Proposed Development of Tourist Facilities on Portion 104 of Farm 216, Uitzicht, Knysna, Western Cape.

Aquatic Biodiversity Site Sensitivity Verification and Impact Assessment.

Prepared For: Eco Route Environmental Consultancy

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EXECUTIVE SUMMARY

Confluent Environmental Pty (Ltd) was appointed by Eco Route to provide aquatic specialist inputs for the proposed mixed developments on Farm 104 of 216, Knysna, Western Cape. According to the DFFE Screening Tool, Farm 104 of 216 has a 'Very High' aquatic biodiversity sensitivity. This report is guided by the National Environmental Management Act (NEMA) and the National Water Act (NWA).

The proposed development, situated adjacent to the Knysna Estuary, includes five camping areas with associated infrastructure. The site falls within the catchment of the Knysna River and features a very high rainfall intensity and high soil erosion potential, necessitating careful stormwater and erosion management. The site's vegetation is primarily Knysna Sand Fynbos, classified as Critically Endangered, and Goukamma Dune Thicket, categorized as Least Concern.

The Knysna Estuary is a critical biodiversity area, contributing to water source, watercourse, and coastal resource protection. The site is subject to the regulations of the Knysna River Estuary Management Plan, which mandates SANParks approval for developments within 100 meters of the estuary.

A site visit confirmed the presence of severe erosion on the steep sand cliff adjacent to the estuary, exacerbated by a large lawn area adjacent to the cliff. The construction phase is expected to increase soil exposure, leading to greater surface water runoff and erosion. The addition of impermeable surfaces will further enhance runoff and sedimentation, adversely affecting the estuary.

Given the high sensitivity of aquatic biodiversity in the area, mitigation measures, including a defined 36-meter buffer zone from the edge of the Knysna Estuary, are crucial to minimize existing and future stormwater and erosion impacts and to ensure the protection of the Knysna Estuary's ecological integrity.

DECLARATION OF SPECIALIST INDEPENDENCE

- 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.

Specialist: Mr. Franco de Ridder (MSc., Candidate Natural Scientist. Aquatic Science – 166398)

Date: June 2024

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GLOSSARY

Aquatic Biodiversity	The variety of plant and animal life in water ecosystems, relevant to the study due to the site's proximity to potential water bodies.
Desktop Review	Preliminary assessment based on existing data and information, conducted prior to on-site investigations.
Erosion Control Methods	Techniques employed to prevent or minimize soil erosion, such as haybale check dams or silt fencing, crucial in areas with high inherent erosion potential.
Estuary	Partially enclosed coastal body of water where freshwater from rivers and streams meets and mixes with saltwater from the ocean. This interaction between fresh and saltwater creates a unique and dynamic environment that supports a diverse array of plant and animal species.
Freshwater Ecosystem Priority Area (FEPA)	Designated areas of high importance for freshwater ecosystem conservation, identified as a sensitivity feature in the DFFE screening tool.
Site Assessment	Comprehensive evaluation of the proposed development site, including the identification of wetlands, watercourses, and soil characteristics.
Sensitivity	The degree to which a particular area or ecosystem is susceptible to disturbance or impact, crucial in determining potential environmental consequences.
Terrestrial Critical Biodiversity Area (CBA1)	A designation indicating the significance of the area's biodiversity on land.
Topography	The physical features of the land surface, considered for its potential influence on drainage and ecological features.
Wetland	An area where water covers the soil, or is present either at or near the surface, contributing to biodiversity and ecological significance.
Western Cape Biodiversity Spatial Plan (WCBSP)	A plan indicating categorized areas based on their ecological importance in the Western Cape region.

ABBREVIATIONS

CBA:	**Critical Biodiversity Area**
CD:NGI:	Chief Directorate: National Geo-spatial Information
DFFE:	Department of Environment, Forestry and Fisheries
DWAF:	Department of Water Affairs and Forestry
DWS:	Department of Water & Sanitation
EIS:	Ecological Importance and Sensitivity
ESA:	Ecological Support Area
FEPA:	Freshwater Ecosystem Priority Area
GA:	General Authorisation
GPS:	Global Positioning System
NEMA:	National Environmental Management Act
NFEPA:	National Freshwater Ecosystem Priority Areas
NWA:	National Water Act
NWM5:	National Wetland Map 5
SACNASP:	South African Council for Natural Scientific Professions
WCBSP:	Western Cape Biodiversity Spatial Plan
WUL:	Water Use License

1. INTRODUCTION

Confluent Environmental Pty (Ltd) was appointed by Eco Route to provide aquatic specialist inputs for the proposed tourist development on Portion 104 of Farm 216, Knysna, Western Cape. (Figure 1). According to the DFFE Screening Tool, the sensitivity of aquatic biodiversity on the property is **Very High** (Figure 1). The site is adjacent to the Knysna Estuary towards the northeast of the property boundary, approximately 2.2 km east of Brenton on Sea and 3.8 km south of Knysna's town centre.

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

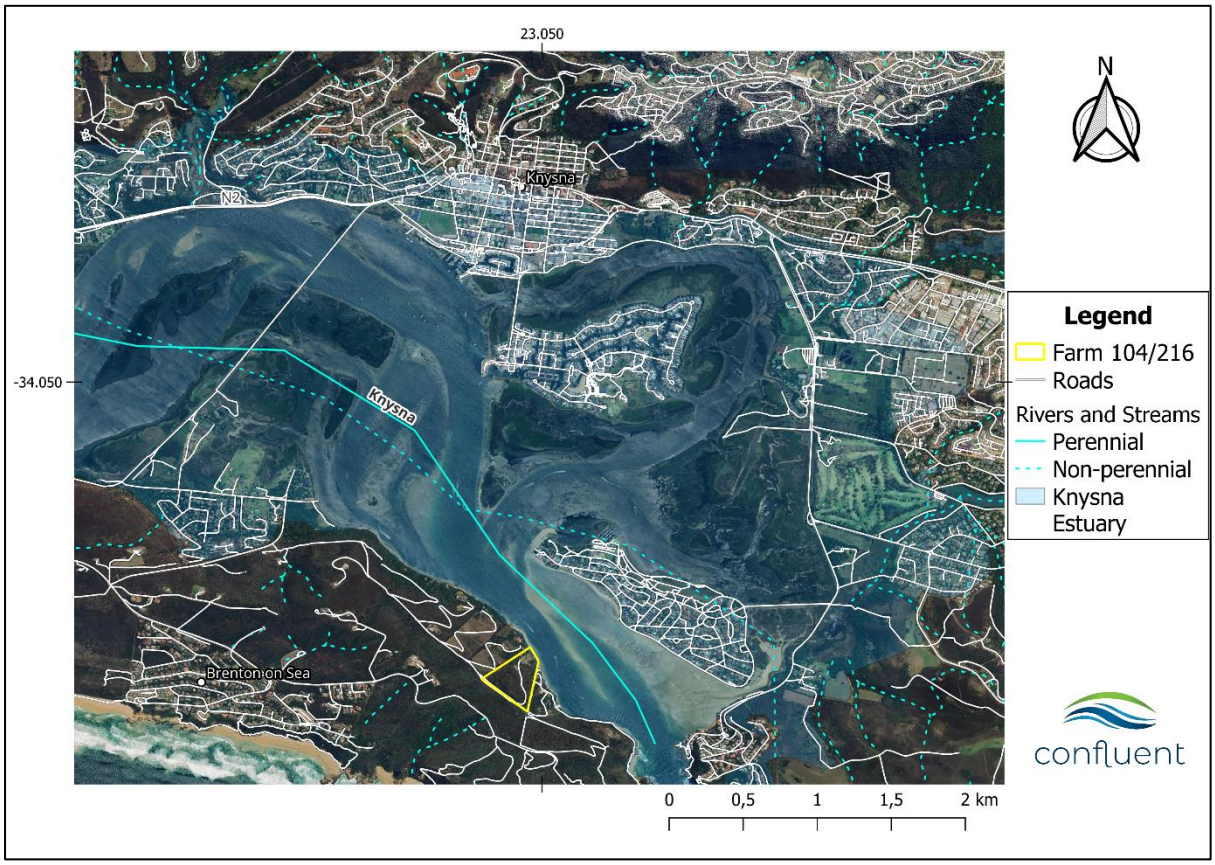

Figure 1. Portion 104/216 Uitzigt, Knysna, Western Cape.

1.1 Key Legislative Requirements

1.1.1 National Environmental Management Act

According to the protocols specified in GN 1540 (Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental 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.

According to the Department of Environment, Forestry and Fisheries (DFFE) screening tool, aquatic biodiversity at the site has a Very High sensitivity (Figure 2) for the following reasons:

- The development footprint is indicated to intersect with an aquatic Critical Biodiversity Area (CBA).
- The Knysna Estuary is located immediately adjacent to the property boundary.
- The property is located within a Freshwater Ecosystem Priority Area (FEPA.
- The property is located within the Outeniqua Strategic Water Source Area (SWSA).

According to the protocol, a site sensitivity verification must be undertaken to confirm the sensitivity of the site as indicated by the screening tool.

