AQUATIC BIODIVERSITY IMPACT ASSESSMENT

Proposed construction of a residential dwelling on Erf 8 Konkiebaai (Portion 53 of Eersterivier 626), Kou-Kamma Municipality, Eastern Cape

Prepared for Ecoroute

by

Dr. Jackie Dabrowski (SACNASP 115166)

Tel: 083 256 3159, Email: jackie@confluent.co.za

confluent

aquatic consulting & research

DECLARATION OF CONSULTANTS INDEPENDANCE

I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);

• At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;

• Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public;

• I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;

• I do not have any influence over decisions made by the governing authorities;

• I undertake to disclose 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 a competent authority to such a relevant authority and the applicant;

• I have the necessary qualifications and guidance from professional experts in conducting specialist reports relevant to this application, including knowledge of the relevant Act, regulations and any guidelines that have relevance to the proposed activity;

• This document and all information contained herein is and will remain the intellectual property of Confluent Environmental. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigators.

• All the particulars furnished by me in this document are true and correct.

Jackie Dabrowski (Ph.D., Pr.Sci.Nat. *Aquatic Science*)
SACNASP Registration Number 115166
Co-director: Confluent Environmental (Pty) Ltd

Qualifications: BSc, BSc Honours (Entomology), MSc & PhD (Veterinary Science)

Expertise: > 10 years' experience working on aquatic ecosystems across South Africa, with a focus on the Southern Cape in the last 3 years. Includes research and consulting expertise, having published > 10 water-related research articles and compiled > 80 aquatic specialist reports. Research and consulting have been in a range of sectors including agriculture, urban developments, linear structures, renewable energy, conservation, and mining.

TABLE OF CONTENTS

LIST OF FIGURES

1. INTRODUCTION

Confluent Environmental was appointed by Ecoroute to undertake a Freshwater specialist assessment for a proposed residential development on Erf 8 Konkiebaai (Portion 53/626 Eersterivier) in the Eastern Cape Province (Figure 1). The site coordinates are: 34° 4'18.37"S, 24°13'23.47"E.

The proposed development is for a double-storey residential dwelling with associated decking and a combined footprint of approximately 360 m^2 which is equivalent to ~ 42% of Erf 8. The proposed construction will be on stilts above the ground, enabling the re-establishment of some shade tolerant vegetation beneath the structure.

According to the Department of Environment, Forestry and Fisheries (DFFE) screening tool, aquatic biodiversity at the site has a **Very High** sensitivity (Figure 2). The sensitivity feature identified is not site-specific, being the **Strategic Water Source Area** within which the site is located.

The scope of work for this report is guided by the legislative requirements of the National Environmental Management Act (NEMA) and the National Water Act (NWA).

Figure 1: Location of Erf 8, Konkiebaai in relation to mapped watercourses.

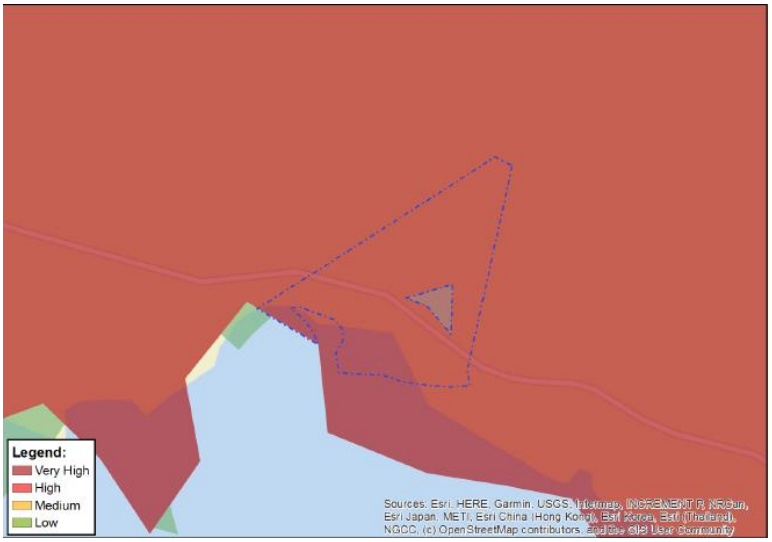

Figure 2. Aquatic biodiversity sensitivity for Erf 8, Konkiebaai based on the National Environmental Screening Tool.

1.1 Proposed Development

The proposed development footprint for the dwelling is indicated in Figure 3. The development footprint is approximately 355 m^2 and was the recommended alternative in the botanical specialist study due to reduced disturbance of High Sensitivity areas of vegetation.

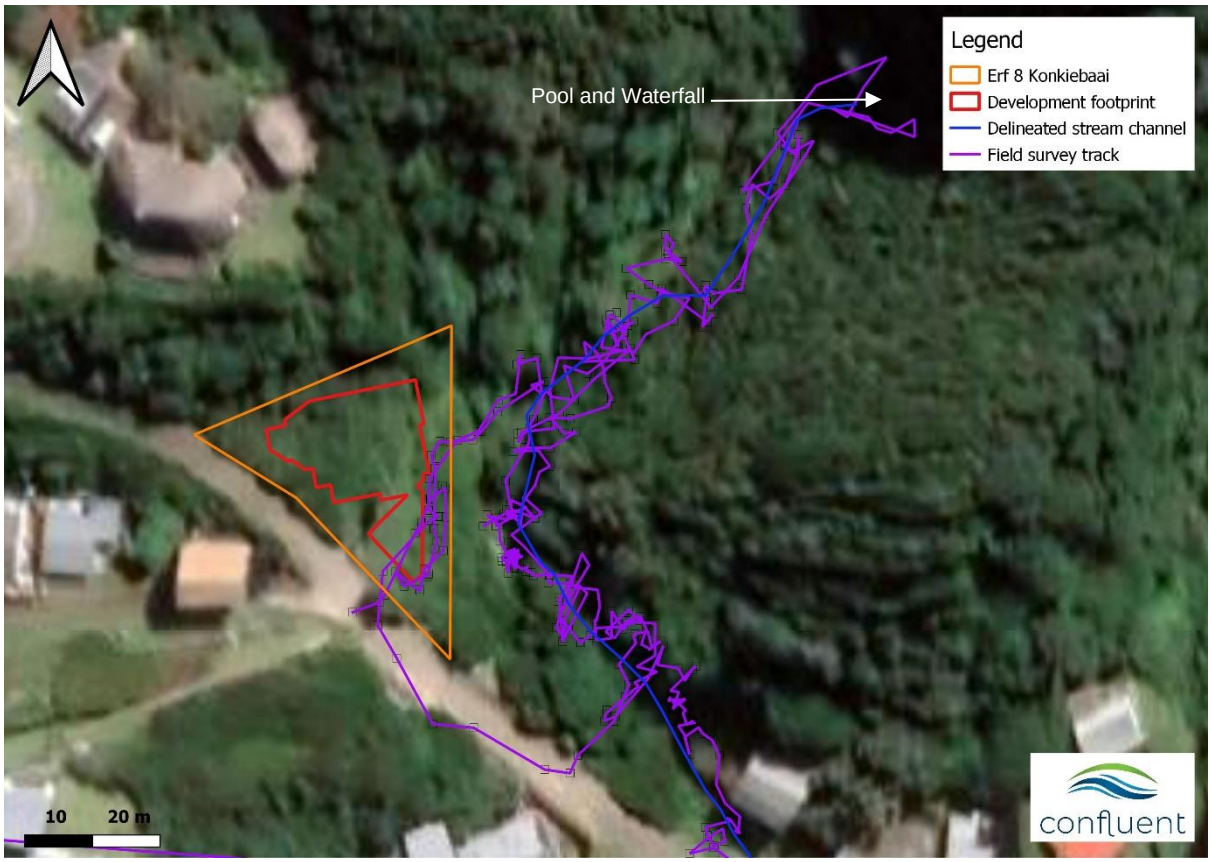

Figure 3. Proposed development footprint of the residential dwelling (red) and GPS track walked during the site visit (purple).

1.2 Terms of Reference

According to the protocols specified in GN 320 (Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity) of the National Environmental Management Act (NEMA; Act No. 107 of 1998), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental screening tool (screening tool). An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of:

- **Very High** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment; or
- **Low** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement.

