundwater abstracted from the aquifer can generally be used for domestic and recreational use (DWAF, 1998). However, is anticipated that the aquifer near the ocean may exhibit high salinity in the order of 300 to 1200 mS/m.

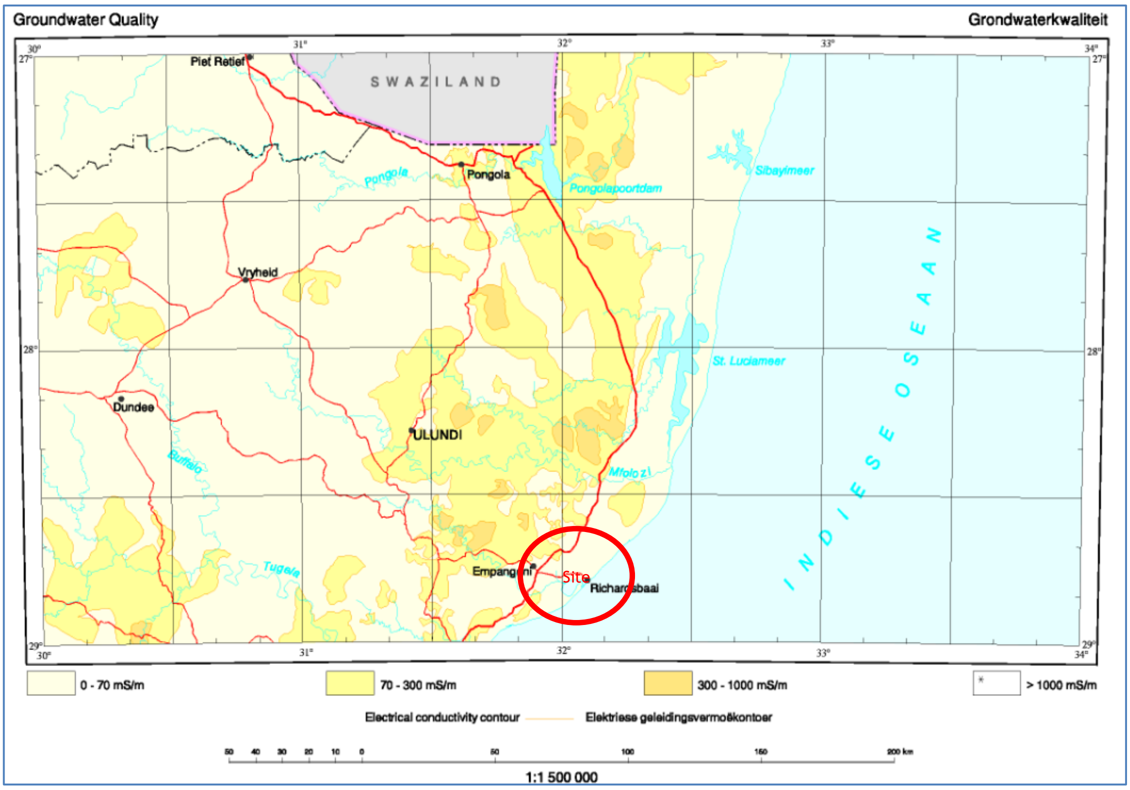


Figure 5-3: Groundwater conductivity for the study area (King, et al., 1998)

5.8 Groundwater quantity

Data from relevant hydrogeological databases, including the Groundwater Resource Directed Measures (GRDM), was obtained from the Department of Water and Sanitation (DWS) and (Aquiworx, 2015). Table 5-2 summarises the quaternary catchment data.

Table 5-2: Summarised Quaternary Catchment Information (Aquiworx, 2015)

Quaternary Catchment	Total Area (km²)	Recharge (mm/a)	Rainfall (mm/a)	Baseflow (mm/a)	Population
W21F	399	154.20	1285.3	51.12	Unknown

5.8.1 Sub-catchment delineation

A sub-catchment was delineated with Global Mapper. A 30 m ALOS (JAXA, 2019) digital terrain model (DTM) was used as input and the drainage systems were delineated for the study area (1:10 000 stream count with a 15 m DTM sink fill applied).

The delineated sub-catchment is indicated in Figure 4-1. The total extent of the sub-catchment area is approx. 22.6 km^2.

5.8.2 Existing groundwater usage (EU)

Eleven (11) SADAC GIP boreholes are situated within the boundary of the sub-catchment. Assuming a median aquifer yield of 0.5 l/sec, an existing use in the order of 475.2 m^3/day is assumed.

5.8.3 Basic human needs (BHN)

Available GRIP (2016)/NGA (2019) data suggest that the aquifer is poorly exploited. Hence, no BHN is preserved.

5.8.4 Proposed groundwater usage (PU)

No groundwater abstraction is proposed as part of this study.

5.8.5 Land use (LU)

Due to the scale of the proposed development (i.e. small-scale linear transmission development), marginal negative impacts in terms of groundwater recharge are anticipated.

5.8.6 Groundwater balance (base case)

The reserve determination for the sub-catchment associated with the project is summarised in Table 5-3. There is a surplus reserve on a sub-catchment level.

