Aquatic risk assessment report for the proposed abstraction of groundwater at the Ackerman's Distribution Centre on Erf 3865, Hagley

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Prepared by:

Stuart Barrow

Prepared for:

PHS Consulting

Freshwater Consulting
Unit 4, Gabriel Place
1 Gabriel Road
Plumstead
Cape Town, 7945
Email: stuart@freshwaterconsulting.co.za

Executive summary

Pepkor (Pty) Ltd currently operate the Ackerman's Distribution Centre on Erf 3865, Hagley, Cape Town. They propose to abstract 2552m^3 of groundwater from an existing borehole on the property for irrigation use in the centre. Due to the borehole being within 500m of the wetlands adjacent to the site, abstraction from it may trigger a Section 21 (c) and (i) water use.

PHS Consulting initiated a water use authorisation application process for the above-mentioned groundwater abstraction. During the pre-application meeting the DWS queried whether the stormwater outlet of the new distribution centre would have an impact of aquatic features within the Kuils River corridor. As part of the development of the site, an attenuation dam of 1300m^3 has been created along the site's western boundary. The attenuation dam receives flow from the site, either overland off the surface of roads and paved areas or via several pipe inlets conveying flow from the wider site. The pond contains one piped outlet, feeding into the Kuils River corridor. This outlet is likely to have an impact upon the wetlands into which it feeds. Whilst the construction has taken place, the operational aspects may trigger a Section 21 (c) and (i) water use.

The proposed abstraction of groundwater from the borehole on Erf 3865 requires a Section 21 (a) authorisation in terms of the NWA. The volume which is proposed is 2552m^2 per year. Up to 400m^3 of water can be abstracted from groundwater per hectare of a property within quaternary catchment G22E, under the current GA for Section 21 (a) (Government Notice 538 of 2016). Erf 3865 has an area of 6.86 hectares. Therefore, up to 2774m^3 could be registered under the GA for groundwater abstraction on the property. The borehole is within 500m of a wetland; however, it is recommended that the abstraction not require a Section 21 (c) and (i) water use authorisation. The abstraction is unlikely to impede or divert flow within the wetland, or change bed, banks, course, or characteristics of the wetland. The abstraction volumes are well below the sustainable yield of the borehole and likely to not significantly draw down the water table in the area. Furthermore, the wetlands adjacent to the site are fed by lateral flows from their catchment and are most likely wetter in the present state than in their natural state. This is as a result of hardening of most of the wetland's catchment through urban development. The abstraction from the borehole is therefore unlikely to dry the wetland out through local drawdown.

The stormwater outlet from the newly developed Ackerman's Distribution Centre on Erf 3865 does trigger a Section 21 (c) and (i) water use. Cognisance has been taken of the increase in the run-off co-efficient of the property as a result of the development by creating an attenuation pond of 1300m^3. However, the pond has an outlet at its lowest level and this focuses all flow off the site to one outlet point. These risks do need to be addressed. Firstly, the attenuation pond itself should be vegetated to stabilise soils in the pond and slow flows through the pond. Secondly, a riprap outlet basin is recommended with additional vegetation planted downstream of it at the outlet into the Kuils River corridor. If this is adequately implemented, the risk that the outlet poses to the adjacent wetland is low.

The Section 21 (c) and (i) water use for the stormwater outlet should be included in the water use authorisation process of the Section 21 (a) water use.

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1. Introduction

Pepkor (Pty) Ltd currently operate the Ackerman's Distribution Centre on Erf 3865, Hagley, Cape Town. They propose to abstract groundwater from an existing borehole on the property for irrigation use at the centre. PHS Consulting has been appointed to facilitate a water use authorisation application process on behalf of Pepkor (Pty) Ltd. During the application process, the Department of Water and Sanitation (DWS) highlighted the need to assess whether the proposed abstraction would have impacts upon the Kuils River and associated wetlands – the Nooiensfonteinvlei. This wetland area is a remnant of floodplain wetlands that were once widespread along and a defining character of the Kuils River. In addition to the abstraction from the borehole, the site's stormwater attenuation pond outlet structure discharges towards the Nooiensfonteinvlei The DWS requested that the risks to freshwater features posed by the pond outlet also be considered during the water use authorisation process.

2. Objective statement

The objective of this study is to provide the required freshwater ecological input into the water use authorisation process. In order to provide this input, the report will aim to:

1) Identify, map the extent of, and assess the ecological integrity, sensitivity and importance of all freshwater features potentially affected by the activities;
2) Assess the proposed activities in terms of the National Water Act (Act. No 36 of 1998) and highlight the potential water uses that will be triggered, as well as give guidance towards the appropriate authorisation thereof, via a Risk Assessment Matrix (RAM) in terms of Government Notice GN 4167 of 2023; and
3) Provide recommendations regarding the proposed activity and mitigation measures for undertaking the activity, in order to reduce the impacts on freshwater features on and adjacent to the site.

3. Methods and limitations

The findings of this report are informed by a desktop review of available information as well as a site visit conducted on 30th July 2024 (winter). The following methodology has been utilised to assess the freshwater features on the site:

- The condition of the river habitat was assessed using the Index of Habitat Integrity methodology (DWAF 1999);
- The condition of wetlands was assessed using the Wet-Health Version 2 Level 1b assessment (Macfarlane et al., 2020);
- The ecological importance and sensitivity of riparian and wetland habitats was assessed according DWAF, 1999;
- The ecosystem services supplied by the wetland areas was assessed using Wet-EcoServices as described by Kotze *et al* (2020); and
- The risk posed to water resources by the activity is assessed using the Risk Assessment Matrix produced by the DWS and legislated in GN 4167 of 2023.

Whilst each of the above-mentioned tools have certain limitations that are discussed by their authors, the additional limitations to this specific assessment include:

- A lack of long term or across-seasons assessments of the freshwater features; and
- The assessments were undertaken at a rapid level, due to the time constraints of the project.

4. Definitions

Freshwater ecosystems include both watercourses and wetlands. Of relevance to this is assessment is the definition of both watercourses and wetlands as stipulated in the National Water Act (NWA) (Act 36 of 1998):

"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 Minster may, by notice in the Gazette, declare to be a water course, and a reference to a water course includes , where relevant, its bed and banks;

"wetland" means –

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.

For a wetland to be classified as such, it must have one or more of the following features (after DWAF 2005):

- Hydromorphic soils that display characteristics resulting from prolonged saturation such as mottles, organic streaking or gleying.
- The presence, at least occasionally of vegetation indicators i.e. the presence of obligate or facultative wetland plants (Corry 2012) which means they are found most often in wetlands.
- A high-water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

When considering water uses as listed under Section 21 of the National Water Act (Act 36 of 1998), an important definition is that of the "regulated area" which is defined by GN4167 of 2023 as:

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

(b) In the absence of a determined 1 in 100-year flood line or riparian area as contemplated in (a) above the area within 100m distance from the edge of a watercourse where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the National Water Act 36 of 1998;

(c) In respect of a wetland: a 500m radius around the delineated boundary (extent) of any wetland (including pans).

Typically, if an activity occurs within the "regulated area," the Department of Water and Sanitation requires that a Section 21 (c) and (i) water use be applied for. This is further discussed in Section 6 of this report.

5. Site location

Erf 3865 is located in Hagley, a residential and industrial area of Kuils River, a suburb within the City of Cape Town. Erf 3865 is accessed off the Old Nooiensfontein Road, from the M12, Stellenbosch Arterial highway. The corridor of the Kuils River fringes on the site's western boundary.