The screening tool classified the site as being of **Very High** aquatic biodiversity as it is located in a Strategic Water Source Area (SWSA).

According to the protocol, prior to commencing with a specialist assessment a site sensitivity verification must be undertaken to confirm the sensitivity of the site as indicated by the screening tool:

- Where the information gathered from the site sensitivity verification differs from the screening tool designation of **Very High** aquatic biodiversity sensitivity, and it is found to be of a **Low** sensitivity, an Aquatic Biodiversity Compliance Statement must be submitted.
- Similarly, where the information gathered from the site sensitivity verification differs from the screening tool designation of **Low** aquatic biodiversity sensitivity, and it is found to be of a **Very High** sensitivity, an Aquatic Biodiversity Specialist Assessment must be submitted.

1.3 Scope of Work

The objectives of this assessment included the following:

- To undertake a desktop analysis and site inspection to verify the sensitivity of aquatic biodiversity as **Very High** or **Low**; and
- Compile an Aquatic Biodiversity Compliance Statement or Aquatic Biodiversity Specialist Assessment based on the site verification of the sensitivity of the site. This includes assessment of the following:

  Interrogation of available desktop resources including:

  - DWS spatial layers (1:50 000 rivers)
  - National Freshwater Ecosystem Priority Areas (NFEPA) spatial layers (Nel *et al.,* 2011)
  - National Wetland Map 5 and Confidence Map (CSIR, 2018)
  - Eastern Cape Biodiversity Conservation Plan (ECBCP, 2020).

  Conduct a site visit to determine the site sensitivity:

- Identification and classification of watercourses within and adjacent to the site according to methods detailed by Ollis *et al*. (2013);
- Determine the watercourse Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) using an appropriate method.

Based on the outcome of the site visit compile either an aquatic biodiversity impact assessment or compliance statement.

1.4 Assumptions and exclusions

- The site assessment was conducted once-off during early Summer, a season which provides a good representation of flora and fauna present at the site. In addition, databases such as iNaturalist and the Freshwater Biodiversity Information System (FBIS) were consulted to augment field data for the site.
- While this study excludes terrestrial biodiversity, plant and animal themes, observations of any Species of Conservation Concern within the watercourse and riparian zone are included.
- It is assumed that spatial data and site development plans provided by 3rd parties for this assessment are correct.

2. DESKTOP SURVEY

The site falls within quaternary catchment K80D. The stream immediately east of the property is mapped as an unnamed non-perennial stream arising in the coastal plain which has largely been transformed for dairy pastures (Figure 4). The Eerste Rivier is the closest named river which flows into the sea approximately 2 km to the east. No mapped wetlands appear in association with the watercourse according to the National Wetland Map (V5), but wetlands do not appear to be well mapped in the area. Several significant wetland areas were observed en route to the site and do not appear on the NWM5. Each of the tributaries flowing into the unnamed stream have been impounded for irrigation of pasture in the stream's catchment.

The project area is located within the southeastern coastal belt (Ecoregion Level 2:20.02). The terrain is described as closed hills of moderate and high relief and moderately undulating plains. Altitude ranges between 0 - 1300 m.a.m.s.l.

According to SANBI Vegmap (2018) the mapped vegetation type in the immediate vicinity of Erf 8 is Tsitsikamma Sandstone Fynbos and upstream in the stream is a transition to Southern Afrotemperate Forest. A detailed assessment of vegetation at the site, including vegetation associated with the stream is provided in the botanical specialist report for the site (Dr. A. Grobler, 2022).

Rainfall at the site can fall year-round although minor peaks occur in spring and autumn. The mean annual rainfall relatively high (936 mm) and is mapped at a high intensity, which increases the risk of erosion in the area. The inherent erosion potential of soils is indicated as high.

Table 1. Summary of relevant catchment features for the proposed development area.

Feature	Description
Quaternary catchment	K80D
Mean Annual Runoff	381 mm
Mean Annual Precipitation	936 mm
Inherent erosion potential of soils (K-factor)	0.63, High
Rainfall intensity	High to Very High
Ecoregion Level II	20.02, South eastern coastal belt
Geomorphological Zone	Transitional, upper to lower foothills
NFEPA area	Not classified
Mapped Vegetation Type	FFs20: Tsitsikamma sandstone fynbos FOz1 Southern afrotemperate forest
Conservation	Tsitsikamma Strategic Water Source Area (ECBCP, 2019) Critical Biodiversity Area 1 (CBA1)

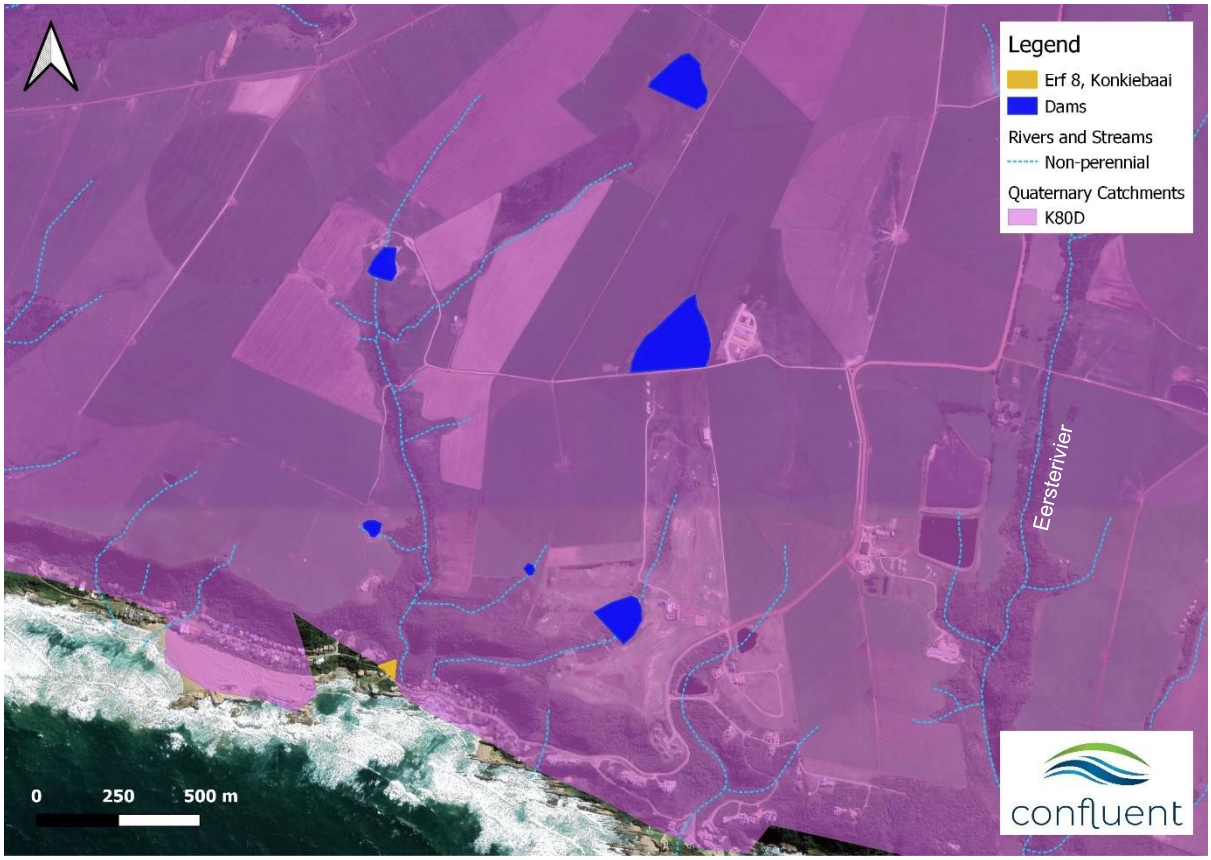

Figure 4: Location of the property in relation to mapped freshwater features in quaternary catchment K80D.

According to the Eastern Cape Biodiversity Conservation Plan (ECBCP) the watercourse adjacent to Erf 8 is classified as a Critical Biodiversity Area 1 (CBA 1). The management objective for this category is:

"Maintain in a natural state (or near-natural state if this is the current condition of the site) that secures the retention of biodiversity pattern and ecological processes: For areas classified as CBA1, the following objectives must apply:

- *Ecosystem and species must remain intact and undisturbed;*

- *Since these areas demonstrate high irreplaceability, if disturbed or lost, biodiversity targets will not be met;*

- *Important: these biodiversity features are at, or beyond, their limits of acceptable change.*

If land use activities are unavoidable in these areas, and depending on expert opinion of the condition of the site, a Biodiversity Offset must be designed and implemented."