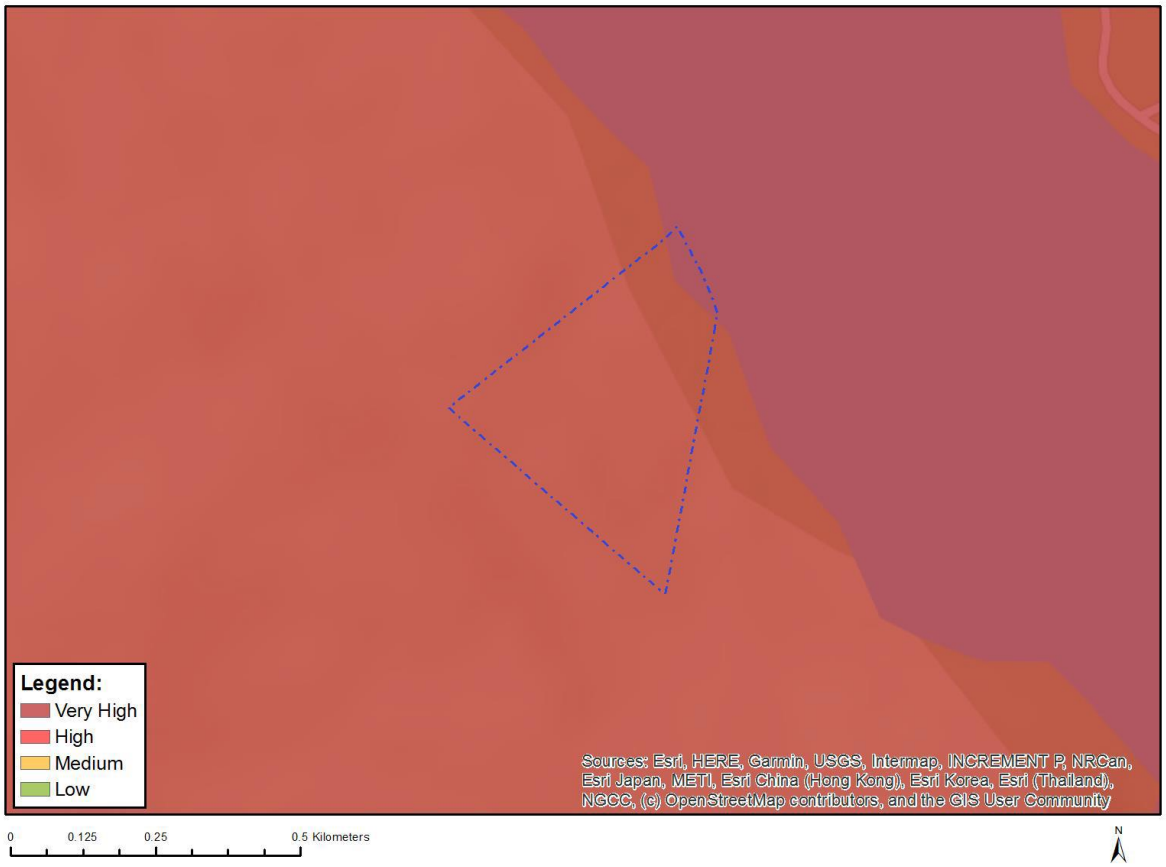

Figure 2: Results of the DFFE Screening Tool which indicate Very High Sensitivity of the Aquatic Biodiversity theme for the preferred development site on Portion 104 of 216.

The National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) outlines specific measures for developments within the coastal protection zone, which includes land within 100 meters of the high-water mark of the sea and estuaries.

According to the National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008), as amended by Act No. 36 of 2014, an "estuary" is defined as:

- A body of surface water that is permanently or periodically open to the sea;
- A body of surface water in which a rise and fall of the water level as a result of the tides is measurable at spring tides when the body of surface water is open to the sea;
- A body of surface water in respect of which the salinity is higher than freshwater as a result of the influence of the sea, and where there is a salinity gradient between the tidal reach and the mouth of the body of surface water

The coastal protection zone is a crucial aspect of coastal management, consisting of various land areas, including:

- Any land unit situated wholly or partially within 100 meters of the high-water mark (Section 16e).

Estuaries must be managed in a coordinated and efficient manner according to a national estuarine management protocol, which includes the following requirements:

- Development within the defined estuarine boundaries must be consistent with the strategic vision and objectives set for effective integrated management of estuaries.

For any development activity within this zone, an environmental authorisation is required. This is to ensure that any proposed changes to the use, physical nature, or appearance of a place, including construction, alteration, demolition, or removal of structures, are compliant with environmental management principles and do not harm the coastal environment.

1.1.2 National Water Act

The Department of Water & Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, or aquifers.

A watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be watercourse.

An estuary is not defined as a watercourse. For the purposes of this assessment, a wetland area is defined according to the NWA (Act No. 36 of 1998):

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

Wetlands must therefore have one or more of the following attributes to meet the NWA wetland definition (DWAF, 2005):

- A high water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil;
- Wetland or hydromorphic soils that display characteristics resulting from prolonged saturation, i.e. mottling or grey soils; and
- The presence of, at least occasionally, hydrophilic plants, i.e. hydrophytes (water loving plants).

No activity may take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). According to Section 21 (c) and (i) of the National Water Act, an authorization (Water Use License or General Authorisation) is required for any activities that impede or divert the flow of water in a watercourse or alter the bed, banks, course or characteristics of a watercourse. The regulated area of a watercourse for section 21(c) or (i) of the Act water uses means:

a) The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

b) In the absence of a determined 1 in 100-year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or

c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

According to Section 21 (c) and (i) of the NWA, any water use activities that do occur within the regulated area of a watercourse must be assessed using the DWS Risk Assessment Matrix (GN4167) to determine the impact of construction and operational activities on the flow, water quality, habitat and biotic characteristics of the watercourse. Low-Risk activities require a General Authorisation (GA), while Medium or High-Risk activities require a Water Use License (WUL).

1.2 Assumptions and Exclusions

A site visit was conducted in May 2024 (autumn). It is possible that sensitive features such as rare or unique biota (e.g. amphibians), plants or habitat were not observed during the site visit, but are influenced by season, time of day, flow level or vegetation cover. However, recent good rainfall would have meant that any wetland features would have been quite evident and easy to identify.

1.3 The Proposed Development

The tourist development will occur in the northern part of Farm 104 of 216 (Figure 3). The development will include five camping areas that will consist of five camping platforms, associated access roads and one ablution, cooking and wash-up facility per camp area (Figure 4).

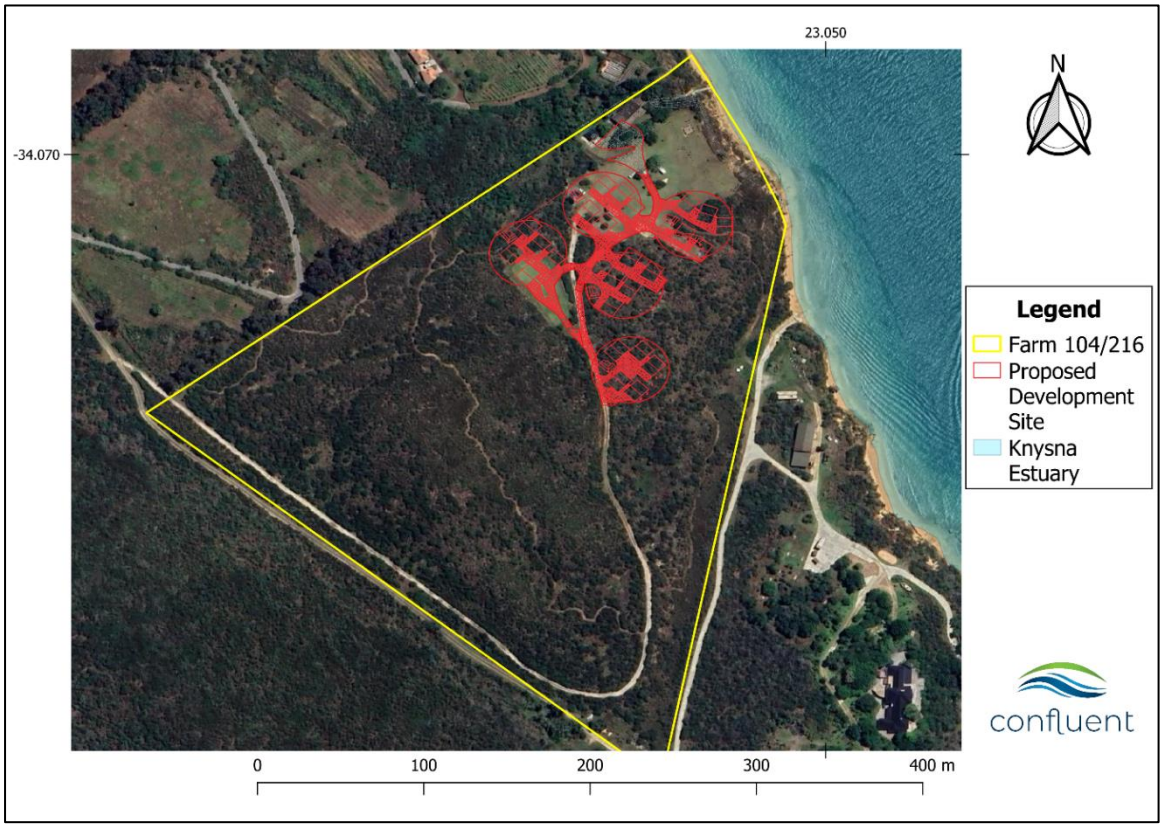

Figure 3: Proposed development plan for the five camp areas.

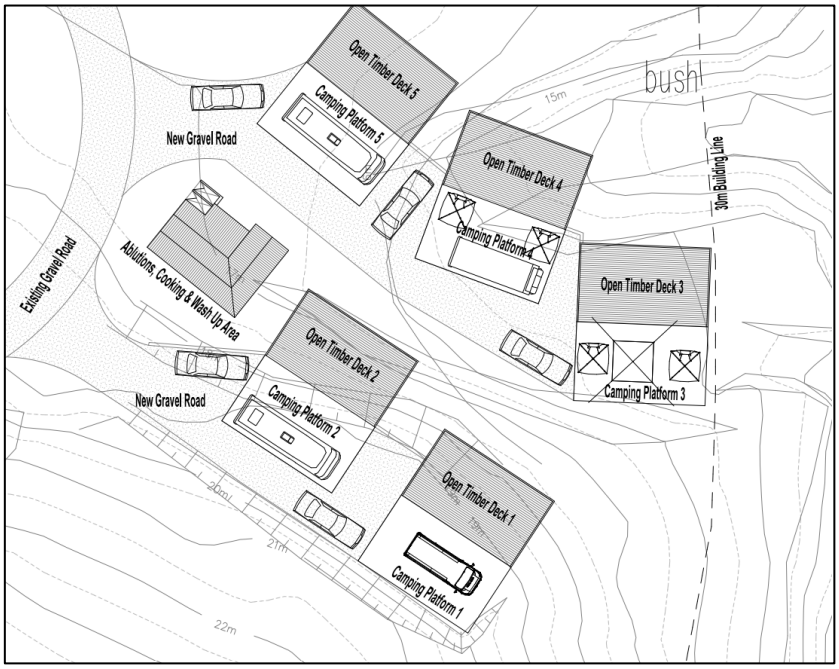

Figure 4: Proposed development layout for one of the proposed camp areas.

The camping platform will consist of a concrete platform and a timber deck (Figure 5).