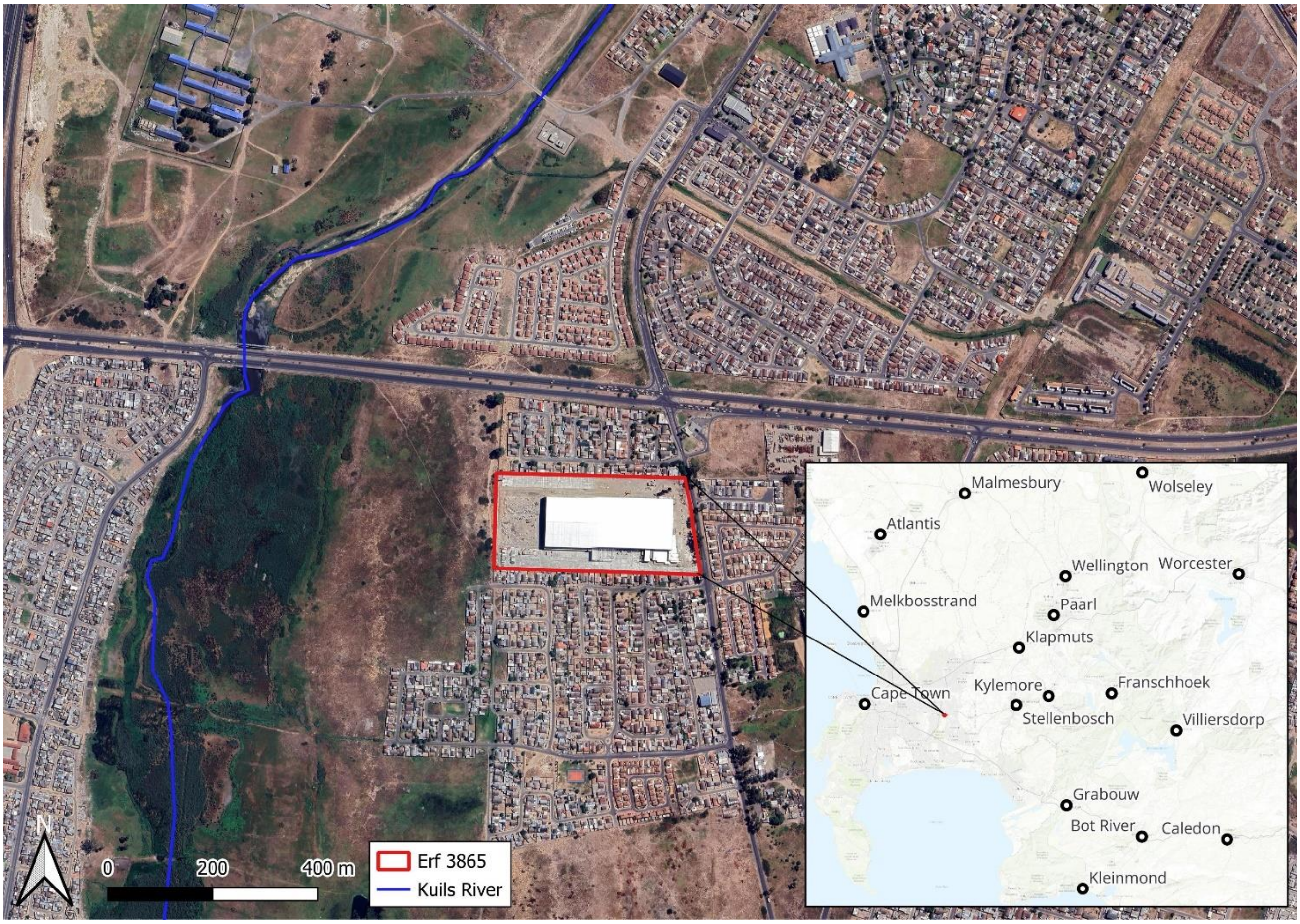

Figure 1. A map showing the location of the Ackerman's Distribution Centre on Erf 3865, within the City of Cape Town and adjacent to the Kuils River corridor

6. Legislation considerations

6.1.1. NWA

The National Water Act (Act 36 of 1998) is the legislation responsible for the management and protection of South Africa's water resources. Section 21 of the NWA lists eleven water uses. These are:

21(a) taking water from a water resource;

21(b) storing water;

21(c) impeding or diverting the flow of water in a watercourse;

21(d) engaging in a stream flow reduction activity contemplated in section 36;

21(e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);

21(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;

21(g) disposing of waste in a manner which may detrimentally impact on a water resource;

21(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

21(i) altering the bed, banks, course, or characteristics of a watercourse;

21(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

21(k) using water for recreational purposes.

A Section 21 (a) water use will be triggered by the proposed groundwater abstraction. In addition, should the proposed area for irrigation be located within the regulated area, then the Department of Water and Sanitation may also require a Section 21 (c) and (i) authorisation. This is due to the wording of Section 21 (i) which includes the altering of characteristics of a watercourse, which may include flows or periods of saturation or impacts on water quality. However, even if the groundwater abstraction takes place within the regulated area, the need to authorise it as a Section 21 (c) and (i) water use may not be required should the risk of altering water quality within the water resource be deemed to be negligible by a specialist.

The proposed activity also requires an assessment of the stormwater outlet from an attenuation pond on the site. This currently discharges into the Kuils River corridor. This assessment will determine whether the stormwater run-off from the site via the storm water outlet may require a Section 21 (c) and (i) authorisation.

There are two possible ways of authorising a new Section 21 (c) and (i) water use – a Water Use License (WUL) or a General Authorisation (GA). The application process for a WUL (known as a Water Use License Application or WULA) is typically longer than that of a GA, and requires more information in order to be processed. A WUL is a customised authorisation with conditions specific to the proposed water uses. The GA is a legislated document (Government Notice GN 4167 of 2023) with set conditions. The notice also specifies how to determine the risk which the water use poses to a water resource. This risk matrix is the tool used to determine whether an activity requires a WUL or can be authorised as a GA. A low risk activity may qualify for a GA whilst a moderate to high risk requires a WUL. Government Notice 4167 of 2023 specifically excludes activities or infrastructure (Box 2). This exclusion includes the instance where a license is triggered by another water use included in the application. In this instance, the proposed abstraction of groundwater triggers a license due to volumes which are proposed to be abstracted. As a result, should the abstraction or the stormwater outlet be deemed to also trigger a Section 21 (c) and (i) water use, it will need to be included in the license application for the groundwater abstraction and cannot be registered as a separate GA.

Box 1: GN 4167 of 2023: Exclusions from General Authorisation, to Section 21 (c) and (i) water uses, despite a low-risk rating:

1) In instances where an application must be made for a water use license for the authorisation of any other water use as defined in Section 21 of the Act that may be associated with a new activity;
2) Where storage of water results due to impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse;
3) To any section 21 (c) and (i) water use associated with construction/installation or maintenance of main of bulk sewer pipelines, French drains, pipelines carrying hazardous materials. Notwithstanding this requirement, conservancy tanks of not more than 1 (one) tank per hectare and internal sewerage reticulation in residential and mixed use developments including minor sewerage connections to main sewers are not excluded from this Notice provided that the maximum flow in the pipelines is below the 120 l/s threshold;
4) To any section 21 (c) and (i) water use associated with construction of water- and wastewater treatment works including package plants and septic tanks;
5) To any section 21 (c) and (i) water use associated with any hazardous material within the regulated area of a watercourse; and
6) To any section 21 (c) and (i) water use associated with mining activities and associated infrastructure unless it falls within appendix D1 or D2

7. Description of the study area

7.1. Catchment characteristics

The study area lies within the Kuils River catchment (quaternary catchment G22E). The Kuils River is a major tributary of the Eerste River. The Kuils River lacks a mountain catchment area and arises on the south-eastern, lower slopes of the Durbanville and Bellville hills, within an urban residential setting. The river has a gentle gradient and flows through residential, informal residential and industrial areas of the City of Cape Town before it joins the Eerste River only ~ 5km upstream of Eerste River's estuary. Due to the development along its entire length, the Kuils River is a significantly modified watercourse.

Figure 2. A map of the Kuils River, G22E catchment, showing the location of the site as well as an elevation profile of the Kuils River from its source to its confluence with the Eerste River

7.2. Abiotic factors (Geology, topography, soil)

The abiotic factors occurring on the site are the drivers of the habitats and biotic communities which occur there. The site occurs in an area known as the Cape Flats. This is a coastal plain, with very moderate gradients and deep grey loamy sand of the Springfontyn formation (Figure 3 inset). The topography across the site slopes gently towards the Kuils River's primary channel (Figure 4). There are two terraces across the corridor, running parallel to the channel, which facilitate the formation of wetland habitat (Figure 3 and Figure 4). The lower terrace lies within the floodplain and is seasonally to permanently saturated. A low ridge or levee occurs along the corridor, separating the two terraces and facilitating the formation of seasonal wetland habitats within the upper terrace from lateral inputs. The levee appears to be natural, but dumped refuse and rubble have raised it in places.

The area has a winter rainfall regime (Figure 5). Summers extend from December till February and are dry and hot. During this time the mean evaporation exceeds the mean rainfall. Winters are colder and wetter. From June to August the evaporation is exceeded by the mean rainfall. This results in saturated soil conditions on the wider terrace of the Kuils River corridor. Standing, shallow pools of water form in lower lying basins across the terrace in places (Figure 4).