3. SITE VISIT

The site was visited on 7 November 2022 which is early summer. Several plants were in flower, and this is considered a good season for assessment given that many fauna and flora are more visible or audible during the breedings season.

Base flow of water was present in the stream, and no recent rainfall had been recorded. Along with the high number of dams in the catchment this indicates that the stream is more perennial in nature than what is mapped, as it was still flowing despite these conditions.

The full length of the stream and riparian zone on both sides was walked from the seaward outflow to a pool and waterfall located upstream of Erf 8 (Figure 3).

4. ECO-CLASSIFICATION

4.1 Classification

The watercourse was classified using methods described by Ollis *et al.* (2016) and following the definition in the National Water Act (Act No. 36 of 1998) which states that "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 to be a watercourse.

The watercourse flowing to the east of Erf 8 has a linear form in a valley bottom, with distinct channel, banks and riparian zone. No significant wetland areas were observed along the stream. The flow regime appears to be fairly permanent, but the stream may periodically run dry during periods of extended rainfall deficit. The watercourse is defined as a river with seasonal to perennial flows.

4.2 Present Ecological State

4.2.1 Methods

Drainage lines and rivers are natural channels in which water flows permanently or intermittently following rainfall. These are assessed using the Index of Habitat Integrity (IHI; Kleynhans, 1996) which measures the impact of human disturbance on riparian and instream habitats. The IHI is a rapid assessment of the severity of impacts affecting habitat integrity within a defined segment of a watercourse. The method can be applied to both perennial and non-perennial watercourses. The instream impacts considered were: water abstraction; flow modification; bed modification; channel modification; physico-chemical modification; inundation; alien macrophytes; and rubbish dumping. The riparian impacts assessed were: vegetation removal; exotic vegetation; bank erosion; channel modification; water abstraction; inundation; flow modification; physico-chemistry. Each of the impacts were given a score based on their degree of modification (1-25; Table 2), along with a confidence rating based on the level of confidence in the score.

Table 2. Descriptive classes for assessment of habitat modifications (Kleynhans, 1996)

Impact Class	Description	Score
None	No discernible impact or the modification is located in a way that has no impact on habitat quality, diversity, size and variability.	0
Small	The modification is limited to very few localities and the impact on habitat quality, diversity, size and variability are also very small.	1-5
Moderate	The modifications are present at a small number of localities and the impact on habitat quality, diversity, size and variability is limited.	6-10
Large	The modification is generally present with a clearly detrimental impact on habitat quality, diversity, size and variability. Large areas are, however, not influenced.	11-15
Serious	The modification is frequently present and the habitat quality, diversity, size and variability in almost the whole of the defined area are affected. Only small areas are not affected.	16-20
Critical	The modification is present overall with a high intensity. The habitat quality, diversity, size and variability in almost the whole of the defined section are influenced detrimentally.	21-25

An IHI class is then determined based on the resulting score which is shown in Table 3. These results provide an indication of the site-specific PES which can be used as a baseline from which to monitor impacts in the future.

Table 3. Index of habitat integrity (IHI) classes and descriptions

Integrity Class	Description	IHI Score (%)
A	Natural	> 90
B	Largely Natural	80 – 90
C	Moderately Modified	60 – 79
D	Largely Modified	40 – 59
E	Seriously Modified	20 – 39
F	Critically Modified	0 – 19

4.2.2 Results

The Present Ecological State of the stream was generally good and determined to be B, Largely Natural for both the instream and riparian habitat (Table 4). The assessment was largely confined to the stream section from the sea outflow up to the waterfall as this is relevant to proposed development on Erf 8. There are a number more serious impacts affecting the watercourse upstream in the catchment where extensive impoundment in dams, and surface runoff from dairy pastures is likely to have more of an impact.

Riparian vegetation was mostly in good condition with dense cover in place and limited alien encroachment. During the site survey, a healthy population of several individuals of plant Species of Conservation Concern 308 (SCC 308) was identified along the stream. This species was also highlighted in the botanical specialist assessment.

During the site visit numerous amphibians were observed including strictly aquatic *Xenopus laevis* and Cape River Frogs (*Amietia fuscigula*). At least two Knysna Warblers (*Bradypterus sylvaticus)* were observed and their calls recorded in the lower stream area. Knysna Warblers are listed by the IUCN Red List as Vulnerable with a decreasing population.

Only minor areas of encroachment by alien vegetation have occurred, and these are all in the vicinity of minor disturbance due to the gabion embankment historically constructed. This demonstrates the vulnerability of indigenous riparian vegetation to disturbance.

While abstraction and storage of water takes place in numerous dams upstream on dairy farms, it appears that seasonal abstraction takes place from the stream directly adjacent to Erf 8 as indicated by the numerous pipes running down hillsides to the stream, which are currently out of the water. These are likely operated when holiday-makers are numerous and water-demand is high. This would coincide with low rainfall periods in December and January when water levels are already stressed. It is therefore likely that the stream undergoes periods of excessive abstraction coinciding with summer months and peak tourist season.

Table 4. Scores determined for the Index of Habitat Integrity for the stream section adjacent to Erf 8.

Habitat Modification	Erf 8 Stream	Notes
INSTREAM HABITAT		
Water abstraction	10	Substantial in upper catchment, but none below waterfall
Flow	10	Reduced peak and flood flows due to dams
Bed	0	No major modifications observed
Channel	5	Minor modifications in vicinity of gabions
Physico-chemistry	5	Modified catchment with dairy
Inundation	0	None below waterfall
Alien macrophytes	0	None observed
Introduced aquatic fauna	0	None observed
Rubbish dumping	0	None observed
	B, Largely Natural	
RIPARIAN HABITAT		
Vegetation removal	5	Only at private house, converted to lawn
Exotic vegetation	5	Minor invasion by stinging nettle.
Bank erosion	3	Minor area stabilised with gabions
Channel modification	5	Small area stabilised with gabions
Water abstraction	0	Not affecting riparian zone, but does occur
Inundation	0	None observed below waterfall
Flow modification	10	Reduced peak flows and flood flows due to dams
Physico-chemistry	0	No impact expected
	B, Largely Natural	