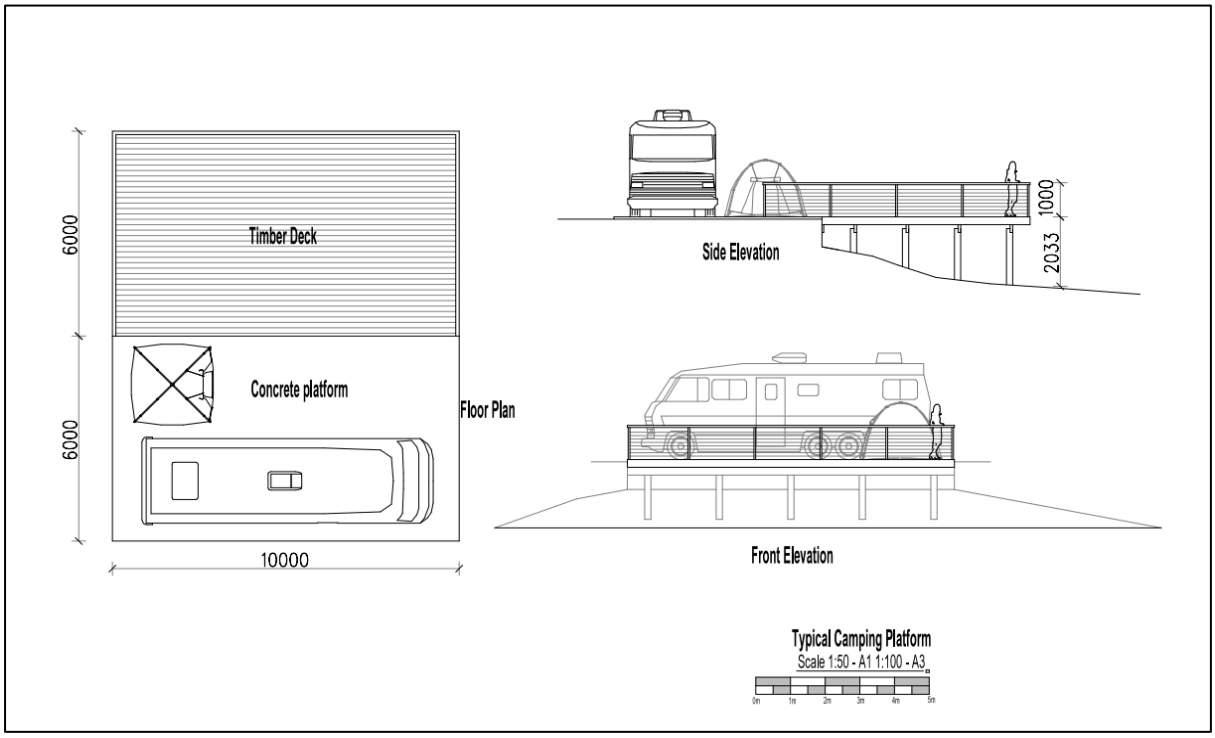

Figure 5: Proposed Camping platform layout.

The ablution, cooking, and wash-up facility will have three urinals two toilets, five showers, and three basins associated with the ablution area of the facility, a wash-up and laundry area, and a cooking area (Figure 6).

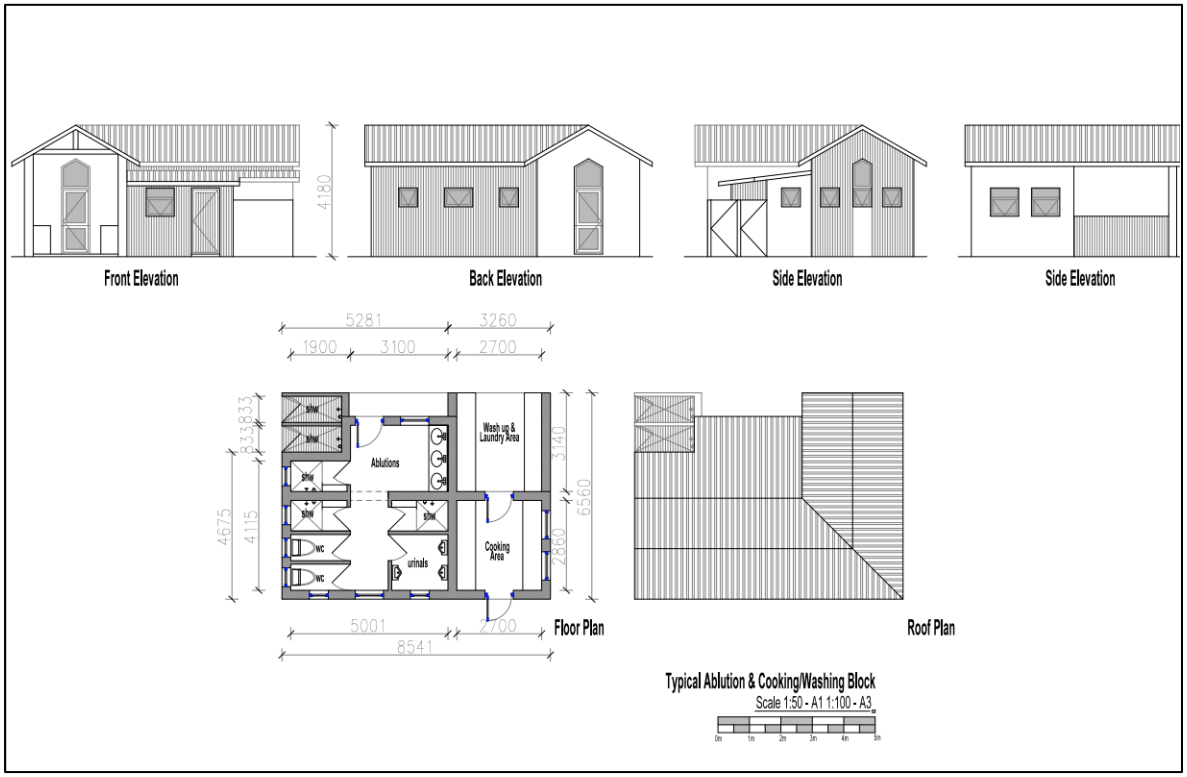

Figure 6: Proposed layout of the ablution, cooking and wash-up facility.

2. CATCHMENT CONTEXT

2.1 Catchment Features

Portion 104 of Farm 216 is located in quaternary catchment K50B which forms part of the catchment area of the Knysna River (Figure 7). The Knysna Estuary is located along the north-eastern boundary of the property. No watercourses are mapped to occur within the property boundary. As the rainfall intensity in the area is classified as Very High and the inherent erosion potential of soils also as High, erosion of soils and stormwater management are factors that must be carefully considered when developing in this area, especially considering the steepness of the slope towards the north of the property (Table 1, Figure 7 and Figure 8). 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 – 1 300 m.a.m.s.l (Figure 9).

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

Feature	Description
Quaternary catchment	K50B
Mean Annual Runoff	303.09 mm
Mean Annual Precipitation	749.00 mm
Inherent erosion potential of soils (K-factor)	0.57 - High
Rainfall intensity	Very High
Ecoregion Level II	20.02, Southeastern coastal belt
Geomorphological Zone	Lowland river
NFEPA area	Sub-quaternary reach 9117, FEPA.
Mapped Vegetation Type	AT36: Goukamma Dune Thicket (Least Concern) and FFd10: Knysna Sand Fynbos (Critically Endangered)
Conservation	Critical Biodiversity Area 1 (Aquatic & Terrestrial), Critical Biodiversity Area 2 (Terrestrial) and Ecological Support Area 2, WCBSP (2017)

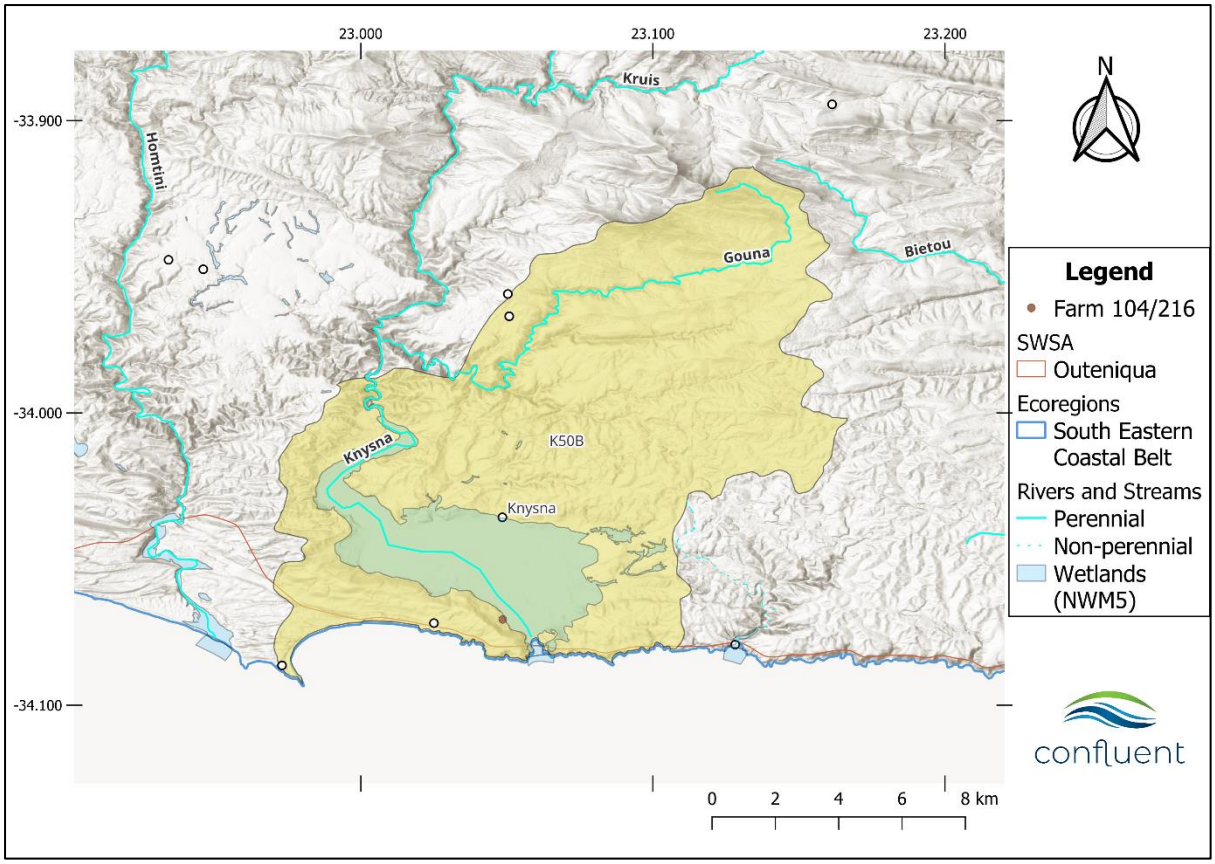

Figure 7: Portion 104/216 in the quaternary catchment K50B.