Table 5-3: Groundwater reserve determination for the sub-catchment

Richards Bay		
Area	22.60	km^2
Rainfall	1285.00	mm/yr
BF	51.12	mm/yr
Aquifer Recharge		
Re	154.20	mm/yr
Re to Aquifer	3 484 920.00	m^3/yr
Re	12.00	%
Existing Use (EU)		
11 SADAC GIP	475.20	m^3/day
Total EU Day	475.20	m^3/day
Total EU Year	173448.00	m^3/yr
Basic Human Needs		
BHN	0.00	m^3/day
BHN	0.00	m^3/yr
Base Flow		
BF	1155312.00	m^3/yr
Available	2156160.00	m^3/yr
Proposed Use (PU)		
Total PU Day	0.00	m^3/day
Total PU Year	0.00	m^3/yr
Nett Balance	2156160.00	m^3/yr

5.8.7 Climate change considerations (by 2050)

The water balances for the sub-catchment considering climate change by 2050 are summarised in Table 5-4. The MAP for 2021 - 2050 under the RCP 8.5 is predicted to reduce by 43.74 mm/yr. The water balance suggests a decrease of -395.58 m³/day on a sub-catchment scale available for groundwater uptake by 2050.

No groundwater abstraction is proposed as part of this project. Hence, climate change will highly likely not impact the activities associated with this project, from a geohydrological perspective.

Table 5-4: Water balance considering climate change

Richards Bay		
Area	22.60	km²
Rainfall	1231.76	mm/yr
BF	51.12	mm/yr
Aquifer Recharge		
Re	147.81	mm/yr
Re to Aquifer	3 340 533.12	m³/yr
Re	12.00	%
Existing Use (EU)		
11 SADAC GIP	475.20	m³/day
Total EU Day	475.20	m³/day
Total EU Year	173448.00	m³/yr
Basic Human Needs		
BHN	0.00	m³/day
BHN	0.00	m³/yr
Base Flow		
BF	1155312.00	m³/yr
Available	2011773.12	m³/yr
Proposed Use (PU)		
Total PU Day	0.00	m³/day
Total PU Year	0.00	m³/yr
Nett Balance	2011773.12	m³/yr

6 PRELIMINARY RISK AND IMPACT ASSESSMENT

The anticipated hydrogeological risk concerning the project infrastructure and activities, in terms of likely contributors to groundwater risk, was assessed. The SPR model (DWAF, 2008) was used to model potential pollution sources and primary receptors within the study area.

6.1 Site conceptual model

The site conceptual geohydrological model (SCM) for the site is shown in Figure 6-2, below. The SCM shows that two (2) aquifers exist in the area:

- An unconfined aquifer associated with unconsolidated sands; and
- A confined and fractured aquifer network associated with deeper and older granite/gneiss rock.

The aquifer underlying the site consists of undifferentiated sand and can be regarded as a low to a moderate-yielding aquifer, with reported yields ranging from 0.1 to 0.5 l/sec. Based on extrapolated groundwater level data, it is estimated that the groundwater level for the site is in the order of 13 mbgl. Available data suggest that the groundwater table mimics the topography and groundwater flows from high-lying areas (water divides) to low-lying areas.

In the SCM, the main source of groundwater recharge is rainfall. The rainfall infiltrates into the ground to become groundwater through the Vadose Zone. The water then moves both vertically and horizontally in the weathered zone. Water flowing horizontally towards the south-east is likely to discharge into the perennial streams/river and wetland areas as base flow whereas water flowing vertically is likely to recharge the fractured aquifer (i.e. partially due to vertical percolation through the vadose zone and weathered aquifer zones).

Any poor-quality seepage from the activities associated with the development of the transmission lines (i.e. crossing of waterbodies with vehicles, seepage and runoff from oil spillages and building material dumping along the watercourse) could lead to contamination of the vadose zone which could percolate to the shallow aquifer. This risk is more likely to occur during the construction phase and not the operational phase of the project.

6.2 Potential pollution migration velocities

Based on available aquifer data and Darcy's Law[1] for groundwater flow through a saturated medium and aquifer hydraulic conductivity (K), the following pollution migration rates are likely:

1. Shallow and deeper aquifer zones:
    a. K values for the aquifer sediments in the study area generally vary between 1×10^{-1} and 1×10^{-4} m/day
    b. Based on the average hydraulic gradient of the area (0.01 to 0.5), pollution migration velocities in the range of 3×10^{-6} to 0.005 m/day, are likely.

The above-mentioned Darcy seepage velocity suggests very slow-moving groundwater through the study area.

6.3 Impact on reserve

The scale of abstraction and aquifer stress for the combined groundwater sub-catchment is summarised in Table 6-1 (base case) and Table 6-2 (climate change). It can be seen that the current scale of abstraction for the sub-catchment associated with the project is predicted at "Small Scale", and aquifer stress is "Class A - Unstressed or low level of stress". The stress-induced is maintained under the climate change scenario (Projected reduction in MAP for 2021 - 2050 under the RCP 8.5 = -53.24 mm/yr).

The tables provided illustrates the changes in the scale of impact as a result of future climate change and should be considered if any groundwater abstraction is proposed for this project. The abstraction proposed would then add to the cumulative stress and scale indices for the sub-catchment delineated.

The proposed development involves one transmission line (i.e. limited impermeable surface generation), and no groundwater abstraction activities are proposed. The impact of the proposed development on the groundwater reserve is considered zero.

[1] Darcy's Flow (Q) = kiA
Darcy Velocity (v) = ki/θ
Where k = hydraulic conductivity (m/day), i = hydraulic head (ranges from 0.01 to 0.5), A = flow cross sectional area, θ = effective porosity of flow media (ranges from 0.2 to 0.3).