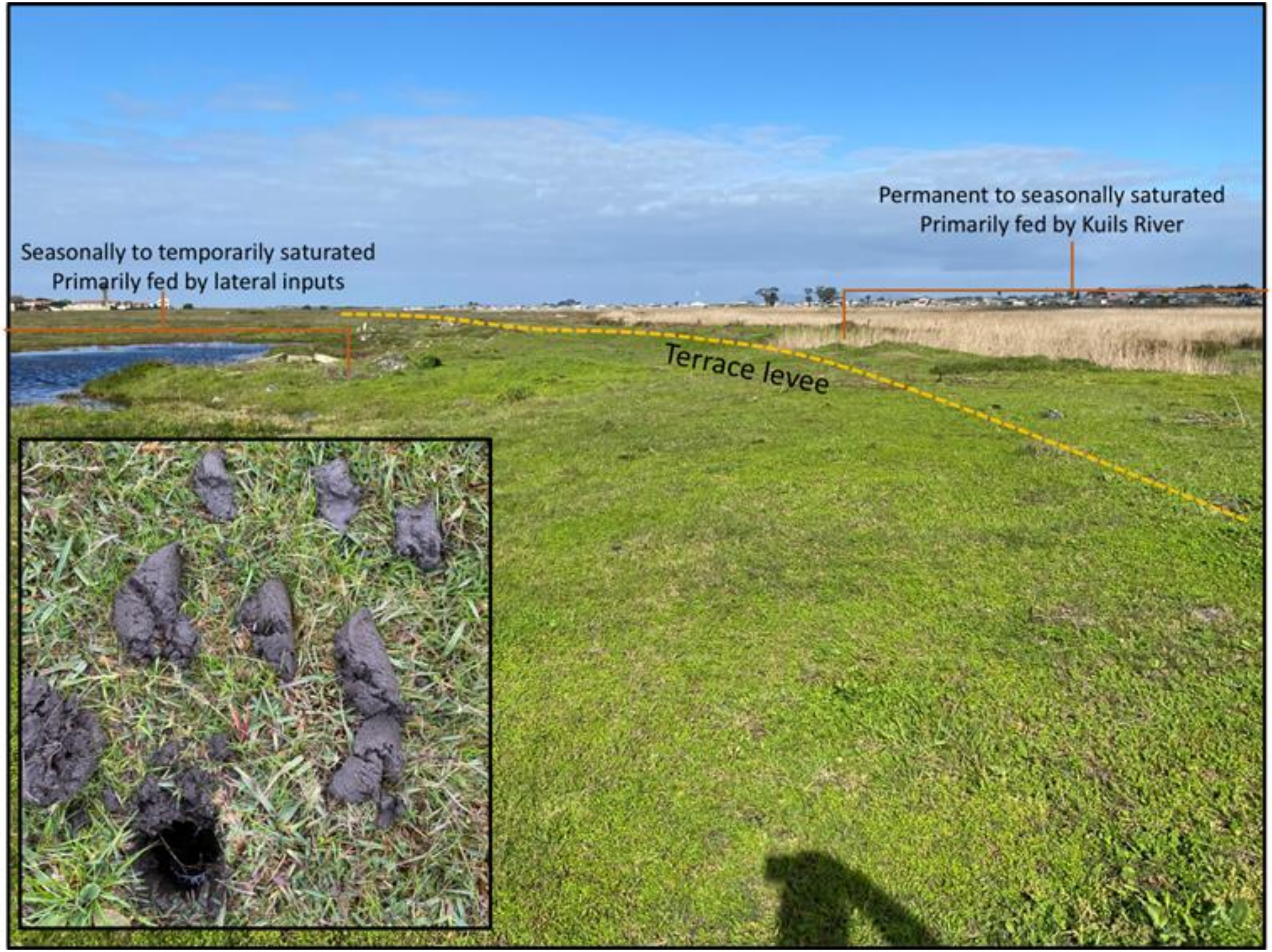

Figure 3. A photograph of the Kuils River corridor showing the terrace levee and the terraces, with a photograph of the saturated grey loamy sands of the Springfontyn formation observed in the seasonally to temporarily saturated zone of the corridor on 30 July 2024.

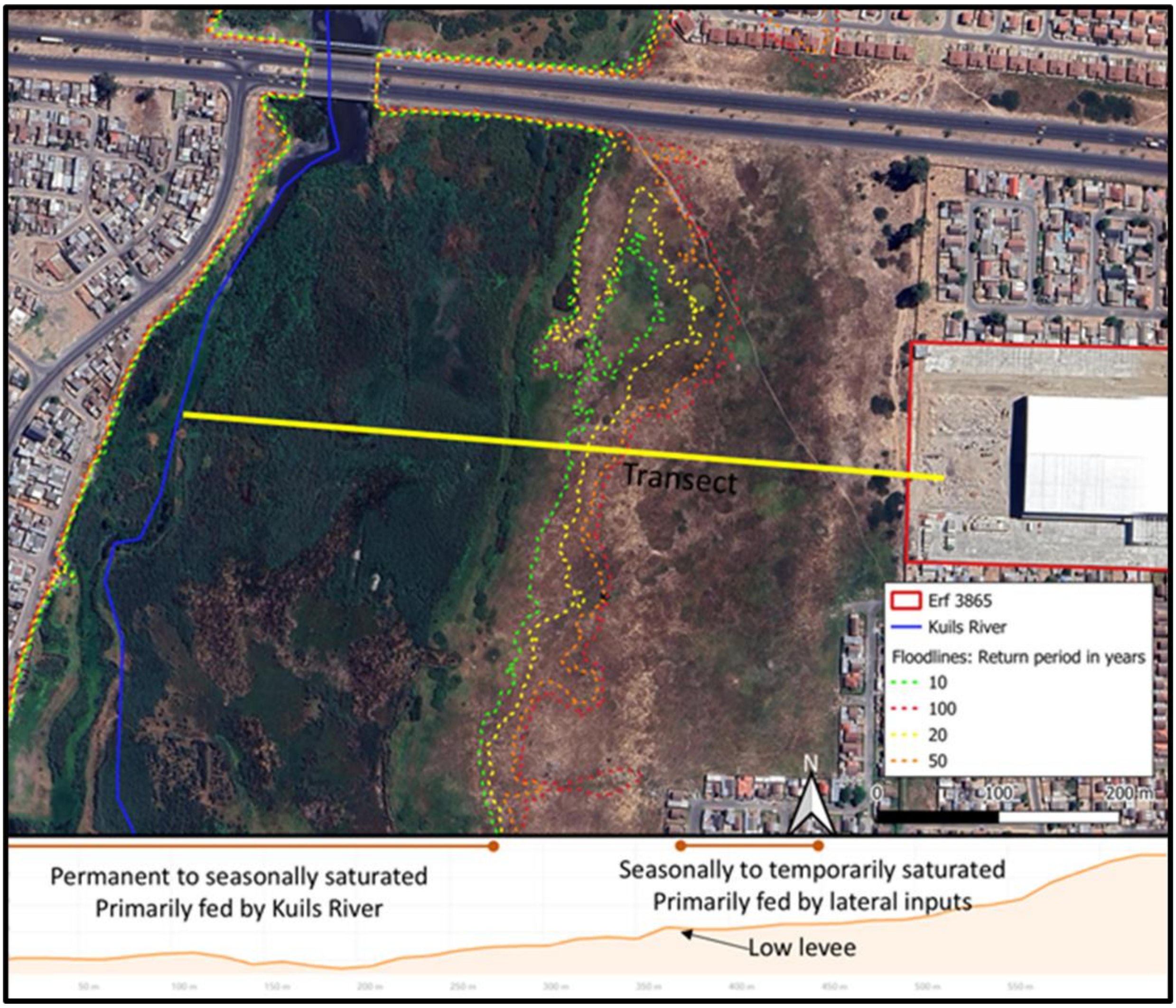

Figure 4. A map of the Kuils River floodplain adjacent to Erf 3865, showing the 1 in 10-, 20-, 50- and 100-year flood lines in relation to the elevation profile across the corridor, illustrating the areas that are permanently wetted and fed by flows of the Kuils River and those that are seasonally wetted and fed by lateral inputs from the adjacent urban areas.

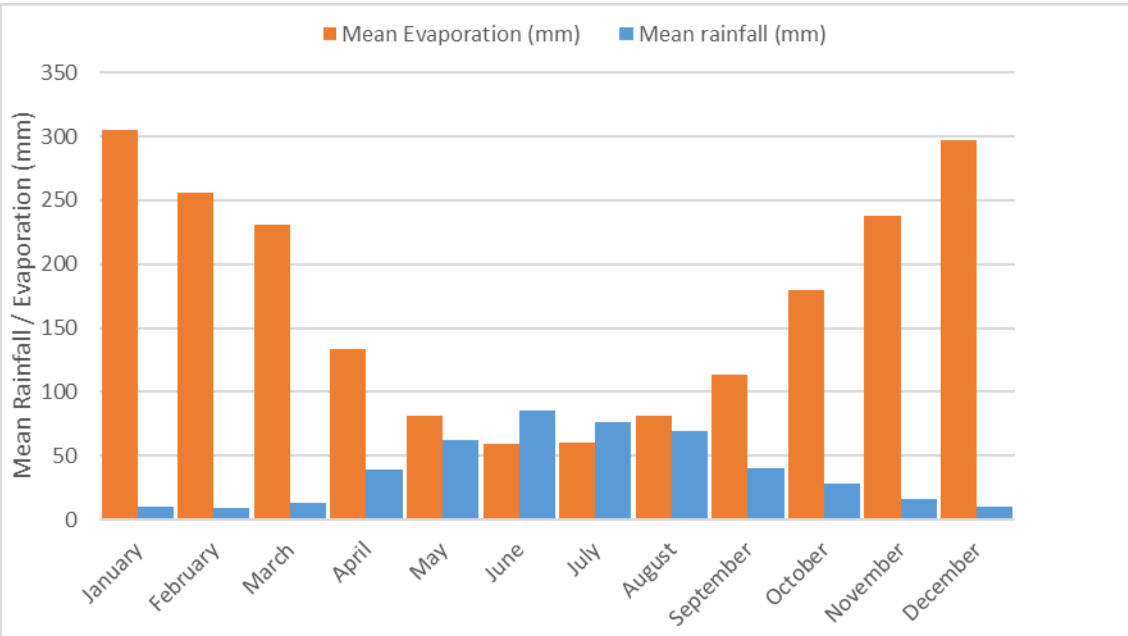

Figure 5. Mean annual rainfall and evaporation for Hagley area (Schulze, R. E. 2009)

7.3. Biotic factors (Fauna and Flora)

The natural vegetation which historically occurred in the area would have been Cape Flats Sand Fynbos. This vegetation type is dense and moderately tall, with a dominance of ericoid shrubs (Mucina and Rutherford, 2004). During the site visit in July 2024, there was evidence that the site had recently been cleared of woody vegetation (piles of chips and stumps). It is most likely that the cleared species was *Acacia saligna* (Port Jackson). Shrubs are largely absent from the vegetation community of the corridor (Figure 6), probably because of exclusion by *A. saligna,* as well as the seasonal wetness regime. Low groundcover species are dominant. The permanently saturated zones of the Kuils River corridor are densely vegetated with *Cyperus textilis*, *Phragmites australis* and *Typha capensis*. The wider corridor is dominated by vygies, *Carpobrotus acinaciformis*. This plant forms dense mats, often circular in shape, that can be seen from aerial or satellite imagery. Within seasonally and temporarily saturated zones of the corridor, grasses such as *Cynodon dactylon* (kweek) and *Stenotaphrum secundatum* (buffalo grass) are abundant. Rushes and sedges such as *Juncus capensis, Cyperus congestus* and *Ficinia nodosa* were also observed within the seasonal habitats.

