FRESHWATER ASSESSMENT FOR THE PROPOSED RETIREMENT VILLAGE DEVELOPMENT AT ERF 657, STILL BAY, WESTERN CAPE.

Section 21 (c) & (i) Risk Assessment

Prepared for Cape EAPrac

by

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- 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;
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Specialist: James Dabrowski (Ph.D., Pr.Sci.Nat. Water Resources)

Date: 24 July 2019

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1. INTRODUCTION & SCOPE OF WORK

Confluent Environmental (Pty) Ltd were requested to conduct a freshwater assessment for a proposed retirement village development at Erf 657 in Still Bay, Western Cape. According to the Western Cape Biodiversity Spatial Plan (2017) there is an Ecologically Sensitive Aquatic Area that extends from the development site into the neighbouring property. In addition, the NFEPA spatial database identified a wetland falling within 500 m of the proposed property development which triggers a Section 21 c and i water use under the National Water Act. The scope of work covered by this report therefore includes the following:

- Confirmation of the absence/presence of a wetland on Erf 657 and neighbouring Erf 692;
- Confirmation of the presence of a wetland within 500 m of the proposed development; and
- Adherence to water use authorisation requirements as stipulated in Section 21 of the National Water Act.

2. KEY LEGISLATIVE REQUIREMENTS

For the purposes of this assessment, a wetland area is defined according to the National Water Act (NWA, Act No. 36 of 1998) as follows:

"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 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, a WUL 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.

3. DESKTOP ANALYSIS

3.1 NFEPA

The proposed development will take place in quaternary catchment H90E, which falls within the Breede River primary catchment (Figure 1). The Erf falls within sub-quaternary 9383 and is not categorised as a National Freshwater Ecosystem Priority Area (NFEPA) (Figure 1).

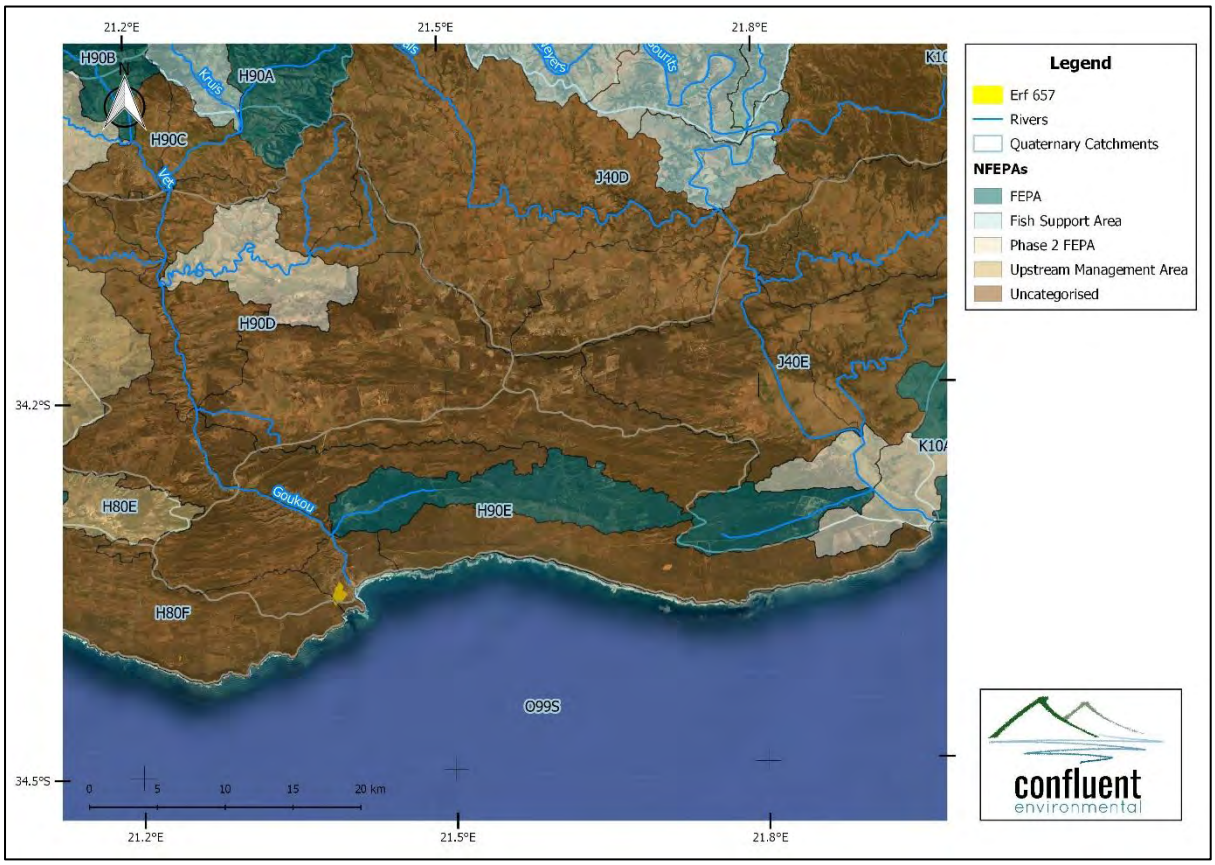

Figure 1: National Freshwater Priority Areas

3.2 Western Cape Biodiversity Spatial Plan

According to the WCBSP an aquatic Ecosystem Support Area (ESA) falls within the footprint of the ERF 657. Aquatic ESA are defined as:

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.