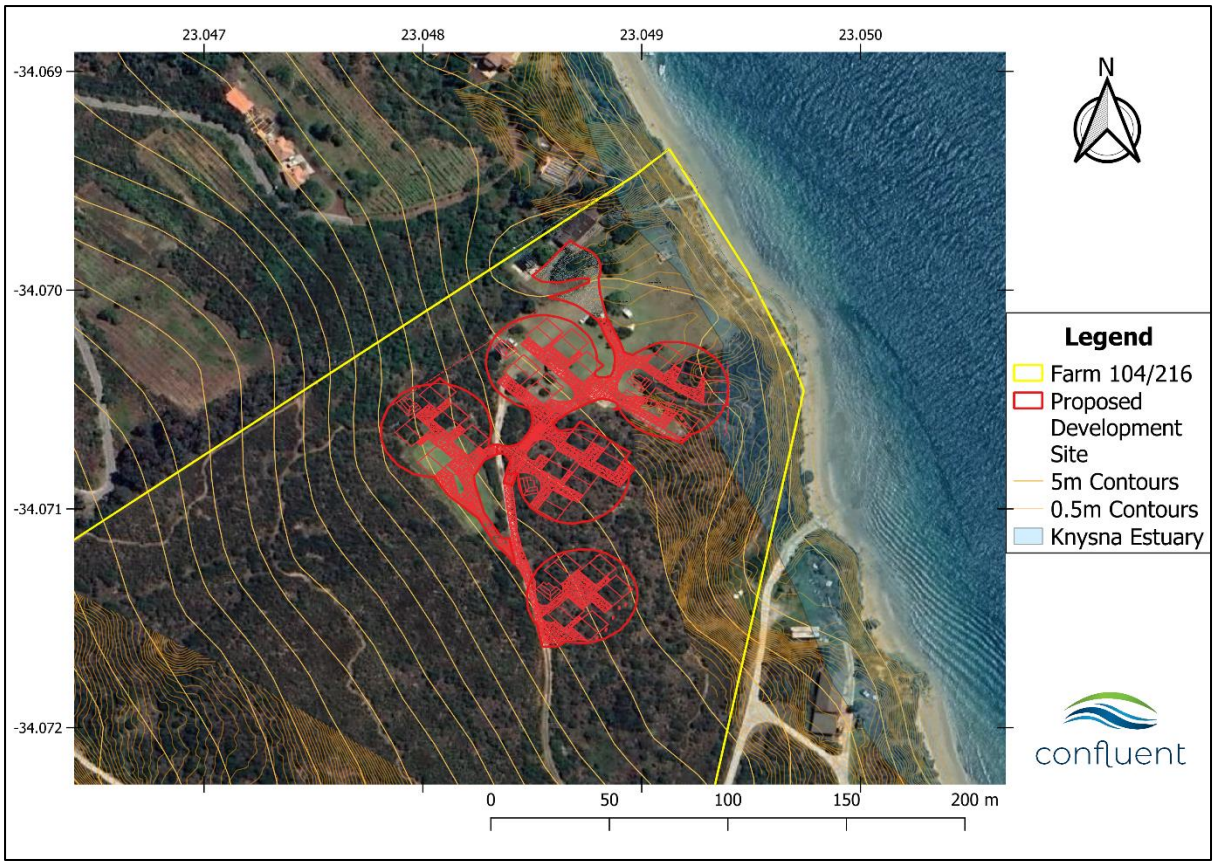

Figure 8: The proposed development sites in relation to mapped watercourses.

Rainfall occurs year-round with seasonal peaks in spring and autumn (Figure 9).

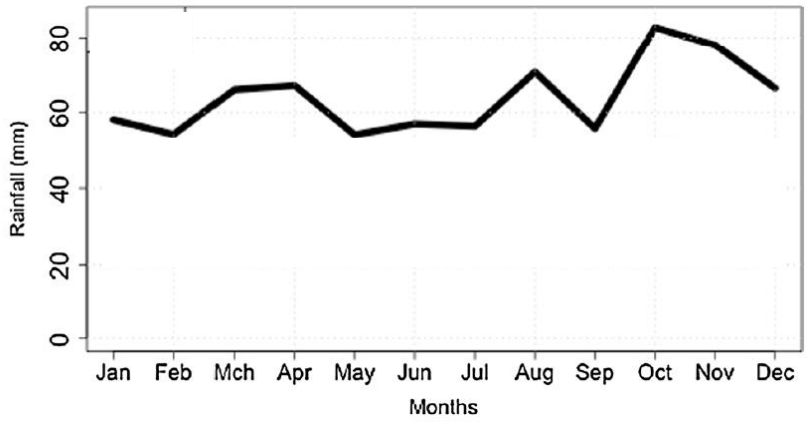

Figure 9. Area-averaged monthly rainfall for the coastal Southern Cape indicating peaks in Mar-Apr, Aug, and Oct. Data averaged between 1979 and 2011 (Engelbrecht et al., 2015).

2.2 Vegetation

The vegetation type at the site is mapped as Knysna Sand Fynbos (FFd10; Critically Endangered; NVM, 2018) and Goukamma Dune Thicket (AT36; Least concern; NVM, 2018), where the Knysna Sand Fynbos has been categorised to have very high sensitivity in the screening tool report.

The Knysna Sand Fynbos vegetation type was described and mapped as Endangered in 2006 by Mucina & Rutherford however, in the Revised National List of Threatened Ecosystems (GN 2747 of the NEM: BA, Act No. 10 of 2004) the vegetation type has been classified as Critically Endangered. The main reason for this classification is that a large area of this vegetation type has already been transformed (70%), together with the small distribution range of this vegetation type, covering only part of the Garden Route coastal flats from Wilderness, generally to the north of the system of lakes, several patches around the Knysna Lagoon, with more isolated patches eastwards to the Robberg peninsula near Plettenberg Bay (Figure 10). The Knysna Sand Fynbos vegetation type continues to be under threat as only 5% of this vegetation type is protected in statutory or private nature reserves, and the remaining is still threatened by pine and gum plantations, cultivation, Knysna urban sprawl, (building of roads) and alien vegetation (Rebelo et al., 2006).

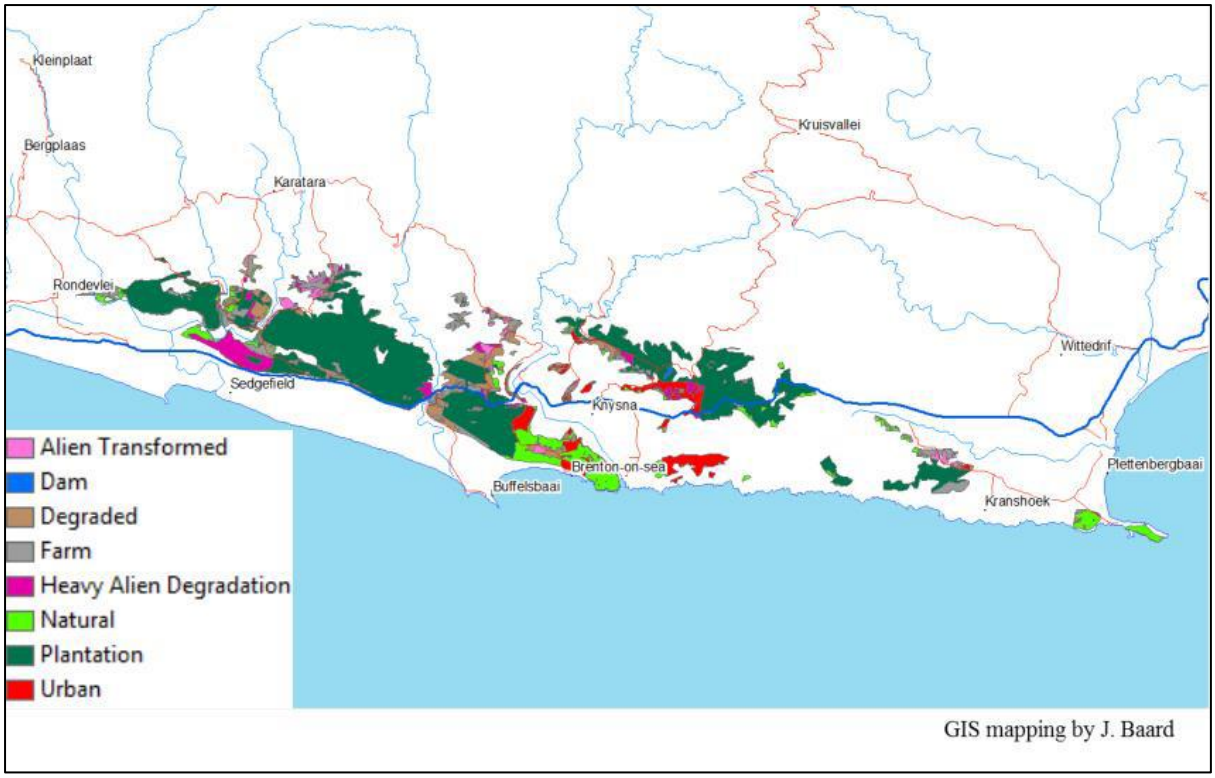

Figure 10: Distribution and transformed classification of the Knysna sand fynbos vegetation type (J. Baard, SANParks).

2.3 Conservation and Catchment Management

2.3.1 Western Cape Biodiversity Spatial Plan

The Western Cape Biodiversity Spatial Plan (WCBSP; 2017) indicated following the biodiversity planning units on the property (Figure 11):

- Aquatic and terrestrial CBAs (CBA 1);
- A terrestrial CBA 2; and
- An Ecological Support Area 2 (ESA 2).