Figure 6. A view across the temporary and seasonally wet areas of the Kuils River corridor.

7.4. Conservation planning

Various sets of conservation planning mapping initiatives were consulted: the Biodiversity Network for the City of Cape Town (City of Cape Town, 2017a), the City of Cape Town's wetland mapping (City of Cape Town, 2017b), the National Freshwater Ecosystems Priority Areas mapping (Nel *et al*, 2011) and the National Biodiversity Assessments: National Wetland Map Version 5 (NWM5) (Van Deventer *et al*. 2018). The City's Biodiveristy Network has mapped this section of the Kuils River corridor as containing no natural habitat. Furthermore, no Critical Biodiversity Areas or Ecological Support Areas are mapped along this reach of the river (Figure 7**Error! Reference source not found.**). The NFEPA wetland map delineates the lower floodplain of the Kuils River, i.e. the permanently to seasonally wet zones discussed above, as channelled valley bottom wetlands. The NWM5 and the City of Cape Town's wetland mapping has captured both the permanently wet to seasonally wet areas and the seasonally to temporarily wet areas as floodplain wetland. The City of Cape Town wetland mapping identifies the wetland as the Nooiensfonteinvlei wetland (City of Cape Town, 2017b).

The wetland delineation and types occurring across the corridor, which were mapped with field verification as part of this study, are further discussed in Section 8 of this report.

Figure 7. The NFEPA , NWM5 and City of Cape Town's wetland mapping across the Kuils River corridor adjacent to the site.

7.5. Historical overview

Historical aerial images provide valuable information regarding the impacts and developments that have taken place along the Kuils River over the past 85 years. The earliest aerial photographs of the study area were captured in 1938, by which time the Kuils River appears to have been significantly confined within an agricultural landscape (Figure 8A). Intensive agricultural activity is still evident across the river's floodplain in 1966 (Figure 8B). However, over the following 30 years the agricultural activity along the river was replaced by urban development. The 1996 aerial photograph (Figure 8C) shows that this change appears to have resulted in the river being less confined, at least in the reach adjacent to the study site, than when the floodplain was actively farmed. The industrial use of Erf 3865 is also evident in the 1996 imagery. By 2006 the urban development along the river had increased, and the floodplain and corridor appear similar to the present state (Figure 8D).

The Kuils River is believed to have been a seasonal stream, which flowed through a sandy valley, feeding a series of 'kuils' or pools and ending behind high coastal dunes (where Khayalitsha is situated today) never flowing freeling into the sea (Brown and Magoba, 2008). As the land use within the river's catchment changed from natural, to cultivated, to urban (Figure 9) – the run-off volumes within the river increased significantly. As a result of the higher flow volumes the river's floodplain areas widened notably, as is clearly evident from Figure 8.

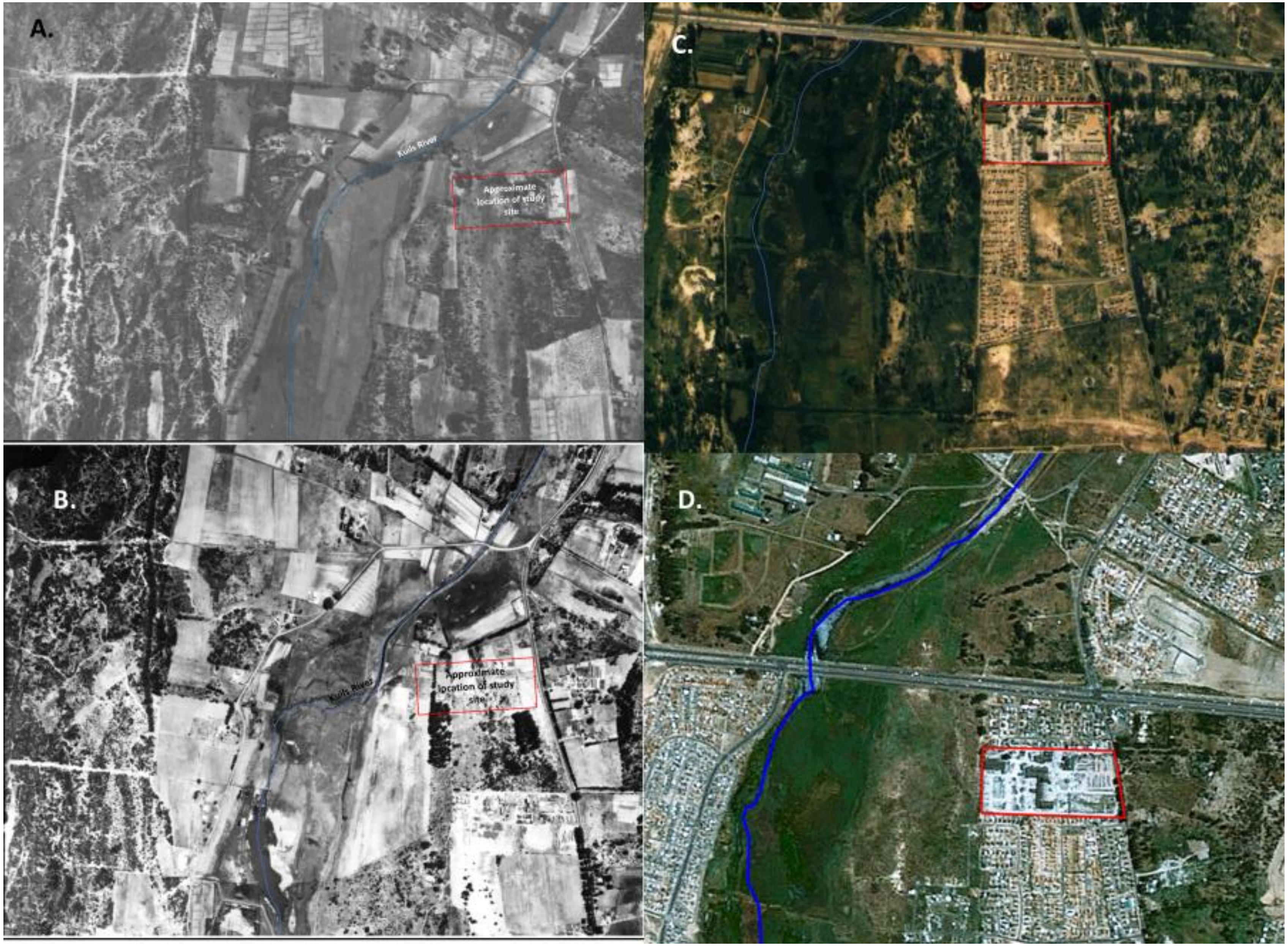

Figure 8. Historical imagery of the area surrounding Erf 3865, relative to the Kuils River captured in A) 1938; B) 1966; C) 1996 and D) 2006.