The management objective for an aquatic ESA is to:

Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.

A wetland area located to the north of Erf 657 falls within an aquatic CBA1 which are regarded as areas that are in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. The management objective for an aquatic CBA is to:

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.

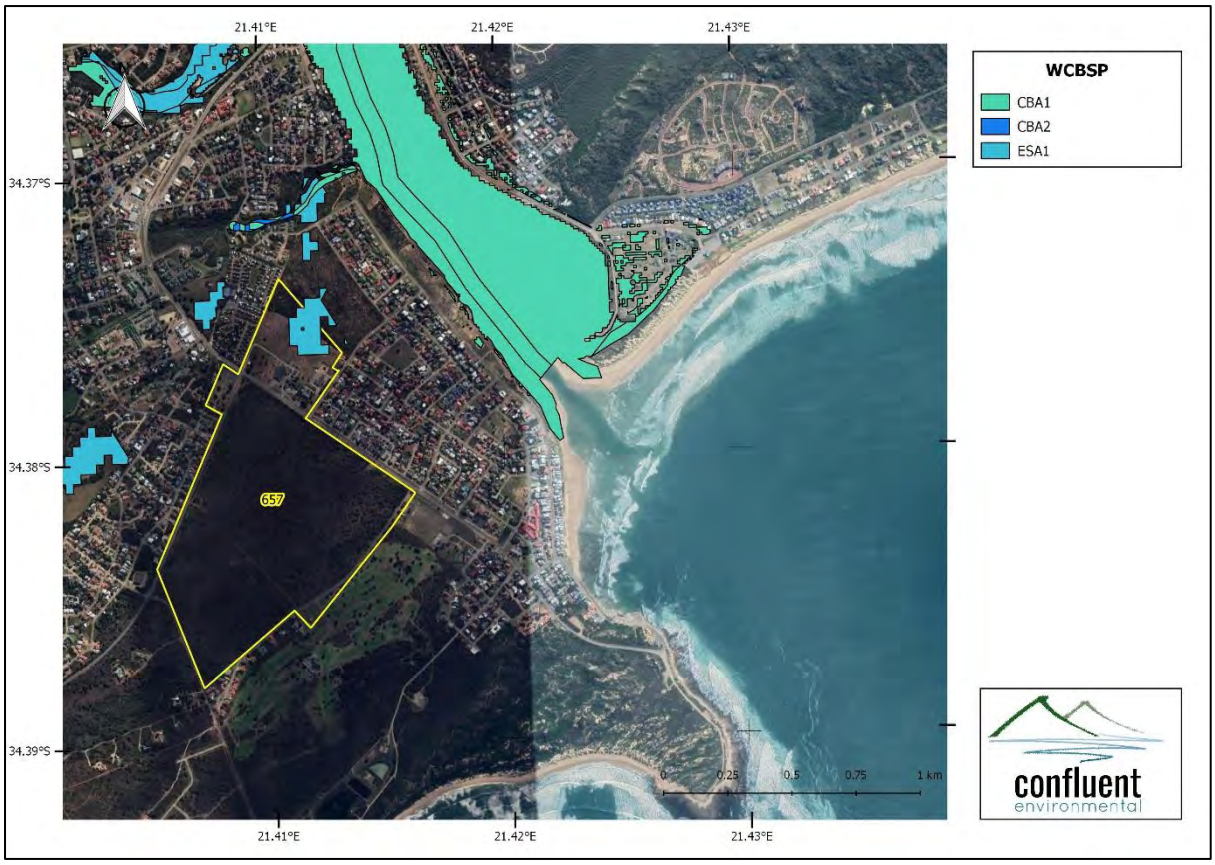

Figure 2: Aquatic CBAs and ESAs identified by the WCBSP (2017)

3.3 NFEPA Wetlands

According to the NFEPA wetlands layer, an unchanneled valley bottom wetland is located within 500 m of the Erf 657 (Figure 3) and therefore falls within the regulated area of a watercourse.