Lower stream portion showing clearing for lawn

Cape River Frog, *Amietia fuscigula*

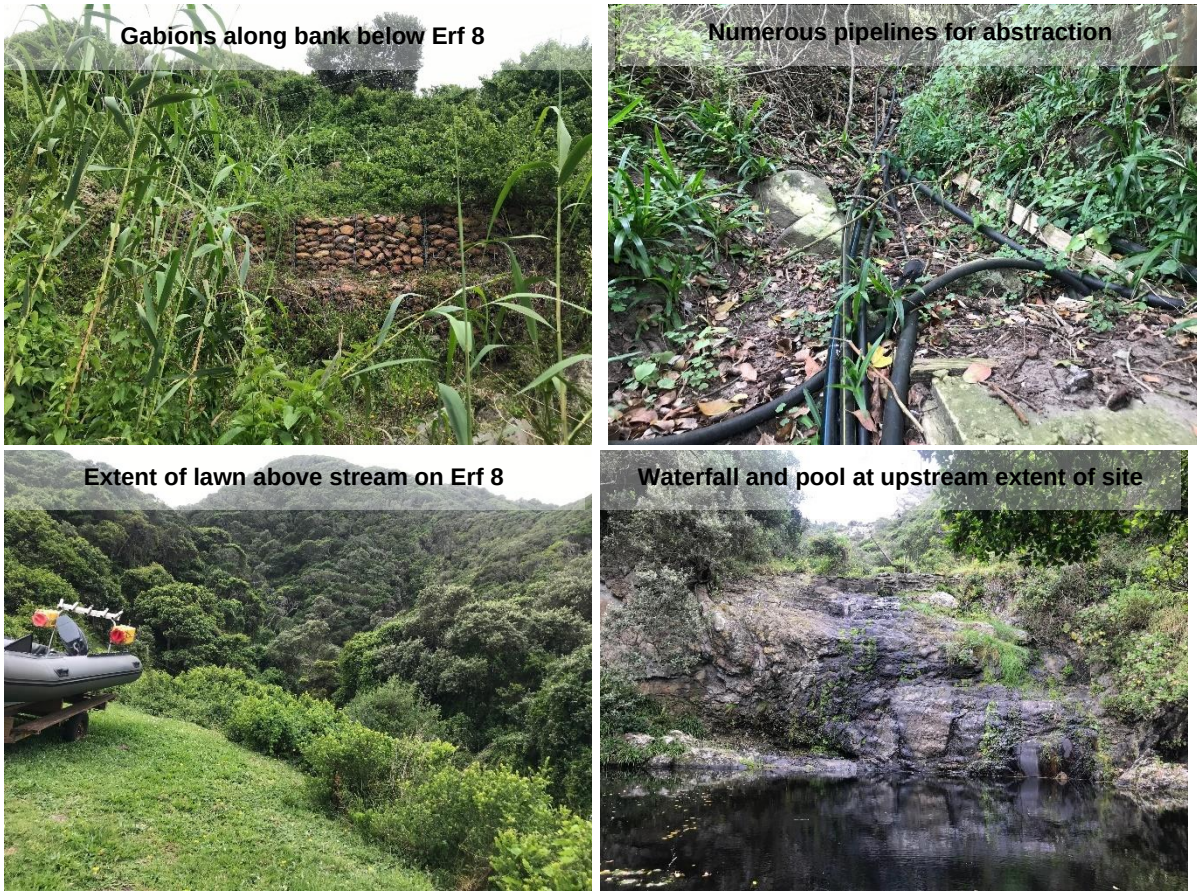

Figure 5: Photographs indicating site locations relevant to the Present Ecological State.

4.3 Ecological Importance and Sensitivity

4.3.1 Methods

The Ecological Importance and Sensitivity (EIS) for drainage lines was derived using the methods developed by Department of Water Affairs and Forestry (DWAF; 1999). Ecological Importance of a system is defined as the expression of its importance to the maintenance of ecological diversity and functioning on local as well as broader scales. Ecological sensitivity relates to the system's resilience to disturbance, or its ability to recover from disturbance that has occurred. The EIS rating does not incorporate the PES and therefore indicates the potential importance or sensitivity of a system as could be expected under unimpaired conditions. For the assessment both biotic and abiotic factors are considered as follows:

- The presence of rare, endangered or unique aquatic species. This includes species of conservation concern, endemic or isolated species populations, intolerant species and overall species richness;
- Diversity and refuge value of habitat types;
- Sensitivity of the system to changes in flow and related water quality changes;
- Importance of providing functional connectivity between related systems;
- Biological connectivity in the form of migration routes / corridors instream and along riparian zones;
- Protection level of the area where the system is located (e.g. National Park).

These parameters are scored individually and the median score of all variables is calculated to derive an EI and ES category as defined in Table 5.

Table 5. Ecological Importance and Sensitivity Categories

Ecological Importance and Sensitivity Categories	General Description
Very High (> 3 and ≤ 4)	Quaternaries/delineations that are considered to be unique on a national or even international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use
High (> 2 and ≤ 3)	Quaternaries/delineations that are considered unique on a national scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be sensitive to flow modifications but in some cases, may have a substantial capacity for use.
Moderate (> 1 and ≤ 2)	Quaternaries/delineations that are considered to be unique on a provincial or local scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually not very sensitive to flow modifications and often have a substantial capacity for use.
Low/Marginal (> 0 and ≤ 1)	Quaternaries/delineations that are not unique at any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have a substantial capacity for use.

4.3.2 Results

The Ecological Importance and Sensitivity of the stream was determined to be ‘High’. The importance was increased by the presence of the Knysna Warbler and various plant species of conservation concern, some of which are present along the stream (See botanical study). The stream forms an important green corridor through an increasingly fragmented landscape due to farming and coastal development. The sensitivity was elevated by the presence of strictly aquatic amphibians such as the Cape River Frog (*Amietia fuscigula)* and the African Clawed Frog (*Xenopus laevis*). These frogs are dependent on permanent water for various stages of their life cycle.

Table 6. Ecological Importance and Sensitivity of the watercourse adjacent to Erf 8, Konkiebaai.

Determinant	Score	Notes
Presence of Rare & Endangered Species	2	Knysna Warbler (Vu) and Plant SCC 308 (Vu)
Populations of Unique Species	1	Unique coastal species associated with fynbos and forest
Intolerant Biota	3	Amphibians sensitive to no flow conditions – strictly aquatic
Species/Taxon Richness	3	High richness due to good ecological state
Diversity of Habitat Types or Features	3	Range of riffles, pools, and extensive shoreline vegetation
Refuge value of habitat types	3	Increasing coastal development therefore more important for refuge and corridor funtion
Sensitivity of habitat to flow changes	3	High sensitivity to reduced flow due to abstraction
Sensitivity to flow related water quality changes	3	High sensitivity because strictly aquatic species are present
Migration route for instream and riparian biota	2	Limited extent due to waterfall as a natural barrier
Protection Status	2	Minimal as not part of a conservation area
EIS Score	**HIGH**	

4.4 Aquatic Impact Buffer Zone

Riparian means where the land meets a watercourse, and refers to the interface between these two habitats. Buffer areas are linear zones adjacent to watercourses managed with the intention of protecting water resources from diffuse pollution associated with adjacent land uses. In addition, they provide habitat for wildlife and aid movement through increasingly fragmented landscapes. Some well established benefits of buffer zones include:

- ✓ Maintain channel stability
- ✓ Control microclimate and temperature
- ✓ Flood attenuation
- ✓ Maintain wildlife habitat
- ✓ Sediment removal from diffuse runoff
- ✓ Nutrient removal from diffuse runoff
- ✓ Improve habitat connectivity
- ✓ Screening adjacent disturbance
- ✓ Enhance visual quality
- ✓ Control noise levels
- ✓ Improve air quality
- ✓ Create recreational opportunities

Buffer zone width was determined using the site-based Riparian Buffer model developed by Macfarlane & Bredin (2017) which is the more comprehensive of the two available models. The model incorporates locally determined environmental factors such as soil type, slope, annual rainfall, soil erodibility and inherent runoff potential at the site.

The slope beyond the edge of the mowed lawn area drops off rapidly until it is near vertical in the vicinity of the gabions, which are stacked approximately 4m high (Figure 6). It is not certain when the gabions were installed, but it is likely they were placed on the eroding bank of the stream as the bend is significant at this point. Which means that during high flows, the bank could be prone to instability again. The distance between the stream channel and the edge of the proposed development is approximately 15 m which is considered a minimal distance for

the protection of both infrastructure and the watercourse from erosion. The distance of **15 m** was determined in the buffer model as the operational phase buffer zone (Figure 6).