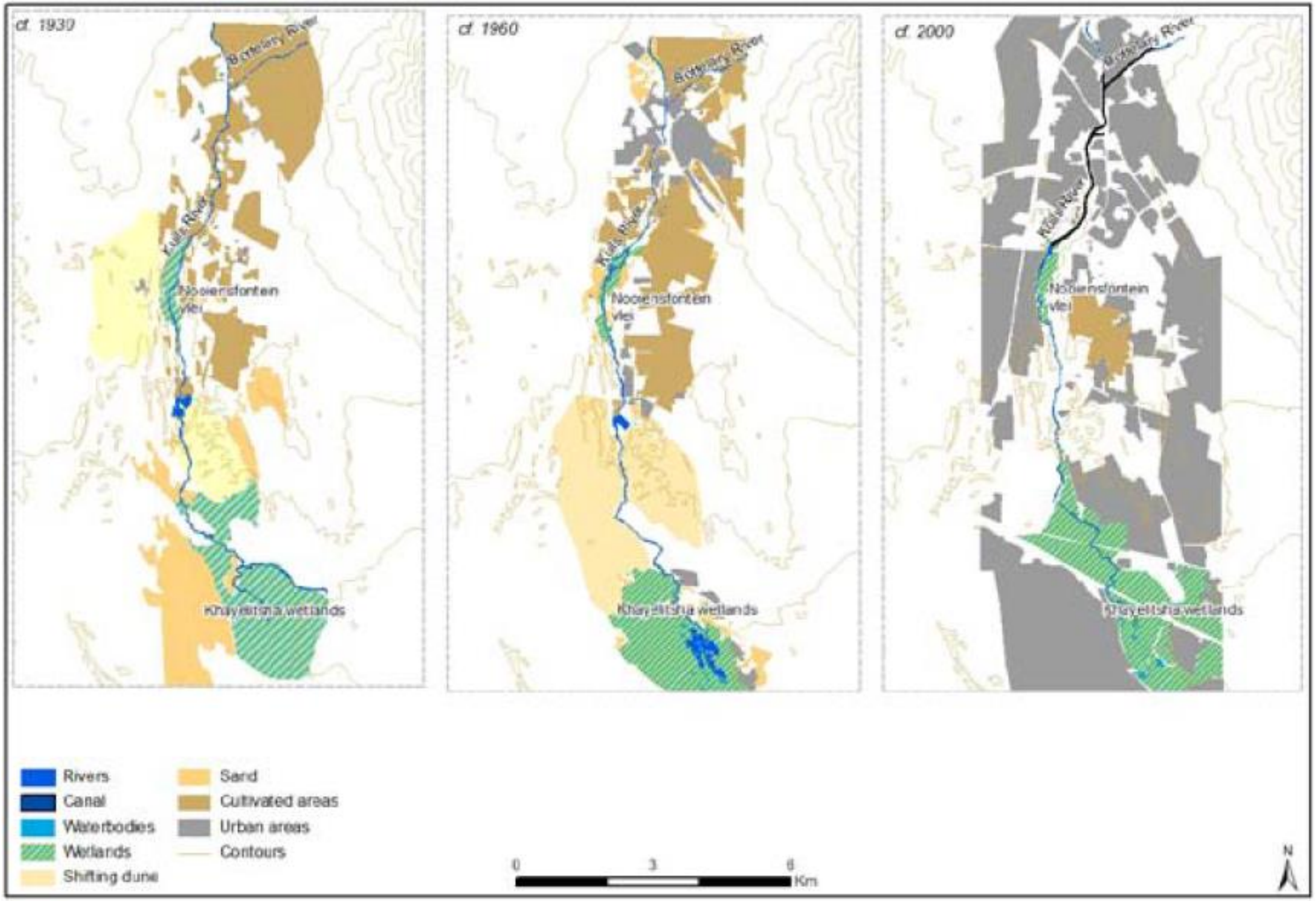

Figure 9. A map of land-use within the Kuils River catchment from the 1930's (left) to the 1960's (middle), and to the early 2000's (right), showing the transition from natural to agricultural to urban. Map taken from Brown and Magoba (2008).

8. Freshwater Assessment

8.1. Current extent of aquatic features on site

The aquatic features occurring adjacent to Erf 3865, across the Kuils River corridor are the Kuils River, the Nooiensfonteinvlei floodplain wetlands fed by the Kuils River as well as by lateral inputs as they drain towards the Kuils River. The extent of these features are shown in Figure 10 and assessed in this section of the report.

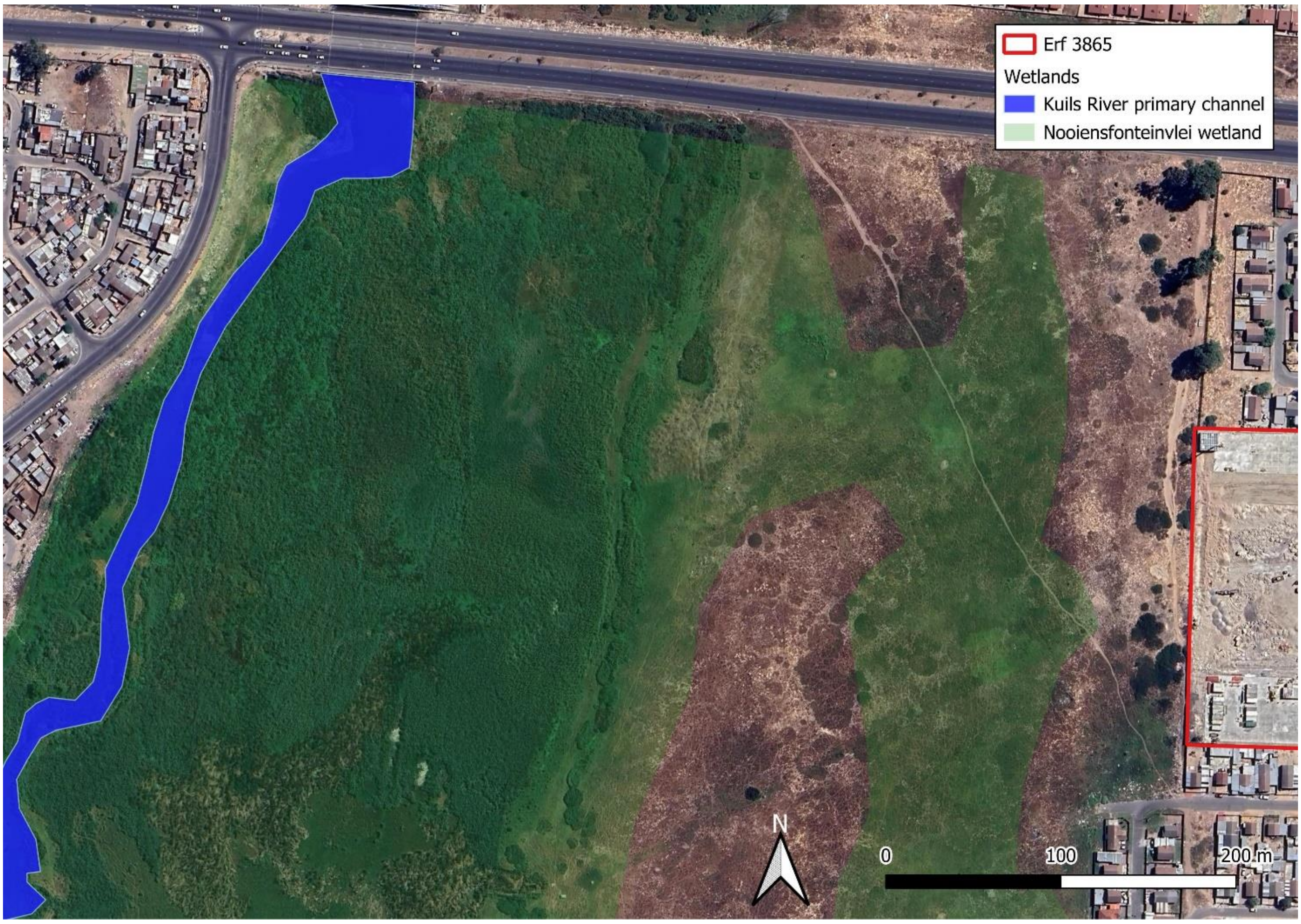

Figure 10. The extent of wetlands which occur across the Kuils River corridor adjacent to the study site

8.2. Habitat Assessment

8.2.1. Ecoregions

An understanding of how a watercourse may have appeared and functioned in its natural state is important to be able to assess its current condition. Rivers across South Africa have been grouped into ecoregions. These are groupings of rivers with similar hydrology, natural vegetation, geology and soils, climate and physiography. This grouping can be further refined according to the geomorphological zone in which they are located. These eco-regional and geomorphological zone groupings can be used to understand how the watercourses on the site may have appeared in their reference condition.

The study site lies within the South Western Coastal Belt ecoregion. This ecoregion is dominated by moderately undulating plains at an altitude of 0 – 100 mamsl. It has winter rainfall seasonality and typically has a MAP of 100 –400 mm and a MAR of 5 - 60mm. Vegetation types across this ecoregion are dominated by sand fynbos vegetation types. The river is within the coastal plain geomorphological zone.

8.2.2. Kuils River

Habitat integrity of the Kuils River

The Index of Habitat Integrity (DWAF, 1999) assesses the degree to which a watercourse has been altered from its natural state. It assesses eight anthropogenic factors that may impact upon the watercourse's riparian habitat and nine anthropogenic factors that may impact upon the watercourse's instream habitat. The severity with which these impacts negatively affect the integrity of the watercourse's habitat is ranked. Based on the final score, the Kuils River was assigned a habitat integrity class (Table 1).

Table 1. Habitat integrity categories

CATEGORY	DESCRIPTION	SCORE (% OF TOTAL)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In worst instances, basic ecosystem functions have been destroyed and changes are irreversible.	0

More than 60% of the Kuils River's channel has been canalised, significantly modifying natural flow patterns and sediment transport regimes. Furthermore, the river receives run-off from informal settlements, industrial discharges, waste water treatment works discharges and raw effluent discharges from leaking sewers. The Kuils River would naturally have been a seasonal stream but is now permanently flowing. As a result, the Kuils River is in an extensively to critically modified state (Table 2).

Table 2. The habitat integrity scoring for the Kuils River.