Table 6-1: Scale of abstraction and Level of the stress abstraction in sub-catchment (current setting)

Scale	
Component	Richards Bay
Re (m^3/yr)	3484920.00
Use (m^3/yr)	1328760.00
Abs. Scale	0.38
Class	Small Scale
Water Stress	
Component	Richards Bay
Proposed Abstraction	0.00
Re - BF	2329608.00
Stress Index	0.00
Class	A

Table 6-2: Scale of abstraction and Level of the stress abstraction in sub-catchment by 2050

Scale	
Component	Richards Bay
Re (m^3/yr)	3340533.12
Use (m^3/yr)	1328760.00
Abs. Scale	0.40
Class	Small Scale
Water Stress	
Component	Richards Bay
Proposed Abstraction	0.00
Re - BF	2185221.12
Stress Index	0.00
Class	A

6.4 Risk assessment associated with the proposed project

The anticipated geohydrological risk concerning the construction and operation phase of the project was assessed. **As stated previously the study is limited to land-based activities associated with the project.** The SPR model (DWAF, 2008) was used to evaluate potential pollution sources and primary receptors within the study area.

Risk assessment entails the understanding of the generation of a hazard, the probability that the hazard will occur, and the consequences if it should occur. The net consequence is established by the following equation:

Consequence = (Duration + Extent + Irreplaceability of resource) x Severity

And the environmental significance of an impact was determined by multiplying consequence by probability. The risk significance rating is summarised in Table 6-3.

Table 6-3: Risk rating scale

Criteria	Rating Scales
Significance	Very high - negative (-49 to -66)
	High - negative (-37 to -48)
	Moderate - negative (-25 to -36)
	Low - negative (-13 to -24)
	Neutral - Very low (0 to -12)
	Low - positive (0 to 12)
	Moderate - positive (13 to 24)
	High-positive (37 to 48)
	Very high - positive (49 to 66)

The anticipated geohydrological impacts are indicated in Figure 6-1 and discussed in Table 6-5 (construction phase) and Table 6-6 (operational phase), below.

Based on the risk assessment and project type, the impacts on the groundwater environment are low to neutral . Moreover, it is anticipated that the impact on groundwater is going to be uniform for all of the tower/pylon sites (i.e. there is no need for tower-specific mitigation).

No decommissioning phase is anticipated for this project. However, similar risks as for the construction phase are anticipated if the facilities at the site are ever decommissioned; or if additional facilities are constructed.

Source
Introduction of a potential pollutant into the groundwater/surface water environment.

(i.e. construction phase and operational phase contaminants / pollutants and associated activities)

Pathway
The medium or path length through which pollution could move (unsaturated soil zone and aquifer material) before it reaches the receptor.

(i.e. vadose zone rock, saturated zone and overland runoff)

Receptor
The end receiver of the pollutant which could show degradation in water Quality and Quantity

(i.e. watercourse or groundwater user)