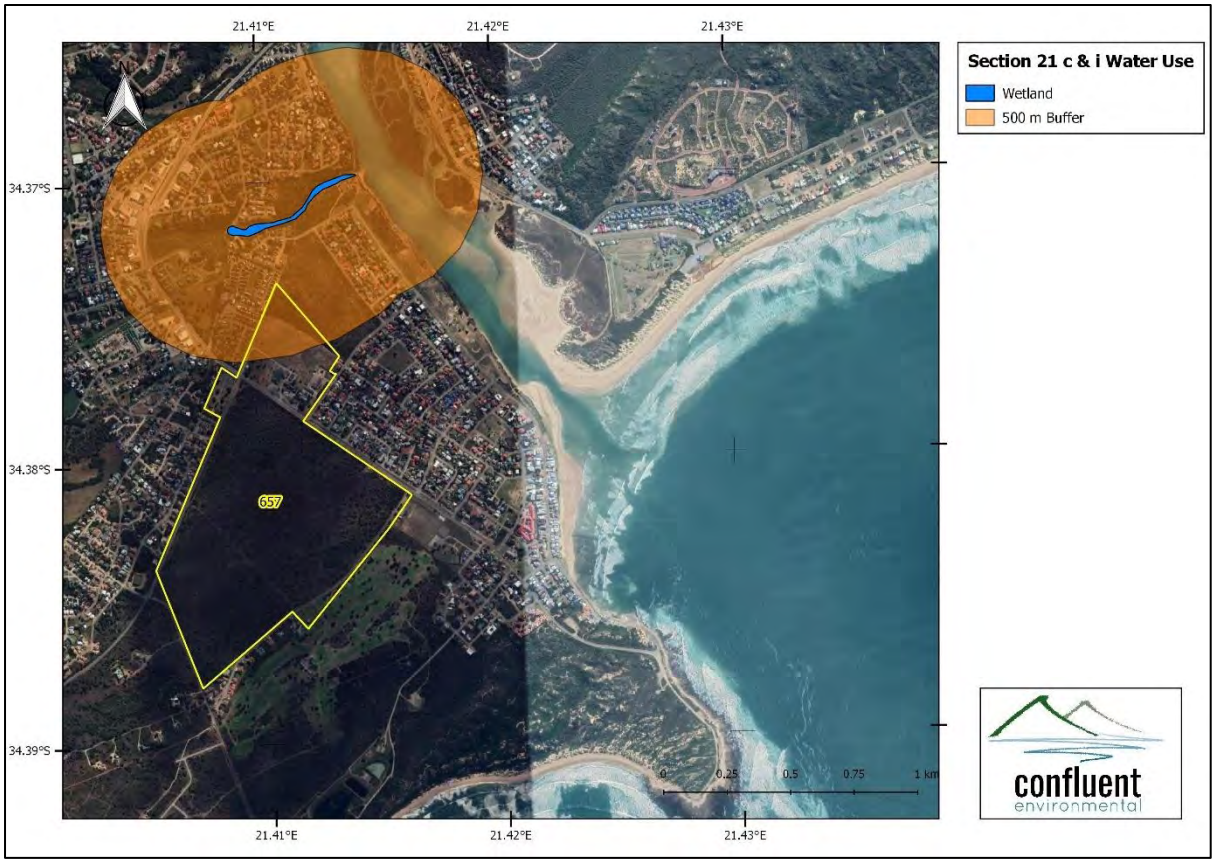

Figure 3: NFEPA wetlands occurring with 500 m of the property development.

4. METHODS

4.1 Classification and Delineation

A site visit was conducted to verify the locations of identified wetlands and describe existing onsite impacts, which were mapped using a hand-held GPS device. All wetlands occurring within the project area were categorised into discrete hydrogeomorphic units (HGMs) based on their geomorphic characteristics, source of water and pattern of water flow through the wetland unit. HGMs were classified according to Ollis et al. (2013). The outer edge of wetlands occurring within and adjacent to the footprint of the proposed mine were delineated according to the following four indicators (DWAF, 2005):

- The presence of wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation such as grey horizons, mottling streaks, hard pans, organic matter depositions, iron and manganese concretion resulting from prolonged saturation (soil indicator);
- The presence of water loving plants (hydrophytes) (vegetation indicator);
- A high-water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm of the soil; and
- Topographical location of the wetland in relation to the surrounding landscape (terrain indicator).

The desktop analysis, in combination with vegetation and terrain indicators were primarily used to delineate wetlands in the project area and were verified through inspection of soil cores obtained through use of a hand-held soil auger.

4.2 Present Ecological State

Desktop and field data were captured in GIS software and used to populate the Level 1 WET-Health tool (Macfarlane et al., 2008) which was used to derive the PES of the wetland HGM units. The magnitude of observed impacts on the hydrological, geomorphological and vegetation components of the wetland were calculated and combined as per the tool to provide a measure of the overall condition of the wetland on a scale from 1-10. Resultant scores were then used to assign the wetland into one of six PES categories as shown in (**Error! Reference source not found.** below.

Table 1: Wetland Present Ecological State categories and impact descriptions.

Ecological Category	Description	Impact Score
A	Unmodified, natural.	0 – 0.9
B	Largely natural with few modifications / in good health. A small change in natural habitats and biota may have taken place but the ecosystem functions are still predominantly unchanged.	1 – 1.9
C	Moderately modified / fair condition. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	2 – 3.9
D	Largely modified / poor condition. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	4 – 5.9
E	Seriously modified / very poor condition. The loss of natural habitat, biota and basic ecosystem functions is extensive.	6 – 7.9
F	Critically modified / totally transformed. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota.	8 – 10

4.3 Ecological Importance and Sensitivity

The ecological importance of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales (Duthie, 1999). Ecological sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Duthie, 1999). The Ecological Importance and Sensitivity (EIS) provides a guideline for determination of the Ecological Management Class (EMC).