Kuils River			
Riparian		Instream	
Riparian Metrices (impact score 1 -25)	RIPARIAN IMPACT SCORE	INSTREAM IMPACT SCORE	Instream Metrices (score 1 - 25)
WATER ABSTRACTION	6	5	WATER ABSTRACTION
FLOW MODIFICATION	15	16	FLOW MODIFICATION
BANK EROSION	0	13	BED MODIFICATION
CHANNEL MODIFICATION	16	18	CHANNEL MODIFICATION
PHYS-CHEM	17	22	PHYS-CHEM MOD
INUNDATION	2	7	INUNDATION
EXOTIC VEGETATION	14	9	ALIEN MACROPHYTES
VEGETATION REMOVAL	14	5	INTRODUCED AQUATIC FAUNA
		10	RUBBISH DUMPING
Riparian Class	E/F	E	**Instream Class**
Habitat integrity score	20	32	Habitat integrity score
Average confidence	3.88	3.67	Average confidence

8.3. Wetlands

The *WET*-Health tool assesses the Present Ecological State (PES) of a wetland in terms of the current extent of deviation from an observed or assumed reference state. The assessment considers the health of the wetland under four modules, namely Geomorphology, Hydrology, Vegetation and Water Quality. The tool can be used to assess the current PES as well as anticipated changes to the PES as a result of changes both within the wetland and / or within its catchment

The overall ecological category of the Nooiensfonteinvlei wetland is assessed and shown in Table 3. The wetland is considered to be **largely modified**. These wetlands are primarily fed by the large upstream catchment of the Kuils River. The catchment area has been significantly developed and this has impacted the hydrological and geomorphological processes of the river and its floodplains. The wider temporary and seasonal elements of the wetland are also fed by lateral inputs and all of this is stormwater from developed areas. This has altered the hydrology of the wetland - it receives higher volumes at higher intensity than it would have under natural conditions. The water quality of the wetland's primary input, namely the Kuils River, is very poor. The vegetation of the wetland has also been altered by a long history of agricultural use followed by invasion by woody alien species. The natural diversity of the vegetation community within the permanently saturated areas, has been reduced to a few dominant species as a result of permanent flows within the Kuils River and the poor quality of the water. The long history of agricultural land-use across the wider wetland area, followed by invasion by alien vegetation, has resulted in the loss of certain elements of the natural vegetation community, such as extensive sedge and rush beds.

Table 3. The final PES result and hectare equivalent of the Wet-Health Assessment of the current state of the Nooiensfonteinvlei wetland occurring adjacent to the site

Final (adjusted) Scores				
PES Assessment	**Hydrology**	**Geomorphology**	**Water Quality**	**Vegetation**
Impact Score	4.7	2.1	6.7	6.0
PES Score (%)	53%	79%	33%	40%
Ecological Category	D	C	E	D
Trajectory of change	→	↓	↓	→
Confidence (revised results)	Medium	Medium	Medium	Medium
Combined Impact Score	4.9			
Combined PES Score (%)	51%			
Combined Ecological Category	D			
Hectare Equivalents	7.0 Ha			

8.4. Ecosystem services, importance and sensitivity assessment

The ecological importance and sensitivity of aquatic features were assessed according to DWAF (1999). This assessment ranks functional importance as well as the sensitivity of habitats and species of the aquatic features using a four-point scale. The findings of the assessment are shown in Table 4, and the range of scores is shown in Table 5.

The Kuils River is of moderate ecological importance and sensitivity. The river habitat has lost sensitive elements, but remains an important corridor within the urban area. The Nooiensfonteinvlei is considered to be of high ecological importance and sensitivity. It is an important refuge and corridor within the developed landscape and one of the last remaining remnants of moderately intact floodplain wetland along the Kuils River. The natural vegetation type that historically occurred along the Kuils River, Cape Flats Sand Fynbos, is considered to be critically endangered and there are a number of species endemic to it. The wider seasonal elements are also sensitive to increases in water input, which will see it transition to a permanently saturated wetland dominated by a few hardy and common species, such as *Phragmites australis*.

Table 4: The ecological importance and sensitivity of the Kuils River and the Nooiensfonteinvlei adjacent to Erf 3865

	Kuils River	**Nooiensfonteinvlei**
Rare and endangered biota	1	3
Unique biota	1	2
Intolerant biota	1	1.5
Species/taxon richness	1.5	2
Diversity of aquatic habitat types or features	1.5	3
Refuge value of habitat type	3	4
Sensitivity of habitat to flow changes	1	2
Sensitivity of flow related water quality changes	1	2
Migration route/corridor for instream and riparian biota	3	3
National parks, wilderness areas, Nature Reserves, Natural Heritage sites, Natural areas, PNEs	2	3
RATINGS	1.25	2.50
EIS CATEGORY	**Moderate**	**High**

Table 5: The categories of the four-point scale used to assess an aquatic feature's importance and sensitivity (DWAF, 1999)

	General description	Range of median
Very high	Quaternaries/delineations that are considered to be unique on a national and 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.	>3-4
High	Quaternaries/delineations that are considered to be unique on a national scale based on their 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 substantial capacity for use.	>2-≤3
Moderate	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 not usually very sensitive to flow modifications and often have substantial capacity for use.	>1-≤2
Low/ marginal	Quaternaries/delineations that are not unique on any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

The assessment of the ecosystem services supplied by the Nooiensfonteinvlei was conducted according to the guidelines as described by Kotze *et al* (2020) for *WET*-Ecoservices assessment. The assessment examines and rates the services shown in Figure 11**Error! Reference source not found.**. The assessment looks at a wide range of relevant characteristics of the wetland being assessed and its catchment to determine 1) the extent to which the wetland is able to supply a specific service and 2) the extent to which this service could be considered valuable in the context of the wetland's location (demand for the service). The most important ecosystem services are those that are both demanded of and supplied by the wetlands. The maintenance of biodiversity, storage of carbon, assimilation of toxicants, nitrates and phosphates are important ecosystem services supplied by the wetland. The wetland also attenuates floods and assist with erosion control.

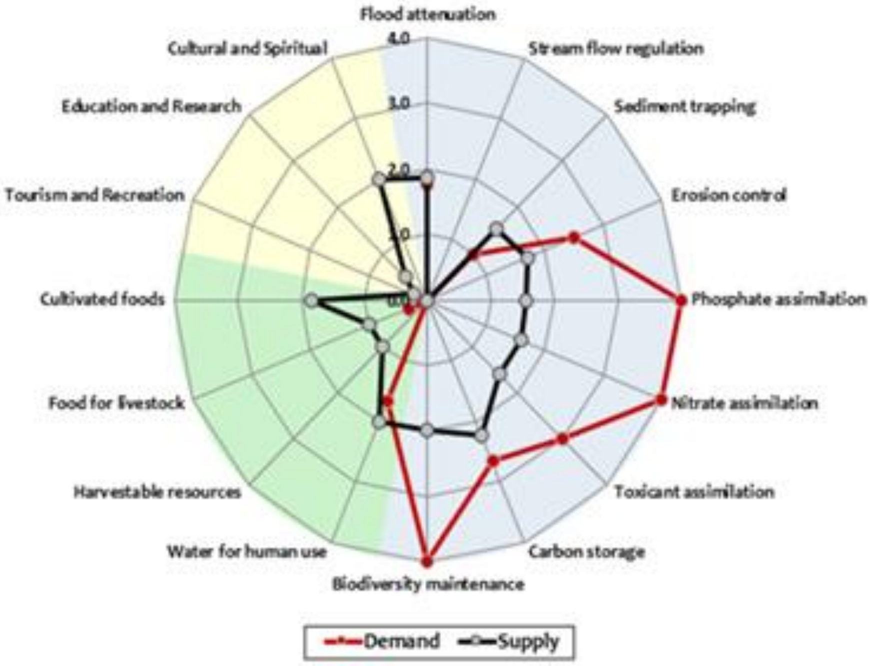

Figure 11. A radar diagram, showing the extent to which various ecosystem services are supplied by- and demanded of the Nooiensfonteinvlei, adjacent to erf 3865

Despite the degraded state of the aquatic features adjacent to erf 3865, they are important for the supply of ecosystem services and represent one of the few remaining refuges for fauna and flora within an increasingly developed landscape.

9. Activity description

Groundwater abstraction

Pepkor (Pty) Ltd developed the Ackerman's distribution centre on Erf 3865 over the course of 2023 and 2024. They propose to utilise a borehole (Figure 12) on the site to supplement their water supply for irrigation of the landscaped areas on the property. It is estimated that 3644m³ per year of water is required for irrigation. Due to the high concentration of iron, chlorine and manganese in the groundwater, it has been recommended that they dilute the ground water with municipal water at a ratio of 70% groundwater to 30% municipal water. Therefore, they would only need to abstract 2552m³ of water from the borehole per year (Figure 12C). Due to the borehole being within 500m of the Nooiensfonteinvlei wetland, abstraction from it may trigger a Section 21 (c) and (i) water use. This is discussed in Section 10 of this report.

C.

Month	*Landscape Architect Irrigation Requirements (m³)	Municipal Water for 30% dillution (m³)	Borehole 70% (m³)
January	573	172	401
February	464	139	325
March	403	121	282
April	224	67	157
May	170	51	119
June	106	32	74
July	110	33	77
August	110	33	77
September	165	50	116
October	298	89	209
November	448	134	314
December	573	172	401
Total (m³/Annum)	±3 644m³	1 093m³	±2 552m³

Figure 12. A photograph of the borehole on erf 3856 (A); with B) a map showing the location of the borehole on the site and wetlands within 500m of the borehole and C) a summary of the proposed water supply balance for irrigation on the site (supplied to Freshwater Consulting by PHS Consulting).

Stormwater outlet

PHS Consulting initiated a water use authorisation application process for the above-mentioned groundwater abstraction. During the pre-application meeting the DWS queried whether the stormwater outlet of the new distribution centre would have an impact of aquatic features within the Kuils River corridor.