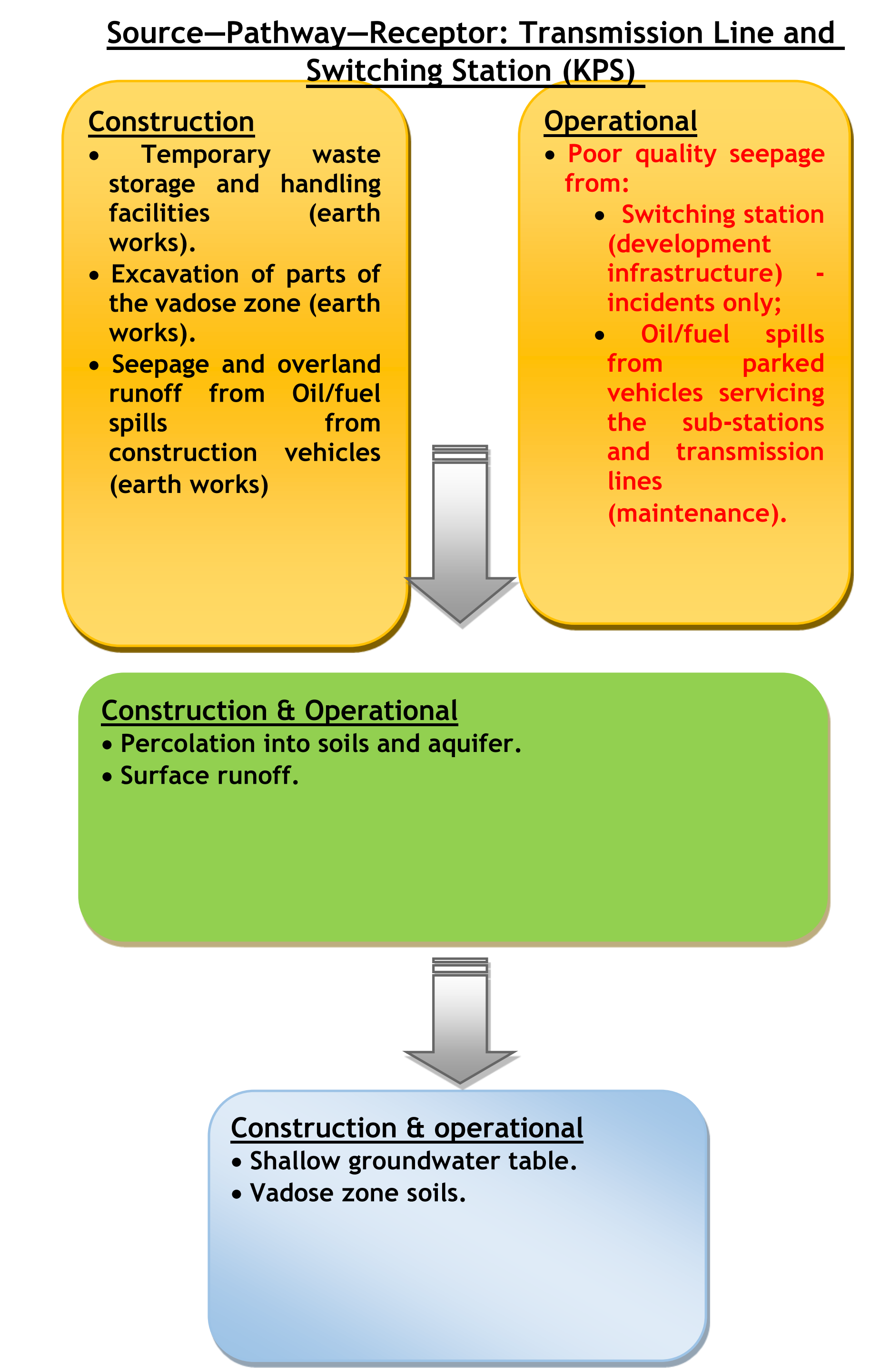


Figure 6-1: Likely impacts and associated risk - SPR model

6.5 Cumulative Impacts associated with similar projects

As the proposed activities will stretch over several sub-catchments and take place close to other proposed power development, there will be cumulative impacts (however limited due to the project type).

The following similar projects are known to occur/are proposed within a 30 km radius of the study area (refer to Table 6-4).

Table 6-4: Similar projects within a 30km radius

Project name and description	Applicant
320MW Emergency Risk Mitigation Power Plant (RMPP) and associated infrastructure near Richards Bay. The Project site is to be located in Alton, near the Richards Bay Industrial Development Zone (IDZ). The facility will have an installed generating capacity of 320MW, to operate with liquified petroleum gas (LPG) or naphtha as an initial source and will convert to utilising natural gas once this is available in Richards Bay. EAP - Savannah Environmental	Phinda Power Producers (Pty) Ltd
RBGP2 400MW gas to power project at the RBIDZ 1F (proposed amendments to the existing Environmental Authorisation and EMPr). The scope includes 6 gas turbines for mid-merit/peaking plant power provision, with 2 steam turbines utilizing the heat from the engineers in a separate steam cycle, as well as 3 fuel tanks of 2000m^3 each for on-site fuel storage. EAP - Savannah Environmental	Richards Bay Gas Power (Pty) Ltd
Nseleni Independent Floating Power Plant - Port/ old Bayside complex. Floating gas powered power station made up of floating Combined Cycle Gas Turbine (CCGT) power plants and associated infrastructure for the evacuation of power from the NIFPP to the National Grid, in the Port of Richards Bay. Four Floating Power Barges generating a nominal 700 MW per barge resulting in 2 800 MW generation capacity. EAP – SE Solutions	Nseleni Power Corporation (Pty) Ltd and Anchor Energy (Pty) Ltd
Eskom 3000 MV CCPP and associated infrastructure on Portion 2 of Erf 11376 and Portion 4 of Erf 11376 within the RBIDZ Zone 1D. The facility will operate with natural gas as the main fuel resource and diesel as a back-up resource. EAP - Savannah Environmental.	Eskom Holdings SoC Limited

Other proposed energy developments are situated in different drainage areas, rendering the likely impact associated with this project, zero. Any geohydrological risk for this project will be confined to the delineated sub-catchments (worst case). The construction and operational phase risk tables consider cumulative risks.

Based on available information for the study area, and in terms of the potential contributing impact on the groundwater system after consideration of this project, it is concluded that the contributing groundwater impact to other similar projects in the area will be zero. The cumulative impact in terms of construction and operation phases associated with this project is anticipated to be neutral (refer to the previous section).