The main reasons for these spatial biodiversity categories are the following:

- Knysna (Core) Estuary
- Eastern Fynbos Renosterveld Sand Fynbos Seep Wetland
- Eastern Fynbos Renosterveld Sand Fynbos Floodplain Wetland
- Water source protection – Knysna Estuary
- Watercourse protection – South-Eastern Coastal Belt
- Coastal resource protection - Eden
- Knysna Sand Fynbos (CR)

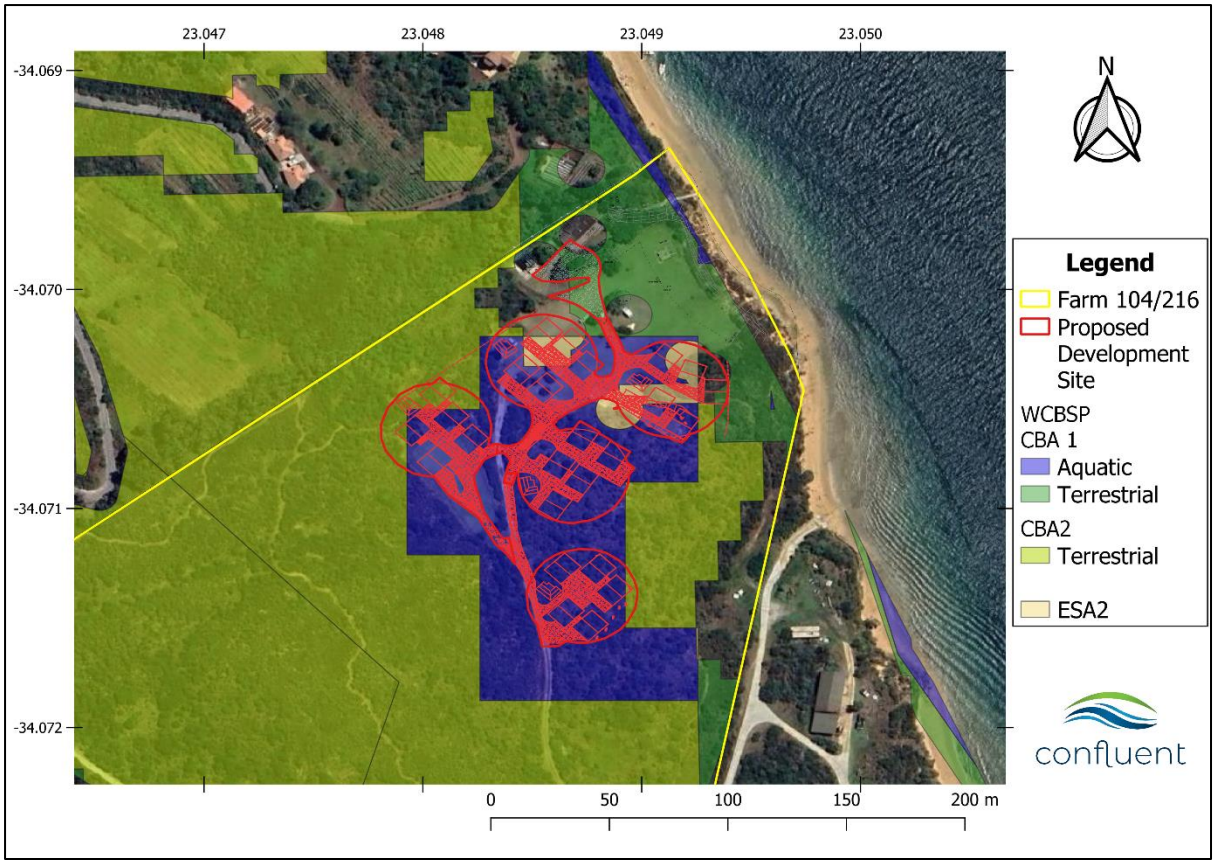

Figure 11. The proposed development area to mapped conservation features of the Western Cape Biodiversity Spatial Plan (2017).

The WCBSP layer indicate two wetland features on the property - an Eastern Fynbos Renosterveld Sand Fynbos Seep Wetland (overlapping with the proposed camping platforms) and an Eastern Fynbos Renosterveld Sand Fynbos Floodplain Wetland (along the edge of the estuary). However, no features indicating the presence of a wetland were observed on the property (see Section 3). Management objectives for the respective conservation categories are indicated in Table 2.

Table 2. Definitions and objectives for conservation categories identified in the Western Cape Biodiversity Spatial Plan (WCBSP, 2017).

WCBSP Category	Definition	Management Objective
Critical Biodiversity Area 1 (CBA1)	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
Critical Biodiversity Area 2 (CBA2)	Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.
Ecological Support Area 2 (ESA2)	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.	Restore and/or manage to minimize impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and to allow for faunal movement.

2.3.2 National Freshwater Ecosystem Priority Areas

According to the National Freshwater Ecosystem Priority Atlas (NFEPA; Nel *et al*., 2011) the sub-quaternary reach (SQR 9117) is classified as a Freshwater Ecosystem Priority Area (FEPA) (NFEPA; Nel *et al*., 2011; Figure 12).

River FEPAs achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). Their FEPA status indicated that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources (Nel et al., 2011).

For river FEPAs, the whole sub-quaternary catchment (SQC) is identified as a FEPA. Thus, the whole SQC must be managed in a way that maintains the good ecological condition of the river reach, which in this case, is the Knysna River and its associated estuary. It is therefore important that development does not result in any deterioration of the river or its catchment area. Similarly, the Knysna Estuary has been identified as an estuary FEPA, which is also indicative of the good ecological condition of the estuary. The larger drainage network and surrounding land use should therefore be managed to ensure the estuarine system remains in a good ecological condition.

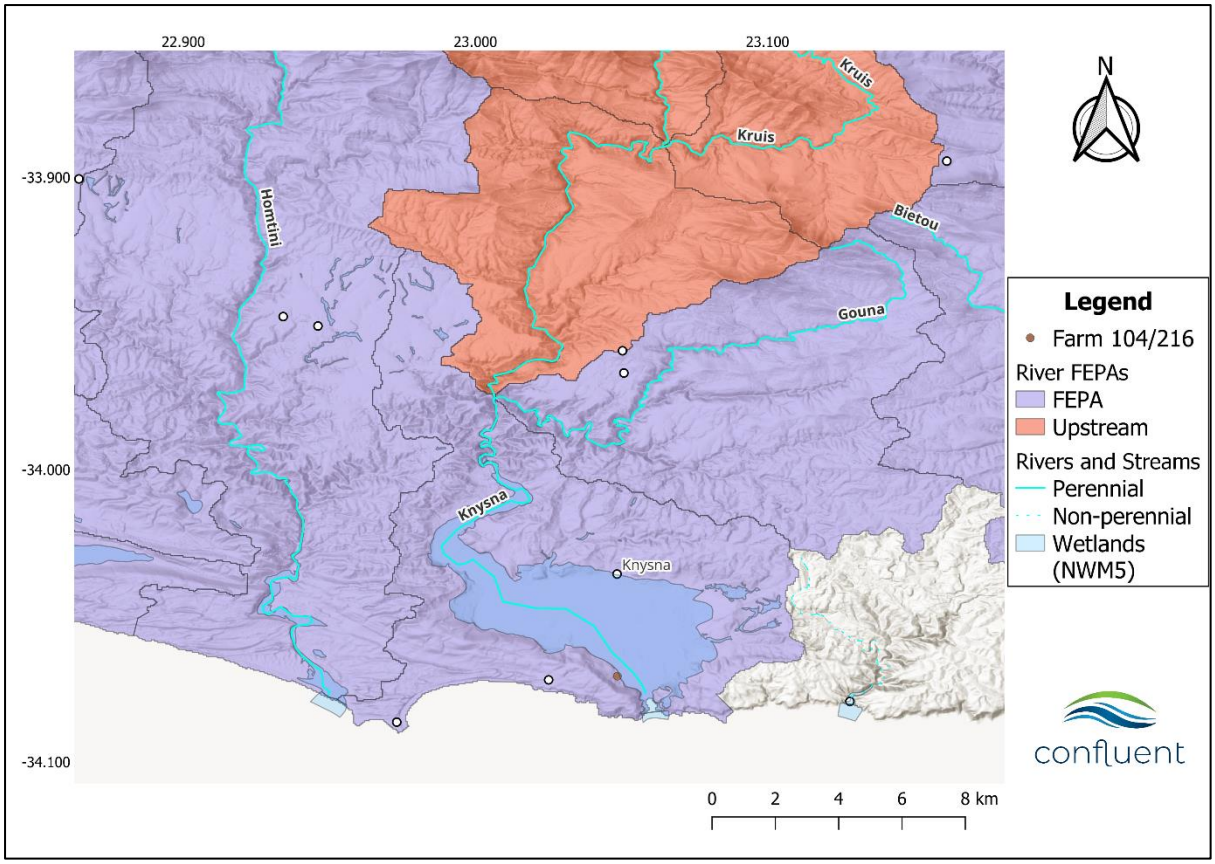

Figure 12: Map indicating the property location in relation to mapped Freshwater Ecosystem Priority Areas.

2.3.3 Knysna Estuary Management Plan

According to the Knysna River Estuary Management Plan (2017), a Development Control Area has been established to manage and regulate development within a specified buffer zone, ensuring that any proposed developments within 100 meters of the water's edge receive SANParks approval and are subject to Strategic or Environmental Impact Assessments. This ensures that the environmental impact of such developments is properly assessed and managed, maintaining the area's ecological integrity. The Knysna River Estuary Management Plan (2017) states the following regarding the Development Control Area:

"With regard to development along the lagoon edge, according to the Regulations for the Proper Administration of the Knysna Protected Environment (Gazette No. 32797 – Notice 1175 dated 11 December 2009), any developments within the Development Control Area (100 m of the water's edge) must seek SANParks approval since they are the designated management authority of the Knysna Protected Environment"

Some sections of the proposed development do extend into the Development Control Area (Figure 13).

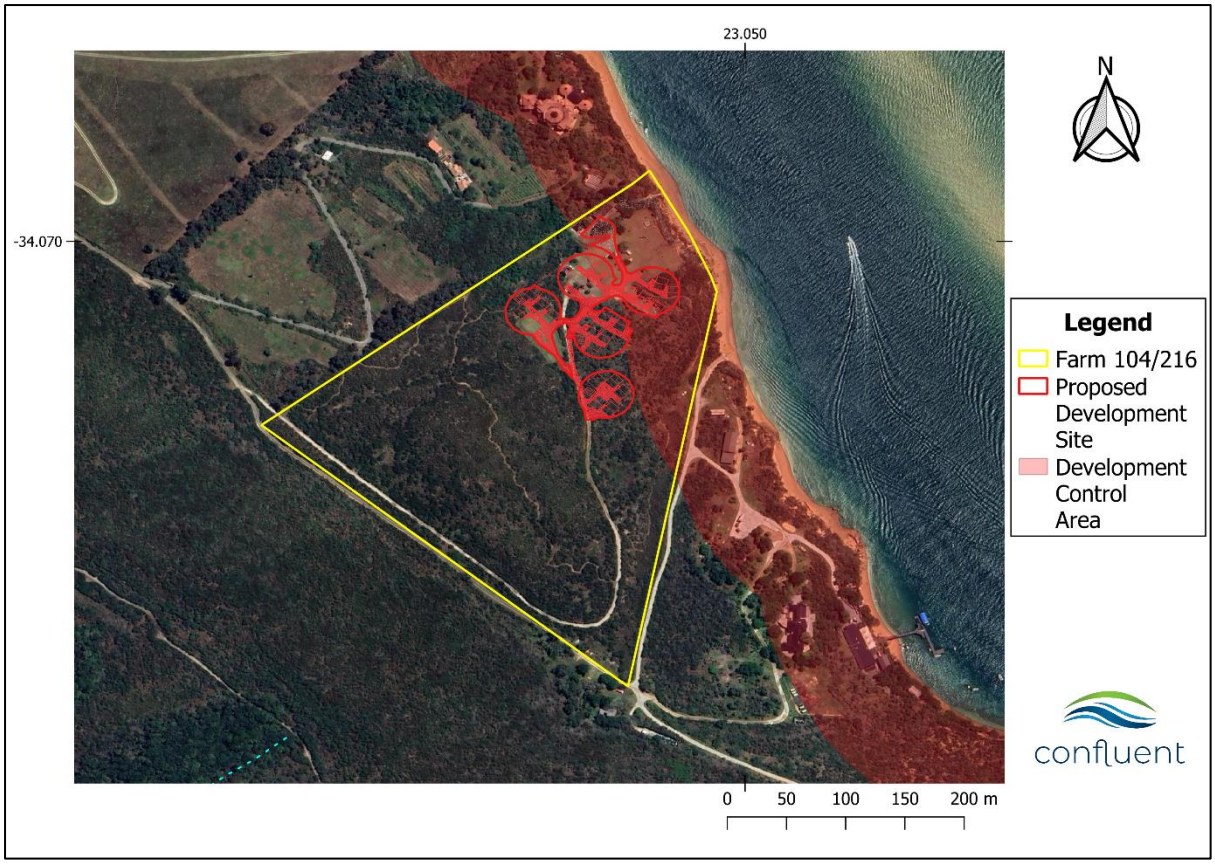

Figure 13: Proposed development in relation to the Development Control Area of the Knysna estuary.