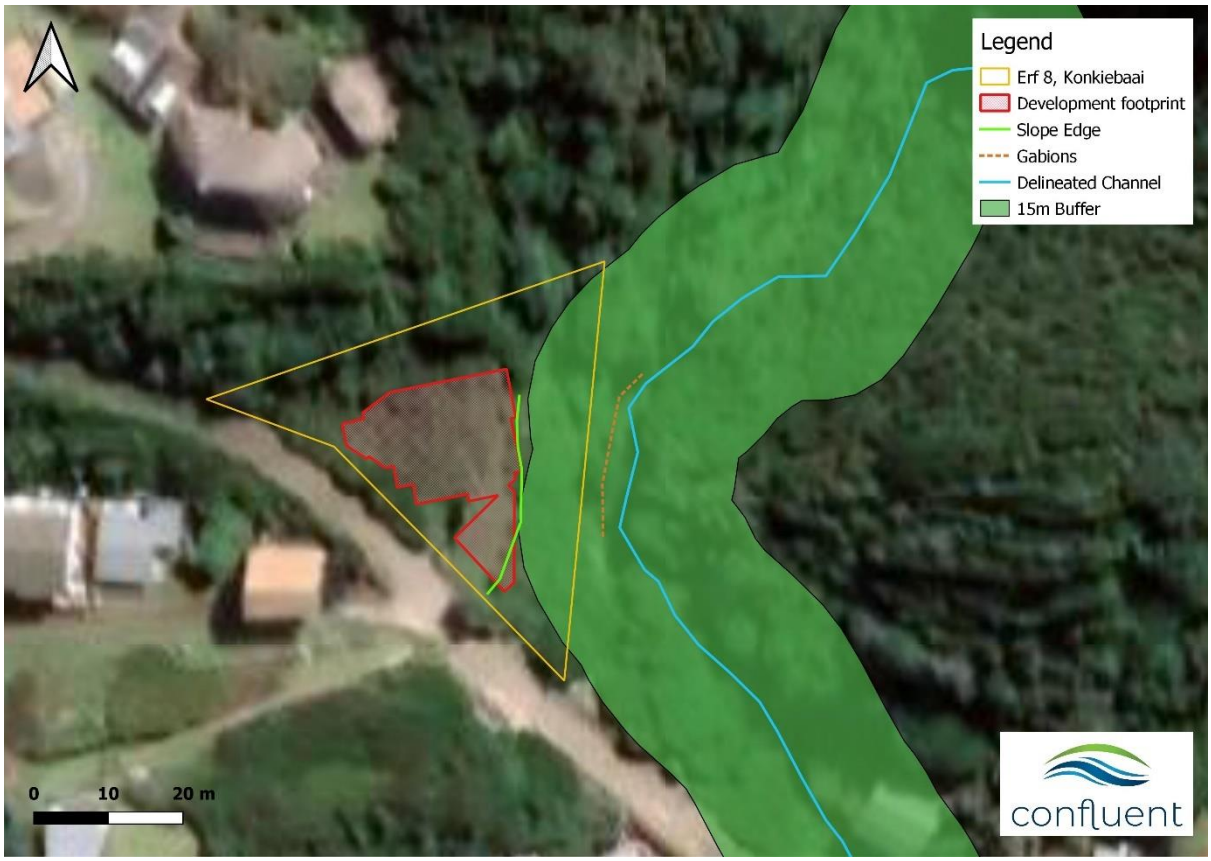

Figure 6. Delineated channel and relevant features affecting development setback line of 15m at Erf 8, Konkiebaai.

4.5 Site Sensitivity Verification

While the actual footprint of development does not appear to impact on the adjacent watercourse, the steep gradient of the edge of the site as it drops towards the stream extends the possible Project Area of Influence to the stream during the construction and operational phase. Steep slopes are vulnerable to erosion and if not managed carefully could result in degradation of the stream during the construction and / or operational phase. Given the High PES and EIS of the stream the site sensitivity is therefore confirmed as Very High. However, this finding is more related to the points already explained than its location within the Strategic Water Source Area. An impact assessment has therefore been compiled for the proposed residential dwelling.

5. IMPACT ASSESSMENT

Methods for the impact assessment are provided in Appendix 1. Impacts for the Layout, Construction and Operational phases of the proposed development were considered, along with relevant mitigation measures.

5.1 Layout Phase

The proposed footprint of the dwelling as indicated in Figure 6 is considered acceptable, as it is located mostly outside of the recommended buffer and does not extend beyond the steep edge. No alterations to this layout are recommended.

5.2 Construction Phase

The first impact considers possible damage to vegetation and disturbance of soils in the riparian buffer area. Protection of this area is considered absolutely vital given the steep slope on which it occurs, and therefore the very first step prior to commencing with construction is to delineate it using temporary fencing (Figure 7) and indicate this as a No-Go area to all workers on site (Table 7). The impact is considered a Minor Negative if not mitigated, but if all measures are implemented will be a Moderate Positive impact.

Table 7. Construction phase impact: Disturbance in the riparian buffer zone

Project phase	**Construction**			
Impact	**Disturbance to vegetation and soils in the riparian buffer area**			
Description of impact	**Loss of stabilising vegetation and increased erosion risk**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• **Before any construction commences at the site, the 15 m riparian buffer zone must be delineated using temporary fencing and indicated to all staff on site as a No-Go area for equipment, materials, vehicles or personnel.** • **As far as possible, all work along the edge of the buffer zone must be done by hand, with no heavy machinery permitted to work in the vicinity of the buffer.** • **Material and fuel stockpile and laydown areas must be located to the western portion of the erf, placed on impermeable material (geotextile or plastic) and bunded with sandbags to prevent loss during rainfall.** • **Absolutely no building materials, excess soil, rocks or litter can be thrown or discarded down the slope. All waste materials must be disposed of at a suitable location such as a registered landfill site.** • **No indigenous vegetation must be cut, trimmed, removed or damaged within the riparian buffer zone due to the valuable stabilising service provided.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Medium term	Impact will last between 5 and 10 years	On-going	Impact will last between 15 and 20 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	High	Natural and/ or social functions and/ or processes are notably altered
Probability	Likely	The impact may occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Moderate - positive**	
Comment on significance	If mitigation measures are strictly adhered to, the well-maintained riparian buffer zone will provide protection to the watercourse and reduce erosion risk and slope slippage which could put the dwelling at risk.			
Cumulative impacts	Not applicable.			

Figure 7. Example of temporary fencing of a riparian buffer zone during the construction phase.

The second impact considered is that of stormwater management during the construction phase. Clearing of vegetation which currently stabilised the slope within the footprint of the residence will render soil susceptible to erosion during heavy rainfall. Without the interception of vegetation, higher volumes of surface runoff will occur from the site. To protect the riparian buffer zone from erosion risk and the stream below from sedimentation, a line of hay bales along the buffer zone is recommended for the full duration of the construction phase until bare soil has been revegetated and stabilised on the site (Figure 8; Table 8).

Figure 8. Example of hay bales bound together with hessian / jute and staked to prevent surface runoff into the adjacent wetland.

Table 8. Construction phase impact: Management of Stormwater

Project phase	**Construction**			
Impact	**Management of stormwater**			
Description of impact	**Runoff from cleared areas may cause erosion and sedimentation downslope**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Before construction begins on site, embed a line of hay bales along the length of the construction side of the buffer zone. A shallow ditch of approximately 10cm deep must be dug along the buffer zone, and the bales placed into this. Bales must be staked into the ground with wooden stakes. It is very important that the bales are jammed tightly together to prevent gaps where water can flow between bales. Stakes can be hammered in at an angle towards adjacent bales to improve the contact between bales. The aim is to prevent sediment-laden surface runoff from flowing down the slope into the riparian zone in case of rain during construction at the site.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Likely	The impact may occur	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts	Not applicable			

The third impact considered in the construction phase is that of workers on site. This impact is considered a Negligible Low impact in both the unmitigated and mitigated state (Table 9). However, mitigation measures must be implemented to protect the stream and riparian buffer zone from unnecessary damage or pollution.

Table 9. Construction Phase Impact: Workers on Site

Project phase	**Construction**			
Impact	**Workers on site**			
Description of impact	**Inappropriate disposal of waste causing pollution**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Provide designated sites for rest periods, rubbish disposal, and ablutions. Bins must be changed regularly, and adequate toilet facilities provided. • All workers on site must be briefed that the riparian buffer zone is a No-Go area to prevent trampling of vegetation and wearing of paths which could increase alien plant encroachment and erosion risk.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Immediate	Impact will self-remedy immediately
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environment will be able to recover from the impact	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	While considered a negligible negative impact, mitigation measures should be implemented to protect the stream and buffer zone.			
Cumulative impacts	Not applicable			

5.3 Operational Phase Impacts

The operational phase impacts include management of stormwater. Development of the residence should attempt wherever possible to reduce surface runoff and concentrated flow paths of high velocity. Mitigation measures are provided which should reduce this impact to a Negligible Negative level (Table 10). Measures to maintain the buffer zone are included as the buffer zone acts to protect the stream from the impacts of stormwater runoff.