The distribution centre was developed on Erf 3865, which appears to have a long history of industrial use (Figure 8C). The redevelopment was not subject to a water use authorisation process. During the site visit, no significant, construction related disturbance outside of the site boundary was observed. However, the operation of the site may have an impact on aquatic features adjacent to the site. The stormwater management plan for the site states that "the development will create relatively large impervious areas that will substantially increase the stormwater run-off from the site." (KLS Consulting Engineers, 2022). The plan calculates that the run-off co-efficient would increase from 0.47 to 0.89. As a result, the plan recommended that an attenuation dam of 1300m³ be created along the site's western boundary (Figure 13). The attenuation dam receives flow from the site, either overland off the surface of roads and paved areas or via several pipe inlets conveying flow from the wider site. The pond contains one piped outlet, feeding directly into the Kuils River corridor (Figure 14).

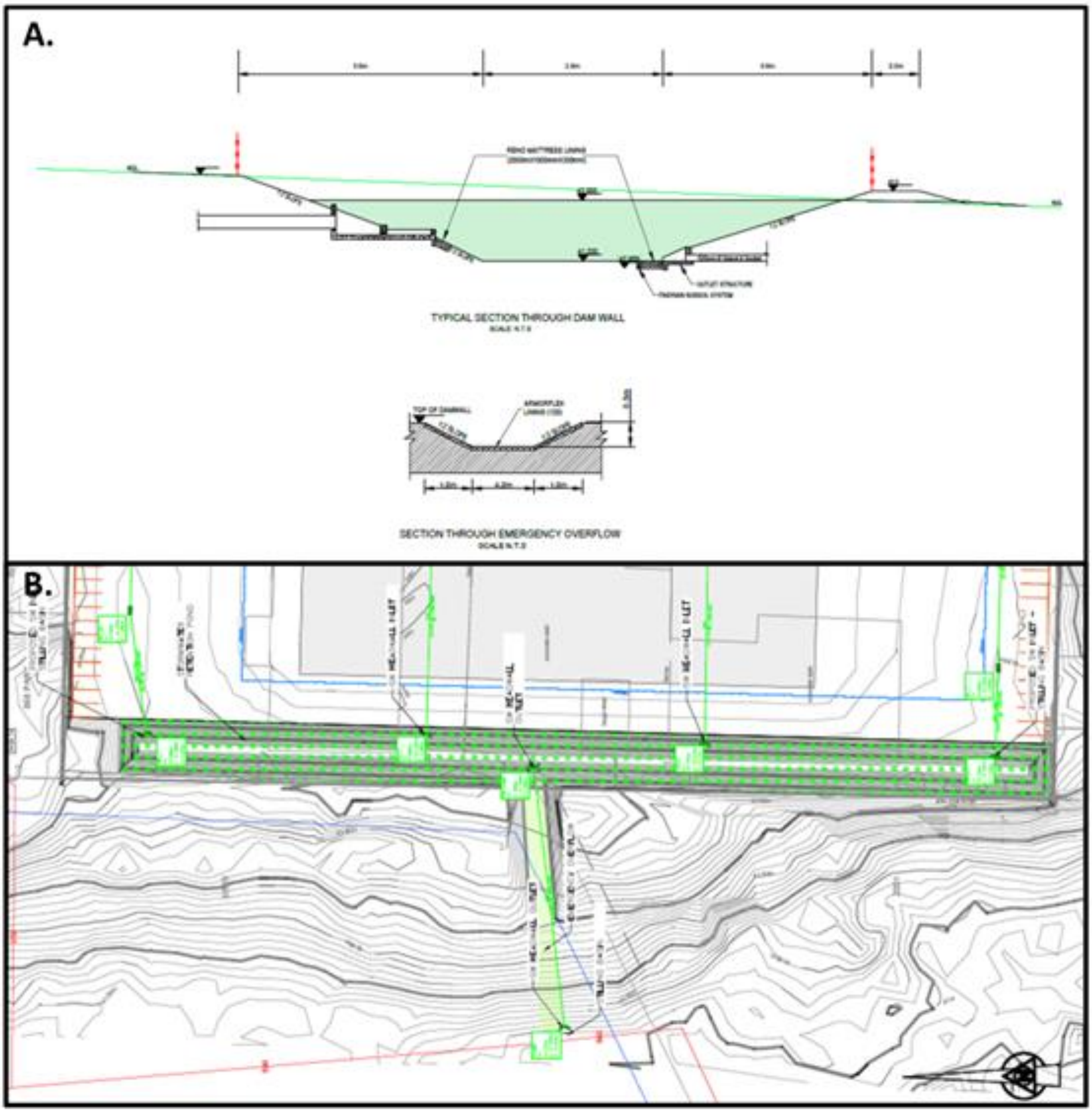

Figure 13. Extracts from the stormwater management plan's attenuation pond design, showing, A) a cross section of the pond and B) a map of its location against the site's western boundary (From KLS Consulting Engineers (2022)).

Figure 14. A Google Earth satellite image of the western boundary of the site showing the location of the stormwater outlet from the attenuation pond, A) the inlet to the stormwater outlet pipe within the attenuation pond and B) the outlet from of the stormwater outlet into the Kuils River corridor, showing erosion downstream of the outlet.

This outlet is clearly already having an impact upon the wetlands into which it feeds (Figure 14Figure 15). Whilst the construction has already been completed, the operational aspects will trigger a Section 21 (c) and (i) water use. As such these are also discussed in Section 10.

10. Water use recommendations and risk assessment

It is recommended that the abstraction of groundwater from the borehole on Erf 3865 does not qualify as a Section 21 (c) or (i) water use. Whilst the activity is taking place within 500m of Nooiensfonteinvlei, it is not likely to impede or divert flows away from or within the wetlands, nor is it likely to alter the wetland's bed, banks or characteristics. This is because the wetland is primarily fed by flow from the Kuils River and lateral flows from the catchment surrounding it. Due to extensive development of its catchment, the wetland is most likely wetter than it would be under natural conditions. The proposed abstraction of 2552m^3 per annum is also considerably lower than the sustainable yield of the borehole of 250.6m^3 per day, as suggested by GEOSS (2023). Finally, no additional infrastructure is proposed in order to carry out the abstraction, which would impact upon the wetlands. The groundwater abstraction should be authorised as a Section 21 (a) water use. The conditions of this authorisation should take cognisance of the recommendations of GEOSS (2023) and be sufficient to ensure sustainable management of the borehole with no risk to other ecosystems.

There newly constructed stormwater outlet is impacting and will continue to impact upon the Nooiensfonteinvlei. The outlet of the newly constructed attenuation pond is located at the lowest level of the pond (Figure 13A). Therefore, it will effectively drain the pond of all water. Discharge volume and velocities would be reduced by increasing the surface roughness of the attenuation area itself. This can be achieved by vegetating the pond's bed and banks. Even with this intervention, the new pond outlet is designed to channel flows to one single outlet point within the Kuils River corridor. During high flows, the flow through this outlet should reach up to 350l/s (KLS Consulting Engineers, 2022). This intense, focused flow has the potential to cause erosion within the wetland. During the site visit, it was observed that sediment had been transported from the developed site into the Kuils River corridor via the stormwater outlet. The stormwater outlet therefore could alter the characteristics of the wetland, and triggers a Section 21 (c) and (i) water use.

A Risk Assessment Matrix (RAM) was carried out according to Government Notice GN 4167 of 2023 (Table 6) for the stormwater outlet. The findings of the risk assessment guide the potential water use authorisation process that will be required by the DWS. A risk assessment normally assesses the risk posed to freshwater resources by a proposed activity in three phases: the planning or design phase, the construction phase and the operational phase. As the outlet is already constructed, with little notable construction-related disturbance noted within the adjacent wetlands, the risks are all assessed under the operational phase. The risk assessment process also assumes that mitigation measures are in place (see Section below).

Table 6. A summary of the Risk Assessment Matrix findings for the stormwater outlet of the Ackerman's DC in Hagley, with- and without- mitigation

Impact	Potentially affected watercourses	Without mitigation			With mitigation		
	Name/s	Significance (max = 100)	Risk Rating	Confidence level	Significance (max = 100)	Risk Rating	Confidence level
Altered flow within the unchanneled valley bottom wetlands	Nooiensfonteinvlei (floodplain wetland of the Kuils River)	44.8	M	High	28.8	L	High
Erosion of the unchanneled valley bottom wetlands		33.6	M	High	22.4	L	High
Sediment deposition across the unchanneled valley bottom wetlands		36	M	High	22.4	L	High

If the outlet and pond are left as is, the risk of ecological degradation to the Nooiensfonteinvlei are moderate. However, if the mitigation measures mentioned below are adequately implemented, the proposed activity poses a low risk to water resources in terms of Section 21 (c) and (i) water uses. The risks are discussed below.

Altered flow pattern across the floodplain wetland

The concentrated outlet flow has already caused erosion and sedimentation downstream of the outlet. This could facilitate the formation of a channel or several channels within the wetland. This would mean that flows would be more effectively drained to lower portions of the wetland or to the primary channel of the Kuils River, and the areas closer to the outlet would potentially be drier. This risk has a high probability if not mitigated.

Erosion of the floodplain wetland

In an extreme instance of the formation of a channel, as described above, the concentrated flows might create erosion dongas within the wetland area. The donga would effectively function as a drain and result in significant changes to the surrounding wetlands. This risk is deemed to have a low probability.