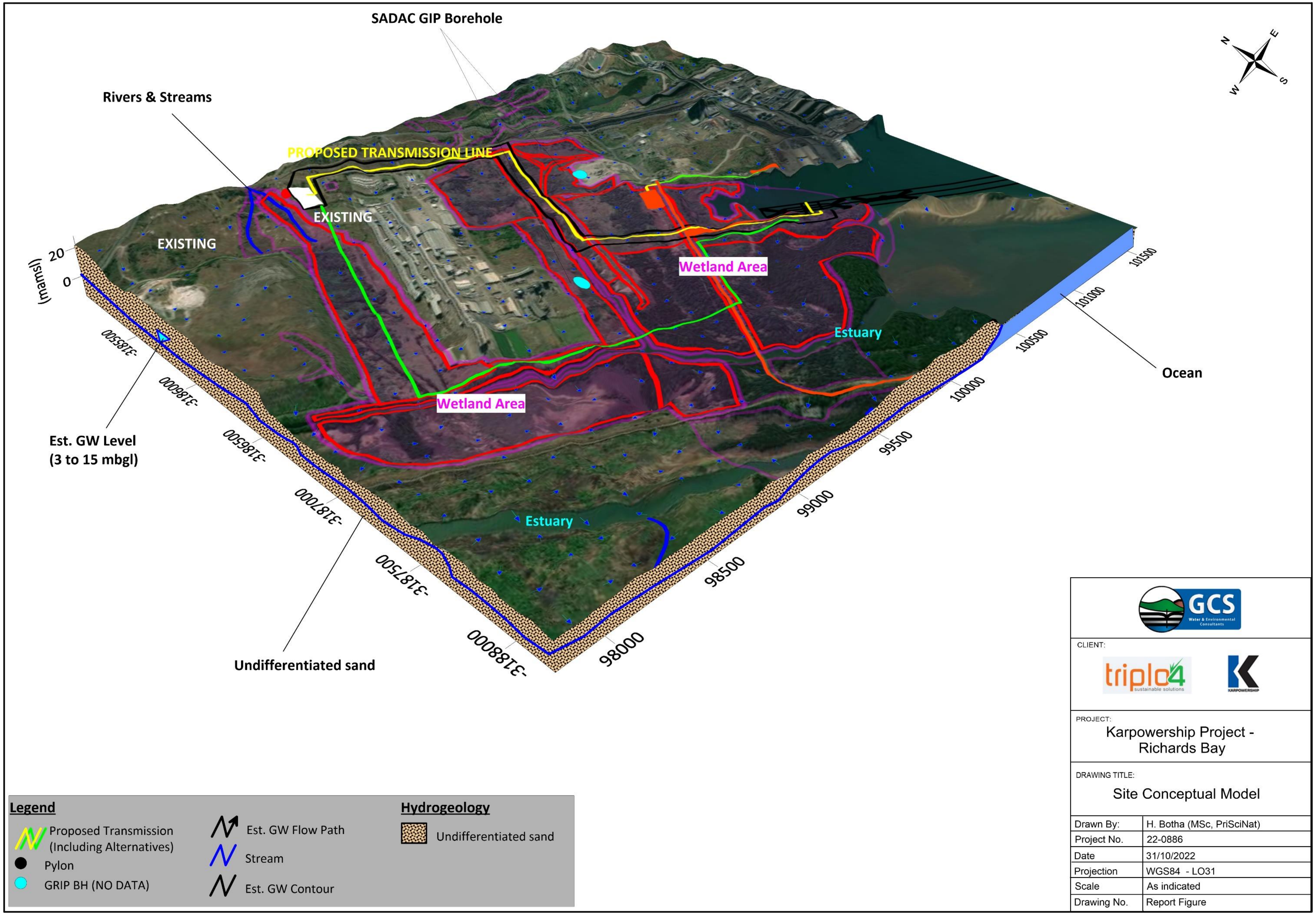


Figure 6-2: **SCM**

Table 6-5: Potential geohydrological risks and mitigation measures (construction phase)

			Pre- Mitigation								Post Mitigation							
Component Being Impacted On	**Activity Which May Cause the Impact**	**Activity**	**Duration (D)**	**Extent (E)**	**Potential for impact on irreplaceable resources (I)**	**Severity (S)**	**Consequence (C)**	**Probability (P)**	**Significance**	**Recommended Mitigation Measures**	**Duration (D)**	**Extent (E)**	**Potential for impact on irreplaceable resources (I)**	**Severity (S)**	**Consequence (C)**	**Probability (P)**	**Significance**	**Confidence**
Vadose zone soils and subsequent aquifer (groundwater table)	Disturbing vadose zone during soil excavations/construction activities.	Net Result of Earthworks and development	Short-term (2)	Site (2)	Yes (1)	Moderate (-2)	Slightly detrimental (-7 to -12) (-10)	Definite (2)	Low - negative (-13 to -24) (-20)	Only excavate areas applicable to the project area. Cover excavated soils with a temporary liner to prevent contamination. Retain as much indigenous vegetation as possible. Exposed soils are to be protected using a suitable covering or revegetating.	Short-term (2)	Site (2)	Yes (1)	Negligible (0)	Negligible (0 to -6) (-4)	Probable (1)	Neutral/ Negligible (0 to -12) (-4)	Medium
	Poor quality seepage from machinery used to excavate soils. Oil, grease and fuel leaks could lead to hydrocarbon contamination of the vadose zone which could percolate to the shallow aquifer.	Net Result of Earthworks and development	Short-term (2)	Site (2)	Yes (1)	Moderate (-2)	Slightly detrimental (-7 to -12) (-10)	Definite (2)	Low - negative (-13 to -24) (-20)	Place drip trays under vehicles at the site. Visual soil assessments for signs of contamination (monthly)	Short-term (2)	Site (2)	Yes (1)	Low (-1)	Negligible (-6 to 0) (-5)	Definite (2)	Neutral/ Negligible (0 to -12) (-10)	Medium
Primary Surface Water Receivers > Non-perennial streams > Mhlatuze River > Wetland system (Watercourses)	Surface water contamination and sedimentation from the following activities: o Equipment and vehicles are washed in the water bodies (when there is water); o Erosion and sedimentation of watercourses due to unforeseen circumstances (i.e. bad weather); and o Alteration of natural drainage lines which may lead to ponding or increased runoff patterns (i.e. may cause stagnant water levels or increase erosion).	Net Result of Earthworks and development	Short-term (2)	Site (2)	Yes (1)	Moderate (-2)	Slightly detrimental (-7 to -12) (-10)	Definite (2)	Low - negative (-13 to -24) (-20)	Install a temporary cut-off trench to contain poor-quality runoff (if required) Routine inspections of all infrastructure (monthly)	Short-term (2)	Site (2)	Yes (1)	Low (-1)	Negligible (-6 to 0) (-5)	Definite (2)	Neutral/ Negligible (0 to -12) (-10)	Medium
Groundwater Users in the Area (Groundwater table and users of groundwater)	Two (2) groundwater user/register borehole falls downstream of the proposed development. Limited impacts are anticipated due to the project type. These boreholes could not be identified in the field, and hence questioned whether they still exist.	Net Result of Earthworks and development	Short-term (2)	Site (2)	Yes (1)	Low (-1)	Negligible (0 to -6) (-5)	Probable (1)	Neutral/ Negligible (0 to -12) (-5)	Neutral impact. No mitigation required.								