Table 10. Operational Phase Impact: Stormwater Management

Project phase	**Operation**			
Impact	**Stormwater management**			
Description of impact	**Concentrated high velocity flows from downpipes and paved areas can cause erosion of the slope**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	• **Install at least one 10 000L rainwater collection tank to collect rainwater from the roof. Ensure this water is used regularly for watering or preferably integrated into the residence plumbing (e.g. for toilet flushing or showering. This creates capacity in the tank when it rains. If it is constantly full it doesn't help for reducing runoff from the property.** • **Install permeable paving (e.g. grass blocks) in parking areas / driveways as this encourages water infiltration instead of surface runoff.** • **Revegetate all bare areas of soil post-construction with indigenous vegetation found at the site. Try to minimise areas of mowed lawn as this has very poor surface runoff interception qualities.** • **Maintain vegetation in the riparian buffer zone in a completely natural state with no trimming, or removal. It is preferable to install a basic fence to delineate the buffer zone so this can be indicated to gardeners as a zone of zero disturbance. No garden waste is to be disposed of in the riparian buffer zone.** • **Try to create rain gardens at the location of any downpipes in order to soak away the rain and recharge groundwater, instead of encouraging surface runoff.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Short term	Impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environment will be able to recover from the impact	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts				

The impact of fencing off the erf along the boundary adjacent to the stream is considered as part of the operational phase. It is recommended that no fencing be placed along this boundary, but that if fencing is considered necessary then it be placed along the edge of the riparian buffer zone to minimise impacts to this sensitive area (Table 11).

Table 11. Operational Phase Impact: Perimeter fencing

Project phase	**Operation**			
Impact	**Perimeter fencing**			
Description of impact	**Fencing along the Erf boundary in the buffer will cause disturbance of vegetation and fragment habitat**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Fencing is not considered necessary along the erf boundary adjacent to the stream. The site is steep, with difficult access, meaning that workers will cause significant disturbance when installing the fence. The fence will also restrict the movement of animals along the watercourse. Accessibility to the erf from this perspective is difficult and highly unlikely if the riparian vegetation is maintained in its current dense state. Fencing (if necessary, e.g. to enclose pets) along the edge of the riparian buffer zone would be supported as this would ensure reduced disturbance to this area.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts	No applicable			

6. CONCLUSIONS

The proposed residence on Erf 8, Konkiebaai is located adjacent to a perennial stream with a PES rated as B (Largely Natural) and a High EIS. Vulnerable plant and bird species were observed during the site visit increasing the ecological value of the stream. The site sensitivity in terms of aquatic biodiversity was confirmed as Very High. The recommended buffer zone is 15 m from the stream channel, which approximately aligns with the proposed footprint of the dwelling. Therefore the dwelling is located outside of the buffer and the proposed layout is supported.

Mitigation measures are required to protect the delineated riparian buffer zone both during the construction and operational phase. These are primarily aimed at protecting the integrity of vegetation and soil on the steep slope leading to the stream below. The buffer zone forms a vital function as it maintains stability in its current state. This area has been prone to destabilisation before, as evidenced by the presence of a gabion wall along the stream bank. All mitigation measures provided in this report should be fully implemented to ensure preservation of the ecological infrastructure on site.

7. APPENDIX

7.1 Impact Assessment Methods

Criteria are ascribed for each predicted impact. These include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criterion based on a seven-point scale (Table 12) and the significance is auto-generated using a spreadsheet through application of the calculations.

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **intensity** *(*size or degree scale), which also includes the **nature** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (intensity + duration + extent)

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

Table 12. Assessment criteria for the evaluation of impacts

Criteria	Numeric Rating	Category	Description
Duration	1	Immediate	Impact will self-remedy immediately
	2	Brief	Impact will not last longer than 1 year
	3	Short term	Impact will last between 1 and 5 years
	4	Medium term	Impact will last between 5 and 10 years
	5	Long term	Impact will last between 10 and 15 years
	6	On-going	Impact will last between 15 and 20 years
	7	Permanent	Impact may be permanent, or in excess of 20 years
Extent	1	Very limited	Limited to specific isolated parts of the site
	2	Limited	Limited to the site and its immediate surroundings
	3	Local	Extending across the site and to nearby settlements
	4	Municipal area	Impacts felt at a municipal level
	5	Regional	Impacts felt at a regional level
	6	National	Impacts felt at a national level
	7	International	Impacts felt at an international level
Intensity	1	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
	2	Very low	Natural and/ or social functions and/ or processes are slightly altered
	3	Low	Natural and/ or social functions and/ or processes are somewhat altered

Criteria	Numeric Rating	Category	Description
	4	**Moderate**	Natural and/ or social functions and/ or processes are moderately altered
	5	**High**	Natural and/ or social functions and/ or processes are notably altered
	6	**Very high**	Natural and/ or social functions and/ or processes are majorly altered
	7	**Extremely high**	Natural and/ or social functions and/ or processes are severely altered
Probability	**1**	**Highly unlikely / None**	Expected never to happen
	2	**Rare / improbable**	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	**Unlikely**	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	**Probable**	Has occurred here or elsewhere and could therefore occur
	5	**Likely**	The impact may occur
	6	**Almost certain / Highly probable**	It is most likely that the impact will occur
	7	**Certain / Definite**	There are sound scientific reasons to expect that the impact will definitely occur

When assessing impacts, broader considerations are also considered. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in (Table 13, Table 14, and Table 15), respectively.

Table 13. Definition of confidence ratings.

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 14. Definition of reversibility ratings.

Category	Description
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 15. Definition of irreplaceability ratings.

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere

8. REFERENCES

Council for Scientific and Industrial Research (CSIR; 2018). National Wetland Map 5 and Confidence Map [Vector] 2018. Available from the Biodiversity GIS website, downloaded on 30 September 2020.

Kleynhans, C.J. (1996) A qualitative procedure for the assessment of the habitat integrity status of the Luvuvhu River (Limpopo system, South Africa). Journal of Aquatic Ecosystem Health 5: 41-54

Nel, J.L., Driver, A., Strydom, W.F., Maherry, A., Peterson, C., Hill, L., Roux, D.J., Nienaber, S., van Deventer, H., Swartz, E. and Smith-Adao, L.B. (2011) Atlas of freshwater ecosystem priority areas in South Africa: Maps to support sustainable development of water resources. Water Research Commission Report No. TT 500/11.

Ollis, D., Snaddon, K., Job, N., & Mbona, N. (2013). Classification system for wetlands and other aquatic ecosystems in South Africa. South African National Biodiversity Institute.

South African National Biodiversity Institute (2006-2018). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/Projects/Detail/186, Version 2018.

Province of the
EASTERN CAPE
ECONOMIC DEVELOPMENT, ENVIRONMENTAL AFFAIRS & TOURISM

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST IN TERMS OF REGULATIONS 12 AND 13 OF THE AMENDMENTS TO THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 AS AMENDED.

	(For official use only)
File Reference Number:	
NEAS Reference Number:	
Date Received:	

Application for environmental authorization in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amendments to the Environmental Impact Assessment Regulations, 2014. This form is valid as of 6 January 2021.

PROJECT TITLE

Konkiebaai Aquatic Specialist Assessment: Proposed construction of residential dwelling

SPECIALIST [1]	Confluent Environmental		
Contact person:	Dr. Jackie Dabrowski		
Postal address:	50 Bokmakierie Street, Eden, George		
Postal code:	6529	Cell:	083 2563159
Telephone:		Fax:	
E-mail:			
Professional affiliation(s) (if any)	SACNASP and SASAqS		

Project Consultant:	Dr. Jackie Dabrowski		
Contact person:	As above		
Postal address:	50 Bokmakierie Street, Eden, George		
Postal code:	6529	Cell:	083 2563159
Telephone:		Fax:	
E-mail:	jackie@confluent.co.za		

4.2 The SPECIALIST

I, , declare that –

General declaration:

- 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 environmental impact assessments, 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 will take into account, to the extent possible, the matters listed in regulation **8** of the regulations when preparing the application and any report relating to the application;
- 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;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by

  interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will keep a register of all interested and affected parties that participated in a public participation process; and
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- all the particulars furnished by me in this form are true and correct;

- will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; and
- I realise that a false declaration is an offence and is punishable in terms of section 24F of the Act.

Disclosure of Vested Interest (delete whichever is not applicable)

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Amendments to Environmental Impact Assessment Regulations, 2014 as amended.
- ~~I have a vested interest in the proposed activity proceeding, such vested interest being:~~

_____

_____

Signature of the environmental assessment practitioner:

Confluent Environmental

Name of company:

1 February 2023

Date:

Signature of the Commissioner of Oaths:

7208362-8 C ST V.C Strydom

Date:

1 Februdry 2023

Designation:

Curriculum Vitae (CV) attached

Official stamp (below)

SUID-AFRIKAANSE POLISIEDIENS
STATION COMMANDER
COMMUNITY SERVICE CENTRE
2023 -02- 01
GEORGE
SOUTH AFRICAN POLICE SERVICE

Ek sertifiseer dat hierdie dokument 'n ware afdruk/afskrif is van die oorspronklike wat deur my persoonlik besigtig is en dat volgens my waarnemings, die oorspronklike nie op enige wyse gewysig is nie.