Sediment deposition

Due to the lack of channels and the gentle gradient across the Nooiensfonteinvlei, the flows exiting the outlet immediately lose their energy. As a result, deposition of any transported sediment, or other material, occurs. During the site visit, deposited sediment was observed downstream of the outlet (Figure 15). The high rainfall events that led to the sediment being transported through the attenuation pond occurred during and immediately after the construction phase. There were still high sediment inputs on the site from incomplete construction areas and from the attenuation pond itself, which had not yet been adequately vegetated. During the long-term operation of the site, it is likely that this risk will reduce and channelised flow or erosion will become more likely.

Figure 15. Sediment deposition occurring within the Kuils River corridor at the stormwater outlet.

Proposed mitigation

It is recommended that the attenuation pond be densely vegetated with appropriate indigenous species, such as *Cyperus textilis*, *Juncus capensis*, *Cyperus congestus* and *Ficinia nodosa* which occur in the adjacent wetlands. This vegetation should across the banks and bed of the attenuation pond. The vegetation will increase surface roughness of the pond area, reducing flow speed through the pond to the outlet. By slowing the flow, the plants will assist in capturing sediment being transported from the site. The roots of the plants will also assist in binding the soils of the attenuation pond itself, so that it is not washed out into the wetland areas.

Figure 16. An example of stilling basin, with vegetation downstream, similar to that which is recommended in this report. (Photograph credit: Kate Snaddon)

It is also recommended that improved energy dissipation be installed at the outlet into the Kuils River corridor. A riprap or loose rock basin would immediately spread flow across a wider area. The downstream end of the basin should be planted with a relatively tall indigenous sedge, such as *Cyperus textilis*. The vegetation would function as a final energy dissipater and assist in preventing erosion downstream of the outlet. An example of this is shown in Figure 16. (Note: a plunge pool style outlet is not being recommended.)

11. Conclusion

The proposed abstraction of groundwater from the borehole on Erf 3865 requires a Section 21 (a) authorisation in terms of the NWA. The volume which is proposed is 2552m^2 per year. Up to 400m^3 of water can be abstracted from groundwater per hectare of a property within G22E, under current GA for Section 21 (a) (Government Notice 538 of 2016). Erf 3865 has an area of 6.86 hectares. Therefore, up to 2774m^3 could be registered under a GA for groundwater abstraction on the property. The borehole is within 500m of a wetland; however, it is recommended that the abstraction not require a Section 21 (c) and (i) water use. The abstraction is unlikely to impede or divert flow within the wetland, or change bed, banks, course, or characteristics of the wetland. The abstraction volumes are well below the sustainable yield of the borehole and likely to not significantly draw down the water table in the area. Furthermore, the wetlands adjacent to the site are fed by lateral flows from their catchment and are most likely wetter in the present state than in their natural state. This is as a result of hardening of most of the wetland's catchment through urban development. The abstraction from the borehole is therefore unlikely to dry the wetland out or pose any significant risk to the characteristics of the wetlands.

The stormwater outlet from the newly developed Ackerman's Distribution Centre on Erf 3865 does trigger a Section 21 (c) and (i) water use. Cognisance has been taken of the increase in the run-off co-efficient of the property as a result of the development, and an attenuation pond of 1300m^3 has been constructed. However, the pond has an outlet at its lowest level and this concentrates all runoff from the site to one outlet point. These risks do need to be addressed. Firstly, the attenuation pond itself should be vegetated to stabilise soils in the pond and slow flows through the pond. Secondly, a riprap outlet basin is recommended with additional vegetation planted downstream of it at the outlet into the Kuils River corridor. If this is adequately implemented, risk that the outlet poses to degradation of the adjacent wetland is low.

The Section 21 (c) and (i) water use for the stormwater outlet should be included in the water use authorisation process of the Section 21 (a) water use.

	Section 21 (a)	Section 21 (c)	Section 21 (i)
Stormwater outlet	Not triggered	**Triggered:** for outlet into the Kuils River corridor **Co-ordinates:** 33°57'28.74"S; 18°40'4.29"E **Recommended authorisation:** GA (provided mitigation is implemented)	**Triggered:** for outlet into the Kuils River corridor **Co-ordinates:** 33°57'28.74"S; 18°40'4.29"E **Recommended authorisation:** GA (provided mitigation is implemented)
Abstraction from borehole	**Triggered**: for 2655m^3 per year **Co-ordinates:** 33°57'25.76"S; 18°40'17.93"E **Recommended authorisation:** GA	Not triggered	Not triggered

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Appendix I: Details of specialist

STUART BARROW

NAME:	Stuart Barrow
NATIONALITY:	South African
PROFESSION:	Freshwater Ecology
SPECIALISATION:	Conservation Ecology
YEARS EXPERIENCE:	10 years post BSc
PROFESSIONAL REGISTRATION:	Registered Environmental Scientist and Aquatic Scientist (SACNSP Number: 400128/17)

CONTACT DETAILS:

TELEPHONE:	0812707337
EMAIL:	stuart@freshwaterconsulting.co.za
LANGUAGES:	English and Afrikaans
COUNTRIES OF WORK:	South Africa

EDUCATION:

MSc (2014) Stellenbosch University, South Africa. Conservation ecology.

BSc (2012) Stellenbosch University, South Africa. Conservation ecology.

SUMMARISED EMPLOYMENT RECORD

2021 – present	Founder and Chairman of Lighthouse Academy (www.lighthouseacademy.org.za)
Jan 2015 – 2023	BlueScience (Pty) Ltd
2014 – 2015	Part-time employment at Geohydrological and Spatial Solutions (GEOSS) (Pty) Ltd.

KEY EXPERIENCE RECORD AND PROJECT INVOLVEMENT

2020-2023

- River maintenance and management plans
- Management of alien tree clearing and riparian and wetland revegetation teams
- Water quality monitoring for water use licence compliance and auditing
- Water use license applications

Experience unrelated to freshwater ecology:

- Establishing Lighthouse Academy NPO and PBO
- Fund raising, financial and administrative management of Lighthouse Academy

2016-2020

- River Maintenance and Management Plans
- Freshwater and wetland assessment projects

- Water Use License applications
- Water Quality monitoring for water use licence compliance and auditing
- Wetland and riparian vegetation rehabilitation

2015

- Freshwater and wetland assessment projects
- Wetland and riparian vegetation rehabilitation
- Water Use License applications
- River Maintenance and Management Plans

2013 -2014

- Compiling monthly reports on the geohydrology monitoring of boreholes for agricultural use.
- Master's Thesis: Contrasting impacts of alien sport fish, *Micropterus dolomieu*, in the Cape Floristic Region.

2012

- Fourth year mini-thesis: An assessment of the ichthyofauna of the Tradouw river catchment: Implications for the conservation of the Barrydale Redfin. (*Pseudobarbus burchelli*)

Appendix II: Full Risk Assessment Matrix

Without mitigation:

PROJECT: **Ackermans DC WUA**

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1

Name of Assessor: Stuart Barrow

Signature:

SACNASP Registration Number: 400128/17

Date of assessment: 30-Jul-24

Risk to be scored for all relevant phases of the project (**factoring in specified control measures**). MUST BE COMPLETED BY SACNASP PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE.

Phase	Activity	Impact	Potentially affected watercourses			Intensity of Impact on Resource Quality					Overall Intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating	Confidence level
						Abiotic Habitat (Drivers)			Biota (Responses)											
			Name/s	PES	Overall Watercourse Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
Operation	Stormwater run-off from the distribution center	Altered flow within the unchanneled valley bottom wetlands	Nooiensfonteinvlei (floodplain wetland of the Kuils River)	D	High	4	1	3	3	2	**8**	2	4	**14**	**4**	**56**	80%	**44.8**	**M**	High
		Erosion of the unchanneled valley bottom wetlands				3	2	4	3	2	**8**	2	4	**14**	**4**	**56**	60%	**33.6**	**M**	High
		Sediment deposition across the unchanneled valley bottom wetlands				2	2	3	2	1	**6**	1	2	**9**	**4**	**36**	100%	**36**	**M**	High

With mitigation

PROJECT: **Ackermans DC WUA**

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1

Name of Assessor: Stuart Barrow

Signature:

SACNASP Registration Number: 400128/17

Date of assessment: 30-Jul-24

Risk to be scored for all relevant phases of the project (**factoring in specified control measures**). MUST BE COMPLETED BY SACNASP PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE.

Phase	Activity	Impact	Potentially affected watercourses			Intensity of Impact on Resource Quality					Overall Intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating	Confidence level
						Abiotic Habitat (Drivers)			Biota (Responses)											
			Name/s	PES	Overall Watercourse Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
Operation	Stormwater run-off from the distribution center	Altered flow within the unchanneled valley bottom wetlands	Nooiensfonteinvlei (floodplain wetland of the Kuils River)	D	High	3	1	2	2	1	**6**	2	4	**12**	**4**	**48**	60%	**28.8**	**L**	High
		Erosion of the unchanneled valley bottom wetlands				3	2	4	3	1	**8**	2	4	**14**	**4**	**56**	40%	**22.4**	**L**	High
		Sediment deposition across the unchanneled valley bottom wetlands				2	2	2	2	1	**4**	1	2	**7**	**4**	**28**	80%	**22.4**	**L**	High