The revised method for the determination of the EIS of a wetland considers the three following ecological aspects (Rountree et al., 2013):

Ecological importance and sensitivity

- Biodiversity support including rare species and feeding/breeding/migration;
- Protection status, size and rarity in the landscape context;

- Sensitivity of the wetland to floods, droughts and water quality fluctuations.

Hydro-functional importance

- Flood attenuation;
- Streamflow regulation;
- Water quality enhance through sediment trapping and nutrient assimilation;
- Carbon storage

Direct human benefits

- Water for human use and harvestable resources;
- Cultivated foods;
- Cultural heritage;
- Tourism, recreation, education and research.

Each criterion is scored between 0 and 4, and the average of each subset of scores is used to derive a score for each of the three components listed above. The highest score is used to determine the overall Importance and Sensitivity category of the wetland system (Table 2).

Table 2: Ecological importance and sensitivity categories. Interpretation of average scores for biotic and habitat determinants.

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3	B
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1	D

5. CONFIRMATION OF WETLAND ON ERVEN 657 AND 692

A field survey was undertaken on the 19th of July 2019 which is considered to be at the beginning of the wet season. During the field survey, the area indicated to be an aquatic ESA

(falling within Erf 657 and the neighbouring Erf 692) was assessed in accordance with DWAF (2005) guidelines which recommends that the following four specific indicators be used to determine the presence of a wetland:

- The Terrain Unit Indicator: Identifies those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator: Identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation;
- The Soil Wetness Indicator: Identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation (i.e. mottling and gleying within 50 cm of the soil surface); and
- The Vegetation Indicator: Identifies hydrophilic vegetation associated with frequently saturated soils.

Signs of soil wetness in the soil profile was determined using a soil augering approach, the aim of which is to dig holes across a transect of the area so that different zones of temporary/seasonal/permanent soil saturation can be delineated.

The area of the ESA falling within Erf 657 has been significantly transformed and most natural natural vegetation has been cleared apart from a strip of vegetation to the north of the property and a few milkwood trees (Figure 4). No signs of any wetland habitat were visible on this portion of the property which was confirmed with soil augering (Figure 5).

The neighbouring Erf 692 consisted of largely natural vegetation characteristic of Albertinia Sand Fynbos vegetation type. From a terrain indicator perspective, no obvious channels conveying water were present. The most likely areas where wetlands are likely to occur are a series of depressions that occur in amongst the vegetated dunes (Figure 6). No obligate wetland plant species were found to occur within these depressions or along any potential seep zones. Several auger points were dug within the depressions and throughout the general vicinity of the identified ESA (Figure 5). None of the soil cores showed any signs that would indicate permanent, seasonal or intermittent saturation of the soil profile.

In summary, no wetlands occur on Erf 657 or Erf 692.