I certify that this document is a true reproduction/copy of the original which was examined by me and that from my observations the original has not been altered in any manners.

7208362-8 C ST V.C
Handtekening/Signature

V.C
2023-02-01

JACKIE DABROWSKI

(Ph.D., Pr. Sci. Nat. Aquatic Science)

☎: +27 83 256 3159
✉: jackie@confluent.co.za

DOB: 18 January 1978
Marital Status: Married
Citizenship: South Africa & New Zealand

TERTIARY EDUCATION

2012–2014: Ph.D. Veterinary Science, University of Pretoria
Title: Pansteatitis in tilapia (*Oreochromis mossambicus*) from Loskop Dam, South Africa: links between the environment, diet and thyroid status.

2010–2011: M.Sc. (*Cum laude*) Veterinary Science, University of Pretoria
Title: Water quality, metal bioaccumulation and parasite communities of *Oreochromis mossambicus* in Loskop Dam, Mpumalanga, South Africa.

2009: B.Sc. Honours (*Cum laude*) Entomology, Department of Zoology, University of Pretoria

2006 -2008: B.Sc. in Biological Sciences, University of Canterbury, New Zealand

EMPLOYMENT RECORD

Present: Confluent Environmental (Pty) Ltd., Co-Director
2014-2016: CSIR (Water Ecosystems and Human Health) – Senior Researcher
2012-2013: CSIR/DST-NRF (Professional Development Programme) – Ph.D. Researcher
1997-2006: Flight Centre – Various leadership roles in New Zealand and South Africa

KEY EXPERTISE

Aquatic specialist studies for environmental authorisations; Aquatic ecology; Biodiversity of ephemeral wetlands in arid climates; Drought and water quality; Eutrophication; Macroinvertebrate diversity; Fish kill investigations; Aquatic food webs; Land rehabilitation with dung beetles; Wetland delineations.

PROFESSIONAL ASSOCIATIONS & OTHER QUALIFICATIONS

Research Affiliations

- Research Associate (Department of Zoology and Entomology, University of Pretoria)
- Research Associate (Sustainability Research Unit, Nelson Mandela Metropolitan University)
-

Professional Societies

- South African Society of Aquatic Scientists (SASAqS)
- South African Council for Natural Scientific Professionals (SACNASP)
- New Zealand Freshwater Sciences Society (NZFSS)

Relevant qualifications

- SASS5 (South African Scoring System) accredited practitioner (DWS)

SCIENTIFIC PUBLICATIONS

Dabrowski, J., Venter, G., Truter, W.F. & Scholtz, C.H. (2018). Dung beetles can tunnel into highly compacted soils from reclaimed mined sites in eMalahleni, South Africa. *Journal of Applied Soil Ecology* 134: 116-119.

Badenhorst, J., **Dabrowski, J**., Scholtz, C.H., & Truter, W.F. (2018). Dung beetle activity improves herbaceous plant growth and soil properties on confinements simulating reclaimed mined land in South Africa. *Journal of Applied Soil Ecology*, 132: 53-59.

Dabrowski, J., Oberholster, P., Steyl, J., Osthoff, G., Hugo, A., Power, D.M., van Wyk, J.H. (2017). Thyroid function of steatitis-affected Mozambique tilapia *Oreochromis mossambicus* from a sub-tropical reservoir. *Diseases of Aquatic Organisms*, 125: 101-113.

Dabrowski, J., Baldwin, D.S., Hill, L., Shadung, J., Dabrowski, J.M. (2017). The impact of desiccation on the mobility of nutrients and metals from the sediments of Loskop Reservoir, Olifants River. *Water SA*, 43: 7-16.

Lübcker, N., **Dabrowski, J**., Zengeya, T.A., Oberholster, P.J., Hall, G., Woodborne, S. and Robertson, M.P. (2016). Trophic ecology and persistence of invasive silver carp *Hypophthalmichthys molitrix* in an oligotrophic South African impoundment. *African Journal of Aquatic Science* 41(4): 399-411.

Dabrowski, J.M., **Dabrowski, J**., Hill, L., MacMillan, P. and Oberholster, J. (2014). Fate, transport and effects of pollutants originating from acid mine drainage in the Olifants River, South Africa. *River Research and Applications*, doi: 10.1002/rra.2833.

Dabrowski, J., Hall, G., Lubcker, N., Oberholster, P.J., Phillips, D.L. and Woodborne, S. (2014). Piscivory does not cause pansteatitis (yellow fat disease) in *Oreochromis mossambicus* from an African subtropical reservoir. *Freshwater Biology*, 59: 1484-1496.

Dabrowski, J., Oberholster, P.J., and Dabrowski, J.M. (2014). Water quality of Flag Boshielo Dam, Olifants River, South Africa: Historical trends and the impact of drought. *Water SA*, 40: 345-358.

Lubcker, N., Zengeya, T.A., **Dabrowski, J**. and Robertson, M.P. (2014). Predicting the potential distribution of invasive silver carp *Hyphophthalmichthys molitrix* in South Africa. *African Journal of Aquatic Science*, 39: 157-165.

Dabrowski, J., Oberholster, P.J., Dabrowski, J.M., Le Brasseur, J. and Gieskes, J. (2013). Chemical characteristics and limnology of Loskop Dam in light of recent fish and crocodile mortalities. *Water SA*, 39: 675-686.

Oberholster, P.J., **Dabrowski, J**. and Botha Anna-Maria. (2013). Using modified multiple phosphorus sensitivity indices for mitigation and management of phosphorus loads on a catchment level. *Fundamental Applied Limnology* 182(1): 1-16.

Chaplot, V., **Brown, J**., Dlamini, P., Eustice, T., Janeau, J-L., Jewitt, G., Lorentz, S., Martin, L., Nontokozo-Mchunu, C., Oakes, E., Podwojewski, P., Revil, S., Rumpel, C. and Zondi, N. (2011). Rainfall simulation to identify the storm-scale mechanisms of gully bank retreat. *Agricultural Water Management* 98(11): 1704-1710.

Brown, J., Scholtz, C.H., Janeau, J-L., Grellier, S. and Podwojewski, P. (2010). Dung beetles (Coleoptera: Scarabaeidae) can improve soil hydrological properties. *Applied Soil Ecology* 46: 9-16.

Oberholster, P.J., **Dabrowski, J**., Blaise, C. and Botha, A-M (2014). To determine *Daphnia* population dynamics and recovering patterns after exposure to different environmental stressors. (2014). Eutrophication: Causes, Economic Implications and Future Challenges. Nova publishers.