Component Being Impacted On	Activity Which May Cause the Impact	Activity	Pre- Mitigation							Recommended Mitigation Measures	Post Mitigation							Confidence
			Duration (D)	Extent (E)	Potential for impact on irreplaceable resources (I)	Severity (S)	Consequence (C)	Probability (P)	Significance		Duration (D)	Extent (E)	Potential for impact on irreplaceable resources (I)	Severity (S)	Consequence (C)	Probability (P)	Significance	
Perched Water Table Dewatering	Temporary dewatering of perched groundwater (if it occurs)	Net Result of Earthworks and development	Short-term (2)	Site (2)	Yes (1)	Moderate (-2)	Slightly detrimental (-7 to -12) (-10)	Definite (2)	Low – negative (-13 to -24) (-20)	Have appropriate dewatering systems in place.	Short-term (2)	Site (2)	Yes (1)	Negligible (0)	Negligible (0 to -6) (-4)	Probable (1)	Neutral/ Negligible (0 to -12) (-4)	Medium

Table 6-6: Potential geohydrological risks and mitigation measures (operational phase)

Component Being Impacted On	Activity Which May Cause the Impact	Activity	Pre- Mitigation							Recommended Mitigation Measures	Post Mitigation							Confidence
			Duration (D)	Extent (E)	Potential for impact on irreplaceable resources (I)	Severity (S)	Consequence (C)	Probability (P)	Significance		Duration (D)	Extent (E)	Potential for impact on irreplaceable resources (I)	Severity (S)	Consequence (C)	Probability (P)	Significance	
Vadose zone soils and subsequent aquifer (groundwater table)	Poor quality seepage from machinery used to excavate soils. Oil, grease and fuel leaks could lead to hydrocarbon contamination of the vadose zone which could percolate to the shallow aquifer.	Net Result of Earthworks and development	Short-term (2)	Site (2)	Yes (1)	Low (-1)	Negligible (0 to -6) (-5)	Probable (1)	Neutral/ Negligible (0 to -12) (-5)	Place drip trays under vehicles at the site. Visual soil assessments for signs of contamination (when servicing of transmission lines takes place)	Short-term (2)	Site (2)	Yes (1)	Negligible (0)	Negligible (0 to -6) (-4)	Probable (1)	Neutral/ Negligible (0 to -12) (-4)	Medium
Groundwater Users in the Area (Groundwater table and users of groundwater)	Two (2) groundwater user/register borehole falls downstream of the proposed development. Limited impacts are anticipated due to the project type.	Net Result of Earthworks and development	Short-term (2)	Site (2)	Yes (1)	Low (-1)	Negligible (0 to -6) (-5)	Probable (1)	Neutral/ Negligible (0 to -12) (-5)	No monitoring is proposed. Impact probability is neutral.								

7 GROUNDWATER MONITORING CONSIDERATIONS

As the risks associated with the project is low to neutral, limited monitoring is proposed. The proposed monitoring will specifically be required during the construction phase, with only visual observations proposed for the operational phase of the transmission line.

During the construction phase, it is recommended that all vehicles are in good working order when entering the site (i.e., visual observations of any leakages that may emanate from the vehicle accessing the site) and parked in designated areas with drip trays. Weekly inspection of vehicles should be sufficient.

As part of the monitoring, visual observations (i.e., monthly inspections and inspections shortly after rainfall events) of the banks associated with the non-perennial streams and rivers and the general conditions of the areas cleared, should be adequate to determine if there is any sediment runoff taking place or erosion. Appropriate erosion controls should then be implemented (i.e. placing of gabion mattresses, berms, trenches etc. as determined by the ECO).

From the risk assessment undertaken, there are very few groundwaters and surface water-related risks associated with this project. No permanent monitoring is proposed nor is dedicated groundwater monitoring. Regular (monthly or during maintenance runs) visual assessments of the transmission lines and switching station should be sufficient (i.e. signs of oil spills, sediment runoff, switching station leakages etc.) to monitor potential pollution. Sampling the non-perennial, wetlands and perennial streams downstream of the site will help to determine if the repair/maintenance activities are impacting the surface water quality (only if visual observations support potential pollution).

8 CONCLUSIONS

Based on the investigation undertaken, the following conclusions are made:

- Two (2) aquifer systems are envisioned:
    - An unconfined aquifer associated with the unconsolidated sands; and
    - A confined and fractured aquifer network associated with deeper and older granite/gneiss rock.
- Available groundwater level data (Section 5.3) suggest that the water table for the area ranges from 3 to 15 metres below ground level (mbgl).
- Based on the Source-Pathway-Receptor (SPR) model, the following receptors are noted for the project area:
    - The non-perennial streams and wetland (estuary) system downstream of the site;
    - The vadose zone soils; and
    - The groundwater table.
- The risk and impact assessment undertaken suggest that the potential geohydrological impact at the site (quantity and quality) is low to neutral.
    - Risks during the construction phase are low and can be considered reversible impacts.
    - Low to neutral impacts are anticipated for the operational phase of the project.
    - No decommissioning phase is anticipated for this project. However, similar risks as for the construction phase are anticipated if the facilities at the site are ever decommissioned; or if additional facilities are constructed.

8.1 Identification of any areas that should be avoided

No dedicated buffer areas are recommended, other than staying out of pre-identified high ecological importance areas and wetland areas as identified per the EIA report and wetland assessment undertaken for the project area.

8.2 Mitigation measures for inclusion in the EMPr and EIA

- All waste generated during construction on-site (i.e. building rubble, used oil and paint containers etc.) must be stored in designated areas which are isolated from surface drains. Waste storage facilities should be covered to prevent dust and litter from leaving the containment area, and to prevent rainwater ingress.
- Minimise the amount of exposed ground and stockpiles of building material (i.e. sand, cement, wood, metal, paint, solvents etc.) to prevent suspended solid transport loads and leaching of rocks/materials. Stockpiles can be covered, and sediment fences constructed from a suitable geotextile.
- The Department of Environmental Affairs (DEA) published a generic Environmental Management Plan (EMPr) for substations and powerlines (22 March 2019). It is proposed that the mitigation and monitoring plan presented in this report be further supplemented by the generic EMP document.
- It is proposed that water monitoring be implemented as discussed in Section 7, and as required.