Figure 4: Transformed portion of Erf 657

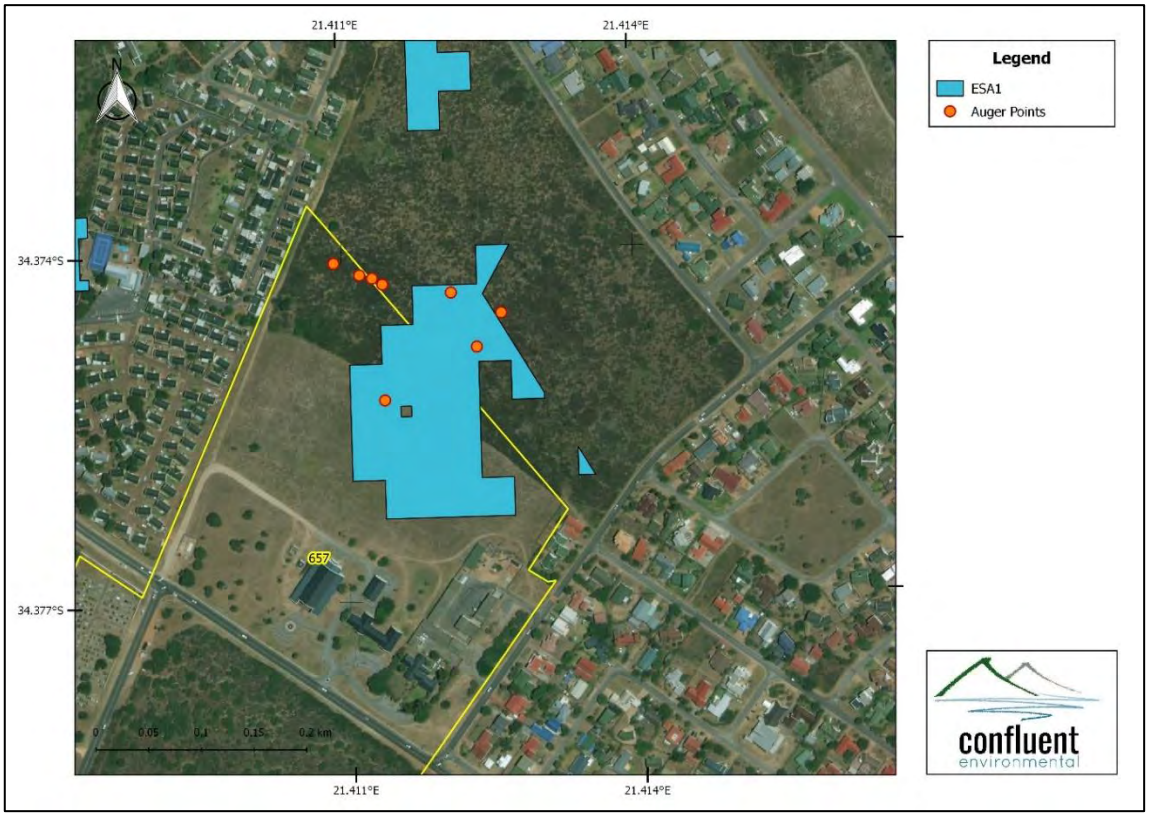

Figure 5: Map illustrating soil auger points in relation to the aquatic ESA.

Figure 6: Photograph showing a depression in amongst the vegetated dunes

6. VALLEY BOTTOM WETLAND

6.1 Wetland Classification

While NFEPA identifies the wetland as an unchanneled valley-bottom wetland, the site visit identified the area as a permanently saturated and inundated channelled valley-bottom wetland, given the distinct river channel that runs through the wetland (Table 3, Figure 7). Given that the proposed development will occur within 500 m of a delineated wetland, the proposed activity does fall within the regulated area of a watercourse. Any water use activities that do occur within the regulated area of a watercourse should be assessed using the DWS Risk Assessment Matrix to determine whether activities may be generally authorised (Low Risk according to the Risk Assessment Matrix) or require a WUL (Medium or High Risk according to the Risk Assessment Matrix).

Table 3: Wetland Classification

Level 1	Level 2		Level 3	Level 4	Level 5	
System	**DWS Ecoregion**	**NFEPA WetVeg**	**Landscape Unit**	**4A**	**5A**	**5B**
Inland	Southern Coastal Belt	Albany Thicket Valley	Valley Floor	Channelled Valley Bottom	Permanently Inundated	Permanently Saturated

6.2 Present Ecological State

The wetland falls within a relatively highly urbanised residential catchment. A concrete pathway leads along the length of the wetland providing access along the wetland for

recreational hiking. Flood peaks are likely to have increased as a result of hardening of the catchment area and increased stormwater inputs (Figure 7). This has led to incision of the channel in sections. The geomorphology has been modified due to the installation of a weir approximately mid-way along the length of the wetland (Figure 7), leading to increased deposition of sediments upstream of the weir and a slight channelization of the wetland downstream of the weir. Vegetation has been altered through the invasion by alien invasive plant species and the introduction of gardens along the length of the garden, many of which extend into the wetland. Accordingly, the PES of the wetland is regarded as Moderately to Largely Modified (Pes: C/D) (Table 4)

Table 4: PES scores for wetland falling within 500 m of the property development.

Wetland	Hydrology	Geomorphology	Vegetation	Overall PES
Channelled Valley Bottom	C/D (60 %)	C (65 %)	D (55 %)	**C/D (60 %)**

Figure 7: Photographs of the wetland indicating distinct channel (A), wetland vegetation including *Phragmites australis* (B), concrete walkway along the length of the wetland (C), instream weir approximately half-way along the length of the wetland (D), stormwater inflows (E) and channelised section downstream of the wetland

6.3 Ecological Importance & Sensitivity

The ecological importance and sensitivity of the wetland is relatively high primarily due its location in an endangered vegetation type (Table 5). It's hydro-functional importance is also relatively high given its ability to assimilate pollutants and sediments (Table 6). This a particularly important attribute in an urbanised catchment area. From a human use perspective the wetland is moderately important overall, but is particularly important with respect to offering a a scenic outdoor location for recreational hiking and jogging and has a well maintained pathway running along the length of the wetland (Table 7).

Table 5. Ecological Importance and Sensitivity importance criteria for the wetland

Ecological Importance and Sensitivity	Channelled Valley Bottom Wetland
Biodiversity Support	
Presence of Red Data species	**1**- Low likelihood at a local scale
Populations of unique species	**1** - Low likelihood at a local scale
Migration/feeding/breeding sites	**2** – Moderately important for reed nesting birds and amphibians.
Average	**1.3 (Moderate)**
Landscape Scale	
Protection status of wetland	**2** - Falls within a Provincial CBA
Protection status of vegetation type	**4**-Albany Thicket Valley (Endangered)
Regional context of the ecological integrity	**2** – Average ecological integrity from a regional perspective (PES – C/D)
Size and rarity of the wetland types present	**1** - Small sized wetland, relatively common throughout the landscape.
Diversity of habitat types	**2** – Mixture of well vegetated and more open channel sections
Average	**2.2 (High)**
Sensitivity of the Wetland	
Sensitivity to changes in floods	**3** – Channelled valley bottom wetland dependent on floods
Sensitivity to changes in low flows	**1** – Permanently inundated, and therefore low sensitivity to low flow
Sensitivity to changes in water quality	**2** – Moderate sensitivity given the assimilative capacity of valley bottom wetlands
Average	**2 (High)**
ECOLOGICAL IMPORTANCE AND SENSITIVITY	**2.2 (High)**