2.3.3 Strategic Water Source Area

Portion 104 of Farm 216 is located in the Outeniqua Strategic Water Source Area (SWSA) for surface water. SWSAs are defined as areas of land that either:

a) Supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or
b) Have high groundwater recharge and where the groundwater forms a nationally important resource; or
c) Areas that meet both criteria (a) and (b).

SWSAs are vital for water and food security in South Africa and also provide the water used to sustain the economy. Given this context, management and implementation guidelines have been developed with the objective of facilitating and supporting well-informed and proactive land management, land-use and development planning in these nationally important and critical areas (Le Maitre, et al., 2018). The primary principle behind this objective is to protect the quantity and quality of the water they produce by maintaining or improving their condition. The proposed development footprint falls within an urban 'working landscape' and in this context the management objectives are:

- To maintain at least the present condition and ecological functioning of these landscapes;
- To restore where necessary; and

- To limit or avoid further adverse impacts on the sustained production of high-quality water.

Development of roads, parking areas and other impervious surfaces, along with wetland draining or infilling has the potential to alter the quantity of water in watercourses by intercepting, increasing, reducing or diverting flows from their normal path. Water quality can be impacted by flow-related alterations, particularly increased flows as this usually results in altered sediment transport causing scouring, sedimentation and increased turbidity due to suspended sediments. Urban developments can also increase the risk of contamination by toxic hydrocarbons and other road-based pollutants as well as contamination by sewage caused by leaking or blocked pipelines or pump stations.

2.4 Historical Assessment

Historically the property has undergone minimal changes over the past 25 years from 1998 to 2023. The properties seem to have been covered by alien vegetation from 1998 to 2003, with extensive alien clearing taking place between 2003 and in the years 2023. The most notable disturbances on the property were the clearance of a large portion of land in the northern corner of the property and the construction of structures in the cleared area. The Knysna fires in 2017 seem to have only affected the area where alien vegetation was still present (Figure 14). It is worth noting that the footprint of three of the camping areas was completely burnt in the 2017 fires, highlighting this factor as a significant risk that must be taken seriously and managed to reduce risks.

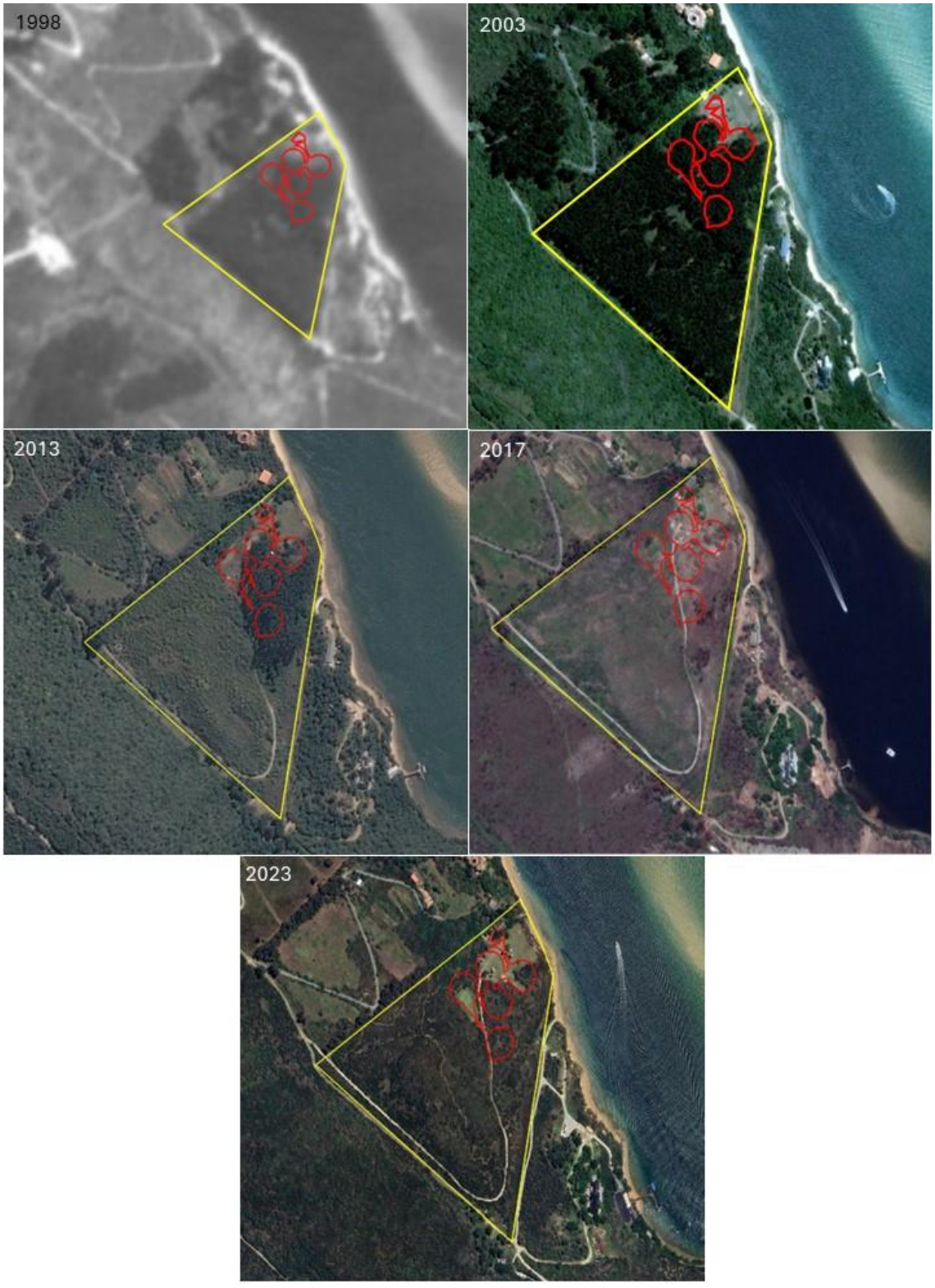

Figure 14. Historical photos showing farm 104/216 through notable changes between 1998 and 2023 (CD:NGI & Google Earth imagery).

3. SITE ASSESSMENT

The site visit was conducted on the 30th of May 2024 during which time the entire extent of the proposed development footprint was traversed by foot (Figure 16). At the time of the site visit the weather was overcast. The property slopes down to the northeast towards the shore

of the Knysna Estuary, which is bordered by a very steep sandy cliff, (Figure 8). The sandy cliff shows signs of erosion (Figure 15: A - B) that is most likely associated with surface water that flows over a large, mowed lawn area immediately adjacent to the cliff (Figure 16). The lawn is located at the base of a relatively steep slope and acts a poor buffer to overland surface water flows which has most likely contributed to the erosion of the cliff face. The soil on the property is very sandy (Figure 15: C) and no hydro-geomorphological landscape features (depressions, confined valleys, channels etc.) indicating the presence of a watercourse (i.e. stream, river or wetland) were observed within the proposed development footprint. The vegetation on the property is terrestrial (*Selago* sp., *Osteospermum* sp., *Passerina* sp., *Searsia lucida*) (Figure 15: D), with very small clumps of wetland vegetation (*Phragmites australis*, *Helichrysum foetidum*, *Helichrysum aureum*.) in a lawn patch being irrigated and is not an indication that a functioning wetland is present on the property (Figure 15: E & F).

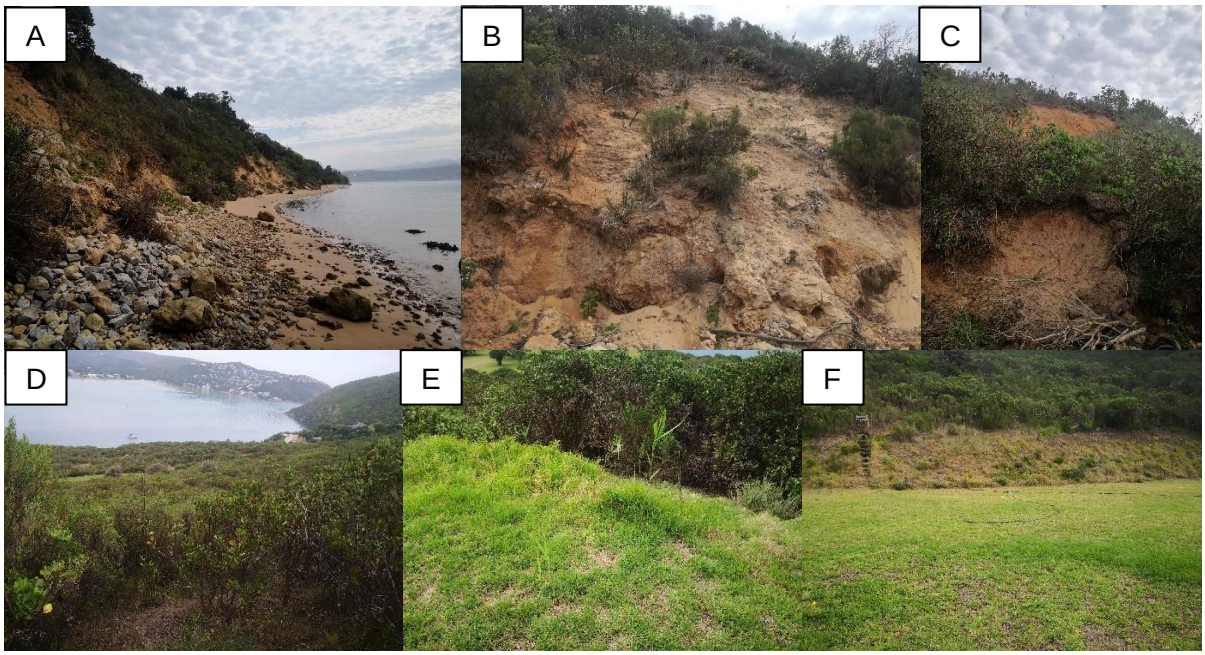

Figure 15: A & B – Erosion of sand cliff, C – Sandy soil present on site, D – vegetation present on site, E – Phragmites australis, F – Irrigated lawn.