8.3 Reasoned opinion on whether the activity should be authorized

This assessment cannot find any grounds or identify high geo-hydrological risks to not proceed with the development of the proposed transmission lines. This is grounded on the assumption that the proposed mitigation measures (Section 6), EMPr and EIA recommendations are implemented during the construction and operational phase of the transmission lines.

9 BIBLIOGRAPHY

Aquiworx, 2015. *Aquiworx Software Integrated Information,* s.l.: s.n.
ARC, 2006. *Lan Types of South Africa,* s.l.: Pretoria: Agricultural Research Council.
Botha, J. V. J. v. d. V. I. V. J. B. J. C. W. a. L. J., 1998. *Karoo Aquifers: Their Geology, Geometry and Physical Properties,* s.l.: WRC Report No: 457/1/98.
Bredenkamp, D., Botha, L., Van Tonder, G. & Van Rensburg, H., 1995. *Manual on Quantitave Estimation of Groundwater Recharge and Aquifer Storativity.,* South Africa: WRC Report No TT 73/95.
CSIR, 2019. *'Green Book | Adapting South African Settlements to Climate Change'. Green Book | Adapting South African Settlements to Climate Change. 2019.,* s.l.: s.n.
DEA, 2019. *South African National Land-Cover (SANLC) 2018,* South Africa: DEA on 1st October 2019.
DMEA, 1998. *2732 St. Lucia - 1:250 000 Geological Map Series,* s.l.: DMEA.
DWA, 2012. *Aquifer Classification of South Africa map,* s.l.: Hydrological Services - Groundwater Information..
DWAF, 2006. *Groundwater Resource Assessment II,* s.l.: s.n.
DWAF, 2007. *Best Practice Guidelines – G3: Water Monitoring Systems,* s.l.: DWS.
DWAF, 2007. *Best Practice Guidelines – G3: Water Monitoring Systems,* s.l.: DWS.
DWAF, 2008. *Best Practice Guidelines: Impact Prediction (G4),* s.l.: DWS.
DWS, 2011. *The Groundwater Dictionary - A Comprihensive Reference of Groundwater Related Terminology. 2nd Edition.,* s.l.: s.n.
DWS, 2016. *New Water Management Areas,* South Africa: Government Gazette No. 40279.
GRIP, 2016. *Groundwater Resource Information Project ,* s.l.: s.n.
Heritage Contracts and Archaeological Consulting, 2020. *Palaeontological Impact Assessment for the proposed Richards Bay Nseleni Independent Floating Power Plant, KwaZulu Natal Province,* s.l.: s.n.
JAXA, 2019. *Advanced Land Observation Satellite (ALOS) Global Digital Surface Model (DSM),* Tokyo: Earth Observation Research Center (EORC), Japan Aerospace Exploration Agency (JAXA).
King, G., Maritz, E. & and Jonck, F., 1998. *2730 Vryheid - 1:500 000 Hydrogeological map series of the Republic of South Africa.,* s.l.: s.n.
King, G., Maritz, E. & and Jonck, F., 1998. *3324 PE - 1:500 000 Hydrological Map Series of the Republic of South Africa,* s.l.: s.n.
Kottek, M. et al., 2006. *World Map of the Köppen-Geiger climate classification updated. Meteorol. Z.15, 259-263. doi:10.1127/0941-2948/2006/0130.* s.l.:s.n.
Lourens, P., 2013. *The relationship between South African geology and geohydrology,* s.l.: IGS, University of the Free State, Bloemfontein. Masters Dissertation..
Meteoblue, 2022. *Climate Data.* s.l.:https://www.meteoblue.com.
NGA, 2019. *National Groundwater Archive.* [Online]
Available at: https://www3.dwa.gov.za/NGANet/Security/WebLoginForm.aspx
NWA, 1998. *The South African National Water Act,* s.l.: South Africa.
Parsons, R., 1995. *A South African Aquifer System Management Classification,* s.l.: Water Research Commission Report No. KV 7795.
Parsons, R. & Wentzel, J., 2007. *Groundwater Resource Directed Measures Manual, WRC Report No TT 299/07,* s.l.: DWAF.
SADAC GIP, 2022. *SADC Groundwater Information Portal,* s.l.: s.n.
SANBI, 2011. *National Wetland Freshwater Priority Areas (FEPAs),,* s.l.: s.n.
SE Solutions, 2020. *Proposed Liquid Natural Gas (LNG) receiving and storage facility and associated physical infrastructure to support the Nseleni Independent Floating Power Plant, Port of Richards Bay, KwaZulu-Natal.,* s.l.: s.n.
Triplo4, 2022. *METHOD STATEMENTS FOR THE PROPOSED KARPOWERSHIP FOR GAS TO POWER PROJECT,* s.l.: s.n.
Triplo4, 2022. *METHOD STATEMENTS FOR THE PROPOSED KARPOWERSHIP FOR GAS TO POWER PROJECT,* s.l.: s.n.
Van Deventer, H. S.-A. L. M. N. P. C. S. A. C. N. G. M. J. N. L. M. O. D. S. P. S. E. &. S. K., 2018. *NBA2018 National Wetland Map 5.* s.l.:s.n.
Van Tonder, G. & Xu, Y., 2000. *A guide for the estimation of groundwater recharge in South Africa. Water South Africa. 27(3): 341 - 343 p.,* s.l.: s.n.