Table 6: Hydro-functional importance criteria results for the wetland

Hdyro-functional Importance			Channelled Valley Bottom Wetland
Regulating & supporting benefits	Flood attenuation		1-Marginal potential to attenuate floods given its small size
	Streamflow regulation		2 - Fed by a perennial river,
	Water quality enhancement	Sediment trapping	3- Extended retention time and wetland vegetation enhances water quality
		Phosphate assimilation	3- Extended retention time and wetland vegetation enhances water quality
		Nitrate assimilation	3- Extended retention time and wetland vegetation enhances water quality
		Toxicant assimilation	3- Extended retention time and wetland vegetation enhances water quality
		Erosion control	3- Extended retention time reduces erosive power of flow
	Carbon storage		2- Minor trapping of soil organic matter
HYDRO-FUNCTIONAL IMPORTANCE			**2.75 (High)**

Table 7: Direct human benefit importance criteria results for the wetland

Direct Human Benefits		Channelled Valley Bottom Wetland
Subsistence benefits	Water for human use	**1**-Limited use Seasonal/intermittent hydroperiod offers limited benefit
	Harvestable resources / cultivated foods	**1**-Few resources of value
Cultural benefits	Cultural heritage	**1**-None known
	Tourism and recreation Education and research	**3** -Relatively high value given recreational pathways and activities that occur adjacent to the wetland
DIRECT HUMAN BENEFITS		**1.5 (Moderate)**

7. DEVELOPMENT PLANS

The development proposal is to develop a new retirement resort, consisting of 120 loose standing retirement homes, 8 semi-detached assisted living units and a frail care facility with administrate and communal facilities (Figure 8). The closest point of the development will be located approximately 230 m from the wetland, with a large existing suburb located in between the development and the wetland (Figure 9).

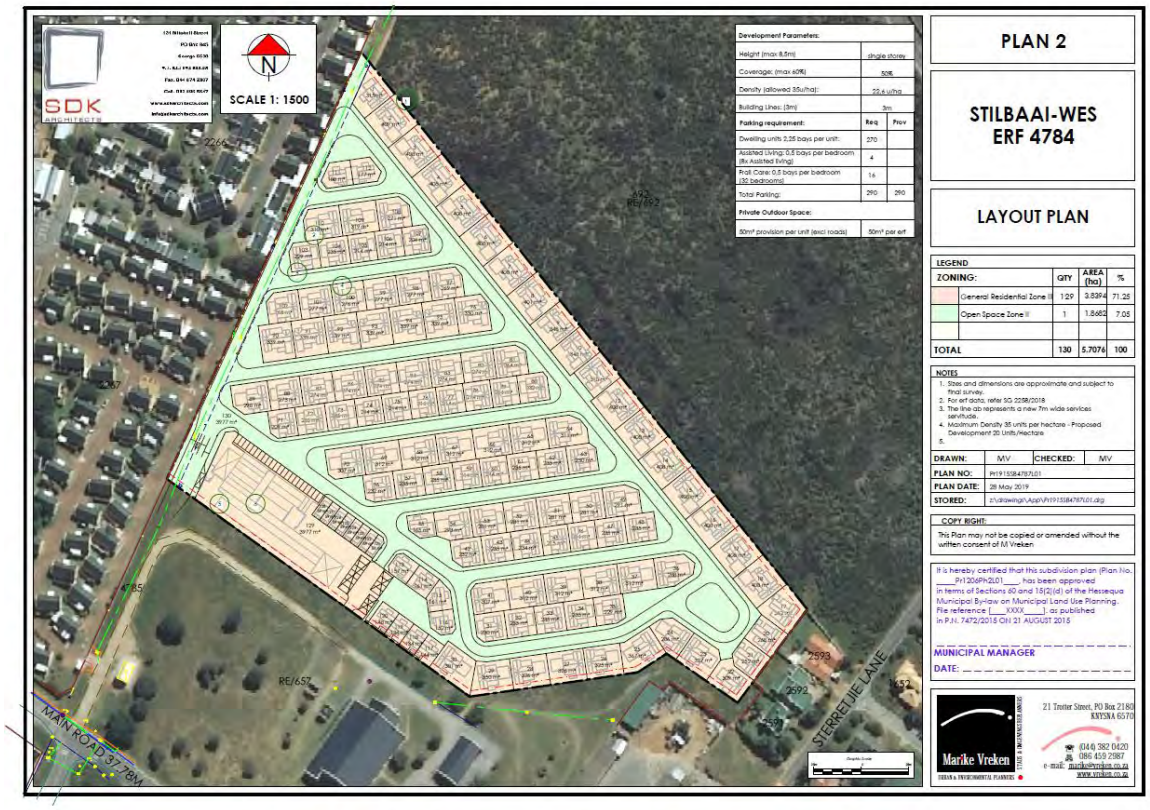

Figure 8: Proposed layout for the Stilbaai Retirement Village.