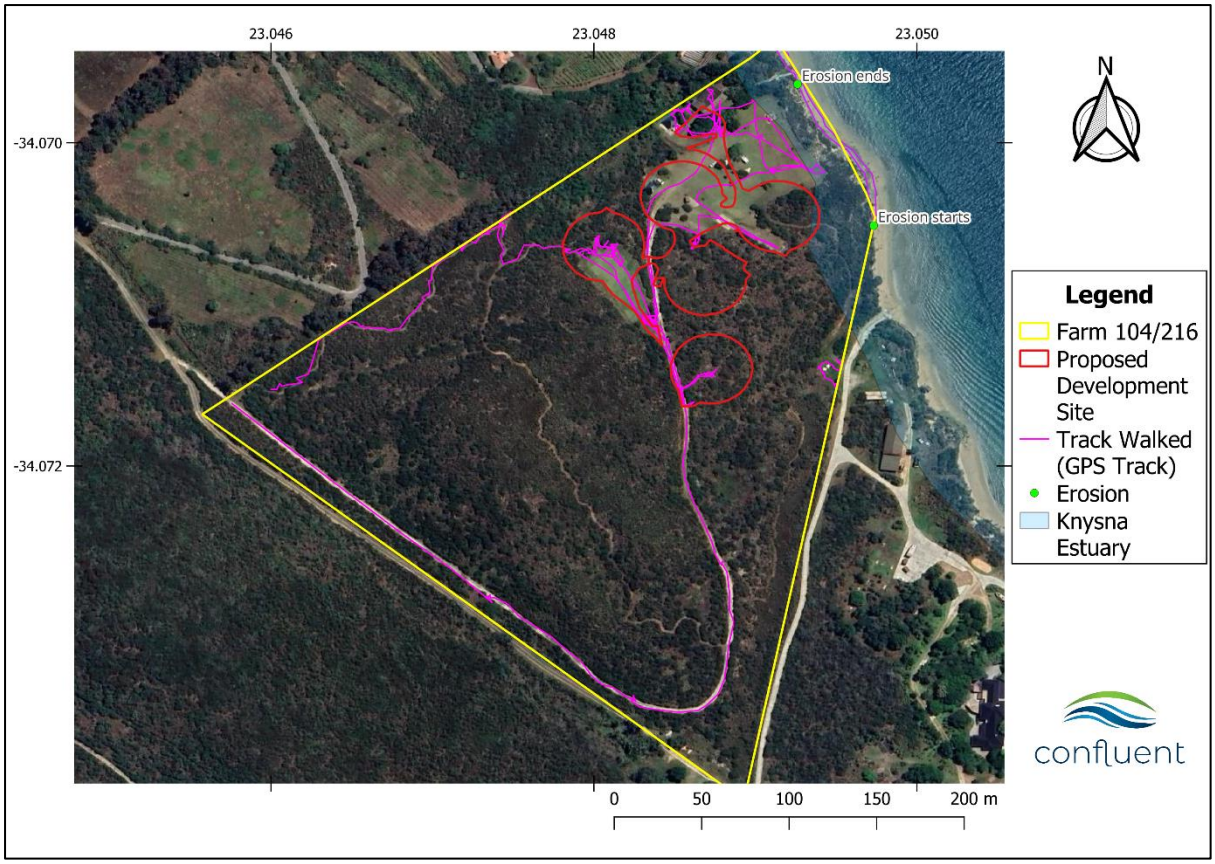

Figure 16: GPS track walked in relation to the property.

In terms of Section 21 c and i of the NWA, the development falls outside of the regulated area of any nearby watercourses (i.e. more than 100 m from a river/stream and more than 500 m from a wetland) (Figure 17). While the estuary is located within 100 m of the development, an estuary is not defined as a watercourse and Section 21 c and i authorisation is therefore not applicable.

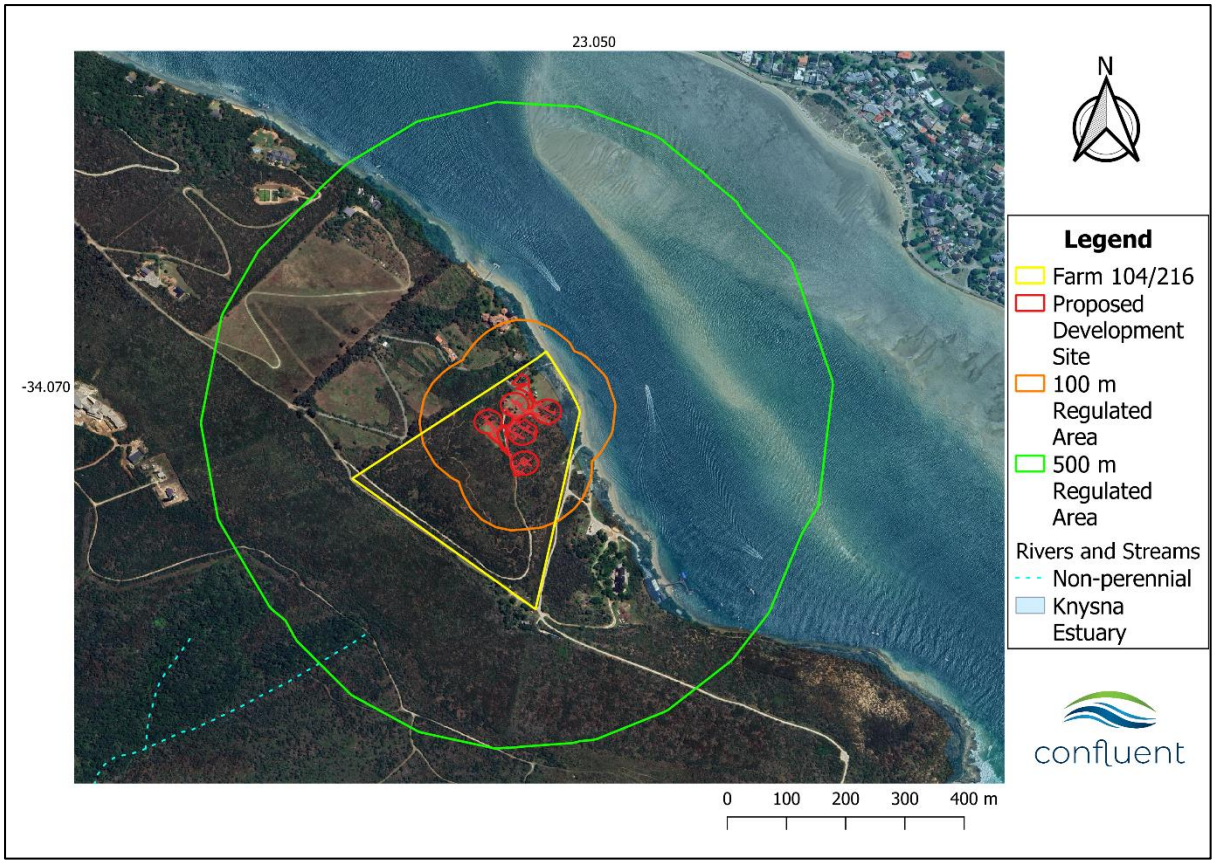

Figure 17: Proposed development sites in relation to the 500 m and 100 m regulated areas.

4. KNYSNA ESTUARY

4.1 Present Ecological State

The Knysna Estuary is one of the most important estuarine systems in South Africa, currently categorized as largely natural with few modifications, corresponding to a Category B ecological status. However, the biotic health of the estuary is somewhat compromised compared to its physical habitat, resulting in an overall ecological state classified as B/C. The estuary is influenced by various human activities and environmental pressures, including nutrient inputs, pollution, and freshwater abstraction, which are primarily affecting the upper reaches of the estuary. Despite these challenges, the estuary benefits significantly from its extensive tidal exchange, which helps mitigate some of the anthropogenic impacts. The estuary is also on a negative trajectory concerning ecosystem health due to these ongoing pressures (Hayes *et al*., 2022).

4.2 Ecological Importance & Sensitivity

The Knysna Estuary is rated as the highest in conservation importance among South Africa's 290 estuaries. It supports approximately 42 % of the country's estuarine plant and vertebrate biodiversity, making it a critical habitat for a wide range of species. The estuary's ecological importance is supported by its high biodiversity, including 310 species of benthic macrofauna, 73 fish species, and 67 waterbird species. Notably, the estuary is home to the endangered Knysna seahorse and the rare estuarine Dwarf goby. Additionally, it serves as a significant site for both resident and migratory bird species. The estuary provides vital ecosystem services such as provisioning services (e.g., freshwater, fish, bait), regulating

services (e.g., waste dilution, carbon sequestration), and cultural services (e.g., recreation, education). These services are estimated to be worth between R1.258 billion and R1.311 billion annually, emphasising the estuary's economic and ecological importance and value (Hayes *et al*., 2022).

5. BUFFER DETERMINATION

Buffer zones have been defined as a strip of land with a use, function or zoning specifically designed to act as barriers between human activities and sensitive water resources with the aim of protecting these water resources them from adverse negative impacts. The location of the watercourses in an SWSA and FEPA catchment was also considered in the buffer determination. Buffer determination considered the implementation of mitigation measures specified in the impact assessment below and was determined based on the following catchment and buffer characteristics:

- Type of estuary: Estuarine bay.
- Present Ecological State: B
- Mean Annual Precipitation Class: > 800 mm.
- Rainfall Intensity: Zone 4.
- Estuary size: > 1000 ha
- Estuary length: 10-20 km
- The inherent runoff potential of soil in the catchment area is moderate to high (C soils).
- The slope of the buffer area is steep (40.1 - 75 %) along the sandy cliff becoming flat (0 - 2%) on top of the sandy cliff.
- Interception characteristics of the vegetation in the buffer are considered to be poor (maintained lawn).

Based on these inputs the buffer for the Knysna Estuary is set to 36 m (Figure 18).