Vegter, 1995. *Groundwater Recharge Map of South Africa,* s.l.: s.n.
Woodford, A. V. T. G. T. A. T. G. R. P. G. M. O. R. V. D. a. E. C., 2013. *Karoo Groundwater Atlas Volume 2,* s.l.: Karoo Groundwater Expert Group (KGEG).
WRC, 2015. *http://www.waterresourceswr2012.co.za/resource-centre/*. [Online].

APPENDIX A: DISCLAIMER AND DECLARATION OF INDEPENDENCE

The opinions expressed in this Report have been based on site /project information supplied to GCS Water and Environment (Pty) Ltd (GCS) by Triplo4 and are based on public domain data, field data and data supplied to GCS by the client. GCS has acted and undertaken this assessment objectively and independently.

GCS has exercised all due care in reviewing the supplied information. Whilst GCS has compared key supplied data with expected values, the accuracy of the results and conclusions are entirely reliant on the accuracy and completeness of the supplied data. GCS does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them.

Opinions presented in this report, apply to the site conditions and features as they existed at the time of GCS's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which GCS had no prior knowledge nor had the opportunity to evaluate.

APPENDIX B: DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Geohydrological Assessment for the Proposed Karpowership 132kV Transmission Line - Richards Bay Port

SPECIALIST INFORMATION

Specialist Company Name:	GCS Environmental SA			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	2	Percentage Procurement Recognition	
Specialist name:	Hendrik Botha			
Specialist Qualifications:	MSc Environmental Sciences (Geohydrology & Geochemistry) BSc Hons. Environmental Sciences (Hydrology) BSc. Geology and Chemistry			
Professional affiliation/registration:	PR SCI NAT 400139/17			
Physical address:	1 Karbochem Road, Newcastle, KZN			
Postal address:				
Postal code:	2940	Cell:		
Telephone:	071 102 3819	Fax:		
E-mail:	hendrikb@gcs-sa.biz			

DECLARATION BY THE SPECIALIST

I, _Hendrik Botha, declare that –

- I act as the independent specialist in this application.
- I will perform the work relating to the application objectively, 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 Act, Regulations and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, Regulations and all other applicable legislation.
- I have no, 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 concerning 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; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

29/08/2022
8:08:15
Pr.Sci.Nat (400139/17)

Signature of the Specialist

GCS

Name of Company:

31 October 2022

Date

CV OF SPECIALIST

Hendrik Botha

Technical Director

CORE SKILLS

- Project management
- Analytical and numerical groundwater modelling
- Geochemical assessments and geochemical modelling
- Hydropedology and hydrological assessments
- Hydrology, floodline modelling & storm water management
- Groundwater vulnerability, impact, and risk assessments
- Technical report writing
- GIS and mapping

DETAILS

Qualifications

- BSc Chemistry and Geology (Environmental Sciences) (2012)
- BSc Hons Hydrology (Environmental Sciences) (2013)
- MSc Geohydrology and Hydrology (Environmental Sciences) (2014-2016)

Membership

- Groundwater Division of GSSA
- Groundwater Association of KwaZulu Natal Member
- International Mine Water Association (IMWA)

Languages

- Afrikaans - Speak, read, write.
- English - Speak, read, write.

Projects undertaken in

- South Africa
- Nigeria
- Namibia
- Liberia

PROFILE

Hendrik (Henri) Botha is currently the manager of the GCS Newcastle Office and occupies the role of principal hydrogeologist. Groundwater, geochemistry and surface hydrology, as well as knowledge of water chemistry together with GIS, analytical and numerical modelling skills, is some of his sought-after expertise. General and applied logical knowledge are his key elements in problem-solving.

Professional Affiliations:

SACNASP Professional Natural Scientist (400139/17)

Areas of Expertise:

- Waste classification and Impact Assessments
- Aquifer vulnerability assessments
- Geochemical sampling, data interpretation and modelling
- Geophysical surveys and data interpretation
- GIS
- Water quality sampling and data interpretation
- Groundwater impact and risk assessments
- Numerical and Conceptual Visual Modelling (Visual Modflow, ModflowFLEX, Voxler, RockWorks, Surfer and Excel)
- Hydropedology (Hydrological Soil Types) & Soils Assessments
- Floodline Modelling (HEC-RAS)
- Stormwater Management Systems and Modelling
- Surface Water Yield Assessments
- Water and Salt Balances

Page **1** of **8**

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/14/12/16/3/3/2007
Date Received:	02 November 2020

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

The Proposed Gas to Power Powership Project at the Port of Richards Bay, Umhlathuze Local Municipality, King Cetshwayo District, Kwazulu-Natal.

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	GCS (pty) Ltd			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Hendrik Johannes Botha			
Specialist Qualifications:	MSc. Geohydrology and Geochemistry			
Professional affiliation/registration:	SACNASP Professional Natural Scientist (400139/17)			
Physical address:	74 Victoria Road Newcastle			
Postal address:	PO BOX 819 Gillits			
Postal code:	3603	Cell:	0711023819	
Telephone:	031 764 7130	Fax:	031 764 7140	
E-mail:	hendrikb@gcs-sa.biz			

2. DECLARATION BY THE SPECIALIST

I, Hendrik Johannes Botha , 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 Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, 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; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

GCS (pty) Ltd

Name of Company:

12/10/2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Hendrik Botha, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

HBotha

Signature of the Specialist

GCS.

Name of Company

27-10-2022

Date

DATE AND SIGNATURE:

LEON PIETER BOTHA, MARRIAGE OFFICER AND COMMISSIONER OF OATHS, REG NO: BD 44601 CALEB MINISTRIES TRUST, TRUST: IT 4106/2009

Signature of the Commissioner of Oaths

2022-10-27

Date