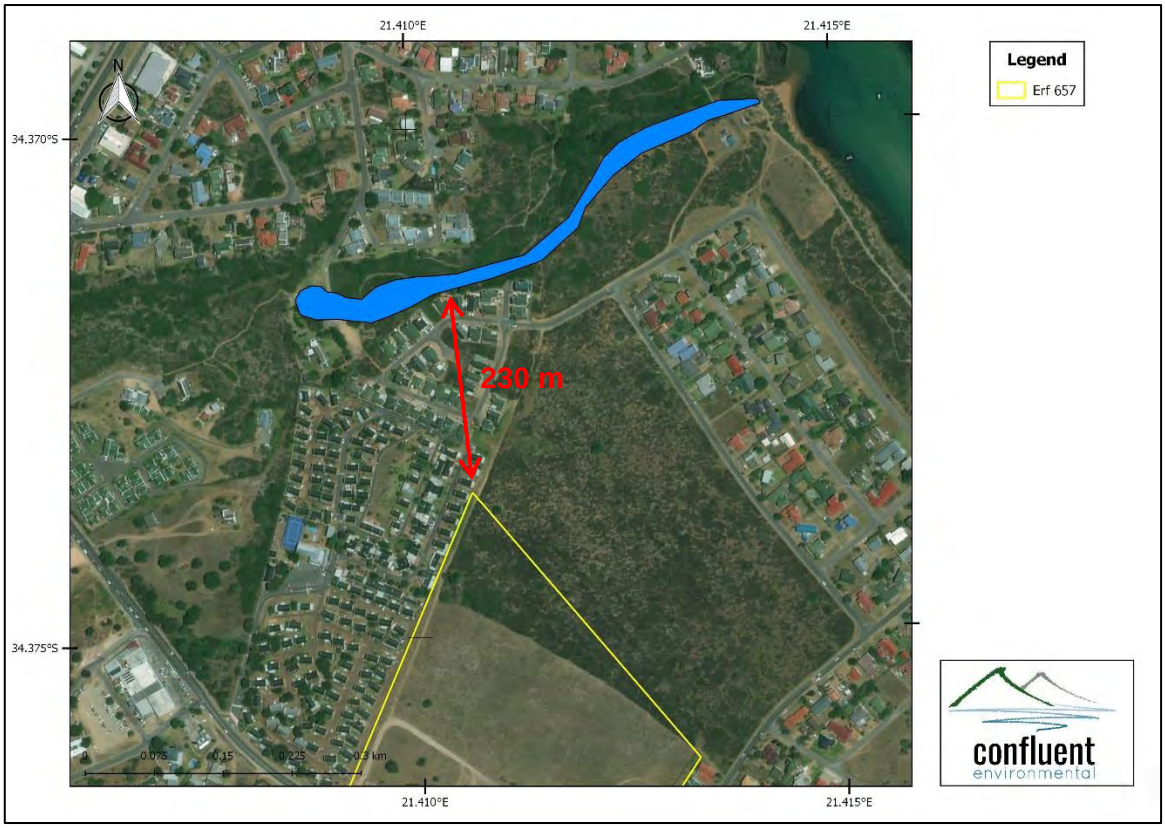

Figure 9: Location of development in relation to the wetland.

8. DESCRIPTION OF ACTIVITIES

The retirement complex will be constructed and operated within 500 m of the channelled-valley bottom wetland and a number of activities associated with the construction and operation of the complex could potentially trigger a Section 21 (i) water use (Table 8). Risks associated with these activities have been assessed in Table 6 and Table 7. The development will take place more than 200 m away from the wetland which will in all cases provide suitable mitigation against potential impacts associated with the identified activities. No activities that could trigger a Section 21 (c) water use were identified.

Table 8: List of activities that could potentially trigger a water use license under Section 21 (i) of the National Water Act.

Activity	Description
Construction Phase	
Disturbance of wetland habitat	Operation of heavy machinery within the wetland area.
Contamination of wetland with hydrocarbons	Spillage of oil and/or fuel through refuelling or operating vehicles within close proximity to the wetland.
Contamination of the wetland with sewage	Spillage of sewage associated with the use of temporary ablution facilities during construction.
Erosion and sedimentation of the wetland	Clearing and levelling of land adjacent to the wetland could potentially result in erosion and sedimentation of the wetland.
Operational Phase	
Input of stormwater into the wetland	Stormwater runoff directed into the wetland could alter the natural hydrological regime of the wetland.