6. LEGISLATIVE IMPLICATIONS

6.1 Site Sensitivity Verification

Considering that the proposed development will take place immediately adjacent to the Knysna Estuary, separated only by a steep, sandy cliff that is presently eroding and that the development is taking place within the Development Control Area of the Knysna Estuary, an SWSA and FEPA, the sensitivity of aquatic biodiversity potentially affected by the development is confirmed as **Very High**. Thus, an aquatic biodiversity impact assessment has been compiled to address both existing and future stormwater and erosion impacts on the property.

6.2 Aquatic Biodiversity Impact Assessment

Each of the impacts including existing and expected to occur during the construction and operational phase have been assessed in terms of their significance. The main impact associated with the existing lawn area and the construction and operation of the five camp areas is the erosion of the sandy cliff into the Knysna Estuary, increasing sedimentation, as well as the increased amount of stormwater associated with the increase of hardened and impermeable surfaces.

6.3 Existing Impacts

Impact 1: Eroding of the sand cliff due to a large amount of runoff from the large lawn area

Currently, the large lawn area provides very limited interception and associated attenuation capabilities, allowing overland surface runoff to run down the slope towards the sandy cliff, consequentially eroding the cliff and leading to deposition of sediment into the estuary.

	Current site development plan	
	Without Mitigation	**With Mitigation**
Intensity	High	Very Low
Duration	Ongoing	Ongoing
Extent	Very limited	Very Limited
Probability	Certain	Unlikely
Significance	**-84: Moderate**	**-27: Negligible**
Reversibility	High	High
Irreplaceability	Low	Low
Confidence	High	High

Mitigation:

- Implement a 36 m buffer from the edge of the estuary to maintain good vegetation, in order to reduce the likelihood of erosion and protect the estuary from sedimentation Figure 18).
- Rehabilitate a section of the buffer zone which must extend 10 m inland from the edge of the cliff (see Figure 19).
- This rehabilitation zone must be re-established with vegetation indigenous to the area. Mowing of lawn within the rehabilitation zone must cease and active planting of indigenous plants must commence (approximately one plant per 1 m^2). Species to be planted can include but are not limited to species listed in Table 3 below.
- A 3 m strip of grass may maintained and mowed around the existing braai area.
- An ECO must be appointed to oversee the establishment of the rehabilitation zone and buffer.
- Construction may only start after the rehabilitation zone and the 36 m buffer have been demarcated and indicated as a no-go area.

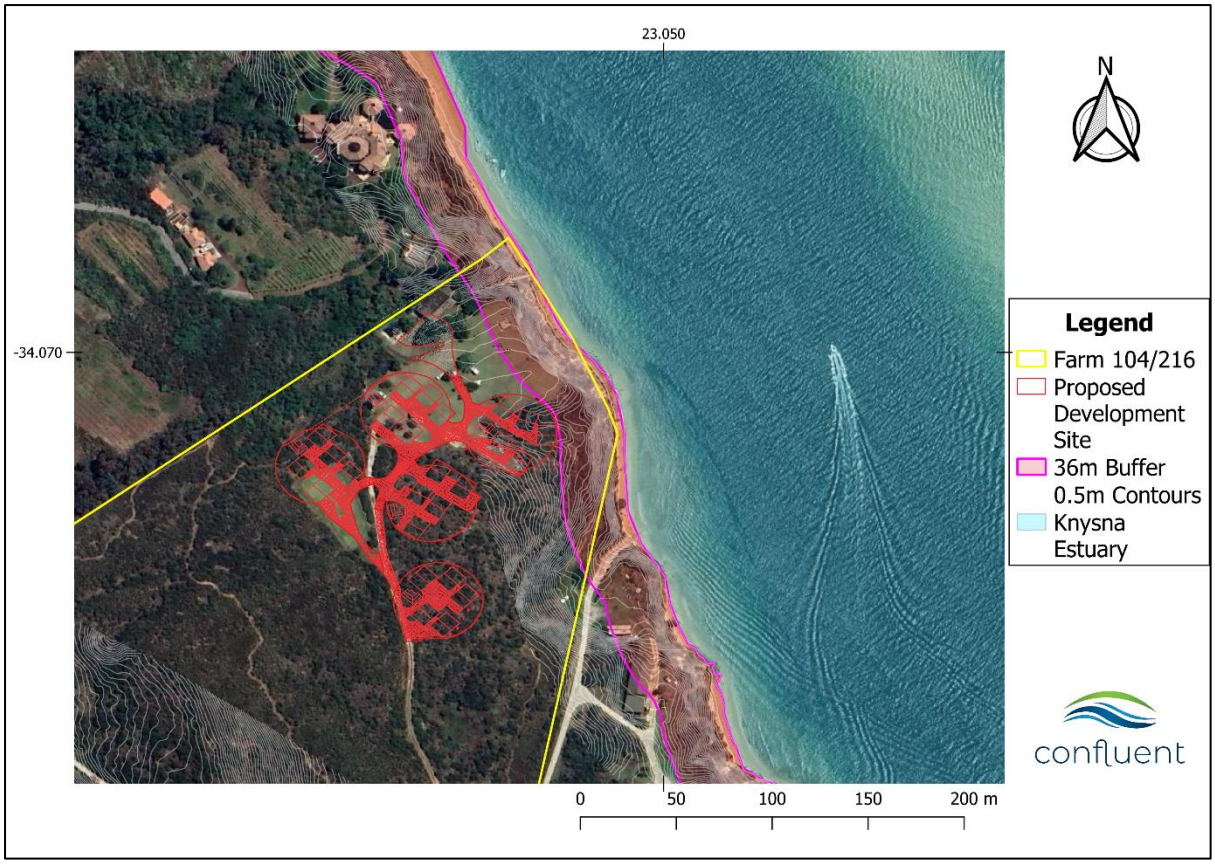

Figure 18: 36 m Buffer in relation to the proposed development site and the Knysna Estuary.

Figure 19: Rehabilitation zone in relation to the proposed development.

Table 3: Indigenous plants local to the site and surrounds which are recommended for planting in the rehabilitation areas.

Species	Common Name	Growth Form
Aristida junciformis	Gongoni grass	Grass
Berzelia intermedia	Knopboss	Shrub
Carpobrotus edulis	Edible sourfig	Succulent ground cover
Cynodon dactylon	Bermuda grass	Grass
Metalasia muricata	White bristle bush	Small shrub
Osteospermum monoliferum	Bietou	Small tree
Passerina corymbosa	Common gonna	Shrub
Searsia crenata	Crowberry	Large shrub
Searsia laevigata	Dune currantrhus	Large shrub
Helichrysum petiolare	Liquorice plant	Shrub
Leonotis leonurus	Wild dagga	Large shrub

6.4 Construction Phase Impacts

Impact 2: Sedimentation of estuarine habitat caused by removal of vegetation and erosion of soil.

As vegetation is cleared for construction, the highly erodible soils will be exposed to the elements, which will result in a short-term increase in the likelihood of erosion and runoff of sediments and other pollutants down the slope towards the estuary.

	Current site development plan	
	Without Mitigation	**With Mitigation**
Intensity	High	Very low
Duration	Short term	Brief
Extent	Very limited	Very limited
Probability	Likely	Unlikely
Significance	**-40: Minor**	**-15: Negligible**
Reversibility	High	High
Irreplaceability	Low	Low
Confidence	High	High

Mitigation:

- Do not clear vegetation outside the proposed development footprint.
- Only use one access road for each camp unit.
- Use the existing road as far as possible.
- Install silt fences or sediment barriers around the perimeter of the construction site to trap sediment-laden runoff and prevent it from entering the estuary.
- Implement phased construction to minimise the area of exposed soil at any given time and reduce the potential for erosion.
- Apply mulch or erosion control mats on exposed slopes and disturbed areas to stabilise soils and reduce erosion rates.
- The 36 m buffer must be maintained and demarcated as a no-go area.
- The laydown areas must be constructed on flat surfaces with a minimum distance of 20 m from the buffer.

- All stockpiles must be covered at the end of the day.
- Install temporary drainage controls such as swales or berms to manage runoff where necessary.
- All materials used during construction must follow the best practice guidelines set out for each product.
- Check weather reports ahead and prepare the site when rainfall is predicted. Discontinue any earthworks on the site during rainfall.

Figure 20: Examples of silt fences (left) and coir logs (right) used to trap sediment mobilised from steep slopes.

6.5 Operational Phase Impacts

Impact 3: Sedimentation of estuarine habitat due to erosion of soil caused by increased stormwater volumes.

The addition of hardened, impermeable surfaces (e.g. camping platforms, paving, roof of ablution blocks etc.) will lead to an increase in stormwater runoff which can increase the likelihood of erosion along the sandy cliff.

	Current site development plan	
	Without Mitigation	**With Mitigation**
Intensity	High	Very low
Duration	Permanent	Permanent
Extent	Very limited	Very limited
Probability	Almost Certain	Unlikely
Significance	**-78: Moderate**	**-30: Negligible**
Reversibility	High	High
Irreplaceability	Low	Low
Confidence	High	High

Mitigation:

- Rainwater harvesting tanks should be installed at each ablution block. The tanks should be connected with the plumbing of the building (e.g. toilets and showers) to reduce the likelihood of the tanks overflowing and to save water.
- Use of permeable paving must be implemented in all new paving area to encourage infiltration of water into the soil.
- Maintain good vegetation cover around camp areas.
- Maintain the 36 m buffer area.

- Control of alien invasive plant species must be carried out within buffer areas to encourage recolonisation by indigenous vegetation and improve the structural integrity of the buffer.
- Only use the existing access road for access to the camp areas.
- Only use the existing staircase to access the beach.
- Control of alien invasive plant species must be carried out within the buffer area to encourage recolonisation by indigenous vegetation and improve the structural integrity of the buffer.

7. CONCLUSION

The presence of severe erosion on the steep sandy cliff adjacent to the estuary has most likely been caused by the establishment of a lawn area immediately adjacent to the cliff. The structure of a lawn provides minimal interception and retention function leading to higher volumes of surface runoff across the lawn (and down the cliff). These features, in combination with periods of high rainfall intensity and highly erodible soils pose a risk to the estuarine shoreline and could potentially be exacerbated by construction and operational phases of the proposed development. For this reason, the sensitivity of the site is considered to be Very High. The scale and nature of the development is not expected to adversely effect the management objectives for the SWSA and no CBA wetlands were observed within the property boundary. Provided the recommended mitigation measures are implemented (including the establishment of a well vegetated buffer across part of the existing lawn area), impacts of the development are likely to be negligible, and on this basis it is recommended that environmental authorisation for the development should be granted. The development does not require any authorisation relevant to the NWA.

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