SELECTED PROJECT EXPERIENCE

Date	Nature of Project	Industry/Sector	Client/Developer	Country (Province)
2022	Monitoring plan development for Knysna WWTW	Monitoring	Zutari / Knysna Municipality	RSA (Western Cape)
2022	Risk Assessment for emergency flood repairs	Roads	Garden Route District Municipality	RSA (Western Cape)
2022	Section 24G report and licensing 4 instream dams, Redford	Agriculture	Private	RSA (Western Cape)
2022	Section 24G report and licensing for 1 instream dam, Redford	Agriculture	Private	RSA (Western Cape)
2022	Risk matrix for layer farm expansion, Friemersheim	Agriculture	Cornerstone	RSA (Western Cape)
2022	Section 24G report and licensing for wetlands, Rooiriviersrif	Housing	Power Developments	RSA (Western Cape)
2021	Risk matrix for TR1 road upgrade, George-Oudtshoorn	Roads	Zutari	RSA (Western Cape)
2021	Watercourse rehabilitation, low-cost housing, Pacaltsdorp	Housing	Royal Haskoning DHV	RSA (Western Cape)
2021	Proposed erosion control for road along Swartvlei Estuary	Roads	Garden Route Municipality	RSA (Western Cape)
2021	Monitoring Klein Wolwe River Mangement Plan	Agriculture	Lancewood Farms	RSA (Western Cape)
2021	Wetland verification & delineation Wolwedans Avocados	Agriculture	Group Editors	RSA (Western Cape)
2021	Wetland verification & delineation Gouritz River Mouth	Tourism	Private	RSA (Western Cape)
2020	Aquatic specialist on 4 river mangement plans, Langkloof	Agriculture	Du Toit / PHS Consulting	RSA (Eastern Cape)
2020	River management plan for the Klein Wolwe River	Agriculture	Lancewood Farms	RSA (Western Cape)
2020	General Authorisation application for the above	Agriculture	Lancewood Farms	RSA (Western Cape)
2020	Risk matrix and wetland delineation Mossel Bay	Housing	Cape EAPrac	RSA (Western Cape)
2020	Risk matrix and wetland delineation Knysna	Housing	Cape EAPrac	RSA (Western Cape)
2020	Risk matrix for Bloemsmond Solar 3, Upington	Energy	Atlantic Energy Partners	RSA (Northern Cape)
2020	Risk matrix for Bloemsmond Solar 1, Upington	Energy	Atlantic Energy Partners	RSA (Northern Cape)
2020	S24G for wetland disturbance, Mossel Bay	Housing	Cape EAPrac	RSA (Western Cape)
2020	Water Use License Application, NB Farms Plettenberg Bay	Agriculture	NB Farms	RSA (Western Cape)
2020	General Authorisation water use, Plettenberg Bay	Agriculture	Black Dog Farms	RSA (Western Cape)
2020	Develop best practice guidelines for riparian buffer zones in the dairy sector	Research	Institute of Natural Resources / Milk SA	RSA (Western Cape)
2020	S24G for dam excavation, Oudtshoorn	Agriculture	Cape EAPrac	RSA (Western Cape)
2020	S24G for dam construction in wetland, George	Housing	Cape EAPrac	RSA (Western Cape)
2020	Specialist inputs to WUL for stream abstraction, Riversdale	Agriculture	Groundwater Complete	RSA (Western Cape
2020	S24G for unlawful road crossing wetlands, Riversdale	Agriculture	Cape EAPrac	RSA (Western Cape)
2020	WUL specialist study for Tswalu Kalahari Reserve	Nature Conservation	Tswalu Kalahari	RSA (Northern Cape)
2019-2020	Rehabilitation of Swakoppoort Dam	Water Resource Management	Namwater	Windhoek, Namibia
2019	Rapid Reserve for the Huis River	Agriculture	Lancewood	RSA (Western Cape)
2019	Maintenance plan for Knysna WWTW	Municipality	Aurecon	RSA (Western Cape)
2019	Bilharzia monitoring	NGO	Bronkhorstspruit Catchment Forum	RSA (Gauteng)

2019	George Rex wetland rehabilitation plan, Knysna	Recreation	Eco Route	RSA (Western Cape)
2019	S24G for unauthorised development, Kaaimans River	Tourism	Cape EAPrac	RSA (Western Cape)
2019	Risk Assessment: chicken farm expansion, Plettenberg Bay	Agriculture	Hilland Environmental	RSA (Western Cape)
2019	EIA for stream diversion/dam expansion	Agriculture	Du Toit / Gorra Water	RSA (Eastern Cape)
2019	Wetland rehabilitation plan, Riversdale	Agriculture	Cape EAPrac	RSA (Western Cape)
2019	S24G for unauthorised dam, Ladismith	Agriculture	Cape EAPrac	RSA (Western Cape)
2019	Riparian delineation & risk assessment, Oudtshoorn	Urban Development	Eco Route	RSA (Western Cape)
2019	Tailings spill biomonitoring	Mining / Platinum	Agreenco / Lonmin	RSA (North West)
2019	BA for Bloemsmond solar 5, Upington	Energy	Cape EAPrac	RSA (Northern Cape)
2019	BA for Bloemsmond solar 4, Upington	Energy	Cape EAPrac	RSA (Northern Cape)
2019	BA for Bloemsmond solar 3, Upington	Energy	Cape EAPrac	RSA (Northern Cape)
2018	Wetland classification & risk assessment, George	Urban Development	Sharples Enironmental	RSA (Western Cape)
2018	Ecological risk assessment, Cape Town	Industry	AECI / USK Environmental	RSA (Western Cape)
2018	River maintenance plan (Klein Piesang)	Agriculture	HilLand Environmental	RSA (Western Cape)
2018	S24G alien vegetation, Riversdale	Agriculture	HilLand Environmental	RSA (Western Cape)
2018	BA for dam expansion, Karatara	Agriculture	CapeEAPrac / Lancewood	RSA (Western Cape)
2018	Restoration plan, cyanide non-compliance at New Liberty Gold Mine	Mining / Gold	Avesoro / Enviro-Insight	Liberia (Grand Cape Mount County)
2018	Water use license application and specialist assessment	Urban Development	M&T Development / Enviro-Insight	RSA (Gauteng)
2018	Environmental authorisation assessment	Urban Development	SMEC / Knysna Municipality	RSA (Western Cape)
2018	Monitoring of a slurry spill at Lonmin Mine	Mining / Platinum	Agreenco / Lonmin	RSA (North West)
2018	Aquatic ecosystem health and rehabilitation of upper reaches of the Jukskei River.	Urban development	Advisian / City of Ekurhuleni	RSA (Gauteng)
2018	Biodiversity of branchiopods in Tswalu Kalahari Reserve	Conservation	Tswalu Foundation	RSA (Northern Cape)
2018	EIA and Water Use License inputs for a proposed dam near Oudtshoorn	Agriculture	Gorra Water	RSA (Western Cape)
2017	Aquatic biodiversity assessment	Mining / Platinum	Agreenco/Lonmin	RSA (North West)
2017	Risk assessment for river rehabilitation plan	Mining / Platinum	Agreenco/Lonmin	RSA (North West)
2017	Biodiversity of ephemeral arid pans	Conservation	Tswalu Foundation	RSA (Northern Cape)
2017	Dung beetle breeding consultation	Animal health	MSD Animal Health	RSA (Mpumalanga)
2015-2017	Dung beetles in mine rehabilitation	Mine rehabilitation/coal	Coaltech	RSA (Mpumalanga)
2017	Fish kill investigation (Wilge River)	Private	Ernest Oppenheimer & Son	RSA (Mpumalanga)
2017	Scoping Study (Vioolsdrift Dam)	Dam	Imperata/AECOM	RSA (Northern Cape)
2017	English editing and scientific review (multiple)	Academic	Nelson Mandela University	RSA (Western Cape)
2016	Water Use License, specialist report	Agriculture	Bokamoso/Drafstap	RSA (KwaZulu-Natal)
2016	Water Use License, specialist report	Agriculture	Bokamoso/Triple C	RSA (KwaZulu-Natal)
2016	Environmental Impact Assessment for an off-stream dam	Agriculture	Bokamoso/Triple C	RSA (KwaZulu-Natal)

2016	Water Use License, specialist report	Agriculture	Bokamoso/AFT	RSA (KwaZulu-Natal)
2016	Water Use License, specialist report	Agriculture	Bokamoso/Robbertze	RSA (KwaZulu-Natal)
2016	Water Use License, specialist report	Agriculture	Bokamoso/De Loskop	RSA (Limpopo)
2016	Water Use License, specialist report	Agriculture	Bokamoso/Onverwacht	RSA (Limpopo)
2016	Water Use License, specialist report	Agriculture	Bokamoso/Kalkgat	RSA (Limpopo)
2016	Statistical analysis of livestock feeding trials	Agriculture	Urban Farmer	RSA (Gauteng)
2016	Fish kill investigation	Mining / gold	Enviro-Insight	Liberia (Grand Cape Mount County)
2009-2013	Upper Olifants River Risk Assessment	Research	Coaltech/Olifants River Forum	RSA (Mpumalanga)
2011-2012	Water quality monitoring & assessment (Emmarentia Dam)	Recreation	Dabulamanzi Canoe Club	RSA (Gauteng)
2014	Fish kill investigation, Eikeboom pan	Mining / coal	Optimum Coal	RSA (Mpumalanga)
2014	Fish kill reporting website design	Mining / coal	Coaltech	RSA (Mpumalanga)
2010	EIA specialist study for road improvements, Burgersfort	Roads	Envirobalance	RSA (Limpopo)
2009	EIA specialist study for bridge, King Williamstown	Roads	Envirobalance	RSA (Eastern Cape)