9. WATER USE LICENSE & RISK ASSESSMENT

The risk assessment matrix (Based on DWS 2015 publication: Section 21 (c) and (i) water use Risk Assessment Protocol) was implemented to assess risks for each activity associated with the construction and operational phase. The first stage of the risk assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions and methodology applied in the impact assessment are provided in Appendix 1 of this report.

Risks were assessed assuming full implementation of recommended mitigation measures. Risk ratings for all activities fall within a Low Risk class (Table 9 and Table 10) and are unlikely to result in a deterioration in the PES or EIS of the wetland. The level of confidence associated with this assessment is very high.

Table 9: Construction phase risk matrix completed by Dr. James Dabrowski (SACNASP registration number 114084). Severity scores assume full implementation of mitigation measures)

Activity	Aspect	Impact	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	PES AND EIS OF WATERCOURSE
Operation and/or storage of heavy machinery within the delineated wetland area	Disturbance to Wetland Habitat	Compacting of wetland soils and physical disturbance of wetland fauna and flora	1	1	1	1	1	1	1	3	1	1	5	1	8	24	Low	95	Development will take place > 200 m away from the wetland	PES: C EIS: Moderate
Operation of machinery within close proximity to the wetland	Spillage of fuel and/or oil during operation, maintenance or refuelling	Contamination of water resources by hydrocarbons	1	1	1	1	1	1	1	3	1	1	5	1	8	24	Low	95	Development will take place > 200 m away from the wetland	
Operation of ablution facilities	Spillage or leaking of sewage	Contamination of the wetland with sewage	1	1	1	1	1	1	1	3	1	1	5	1	8	24	Low	95	- Development will take place > 200 m away from the wetland - Chemical toilets should be provided on-site at 1 toilet per 10 persons; - Chemical toilets should be located outside the designated buffer of the wetland; and - Waste from chemical toilets must be disposed of regularly (at least once a week) in a responsible manner by a registered waste contractor.	
Clearing and levelling of the site and excavation of foundations	Erosion of bare, exposed soils	Erosion and sedimentation of the wetland	1	1	1	1	1	1	1	3	1	1	5	1	8	24	Low	95	Development will take place > 200 m away from the wetland	

Table 10: Operational phase risk matrix completed by Dr. James Dabrowski (SACNASP registration number 114084). Severity scores assume full implementation of mitigation measures)

Activity	Aspect	Impact	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	PES AND EIS OF WATERCOURSE
Stormwater Management	Increased stormwater flows	Disturbance to Wetland Habitat & Hydrological Flow Regime	1	1	1	1	1	1	1	3	1	1	5	1	8	24	Low	95	Stormwater to be conveyed into existing stormwater infrastructure.	PES: C EIS: Moderate

10. CONCLUSION

Given the low impact associated with all activities highlighted in this report, and according to Government Notice 509 of August 2016 (RSA, 2016) of the National Water Act, the proposed development of the retirement development on Erf 657, Still Bay, is Generally Authorised and does not require a Water Use License.

While the development is generally authorised, it is important to note that the water use activity should still be registered with the DWS. In this respect the following steps, as highlighted in the General Authorisation for Section 21 (c) and (i) water uses, are relevant:

1. Subject to the provisions of the General Authorisation, the applicant must submit the relevant registration forms to the responsible authority;
2. Upon completion of registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission;
3. On written receipt of a registration certificate from the Department, the applicant will be regarded as a registered water user and can only then commence with the water use as contemplated in the General Authorisation; and
4. The registration forms can be obtained from DWS Regional Offices or Catchment Management Agency office of the Department or from the Departmental website: http://www.dwa.gov.za/Projects/WARMS/Licensing/licensing1.aspx

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APPENDIX 1 – DWS RISK ASSESSMENT METHODOLOGY

Definitions:

- An activity is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation;
- An aspect is an 'element of an organizations activities, products and services which can interact with the environment'. The interaction of an aspect with the environment may result in an impact;
- Environmental impacts are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity;
- Resources are components of the biophysical environment and include the flow regime, water quality, habitat and biota of the affected watercourse; and
- Severity refers to the degree of change to the status of each of the receptors (Table 11). An overall severity score is calculated as the average of all scores receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- Spatial extent refers to the geographical scale of the impact (Table 12).
- Duration refers to the length of time over which the stressor will cause a change in the resource or receptor (Table 13).
- Frequency of activity refers to how often the proposed activity will take place (Table 14).
- Frequency of impact refers to the frequency with which a stressor (aspect) will impact on the resource (Table 15).

Method:

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity, impact, legal issues and the detection of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 20. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary. In accordance with the method stipulated in the risk assessment key, all impacts for flow regime, water quality, habitat and biota were scored as a 5 (i.e. average Severity score of 5) as all activities will occur within the delineated boundary of the wetland.

Table 11: Scores used to rate the impact of the aspect on resource quality (flow regime, water quality, geomorphology, biota and habitat)

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5

Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland.

Table 12: Scores used to rate the spatial scale that the aspect is impacting on.

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5

Table 13: Scores used to rate the duration of the aspects impact on resource quality

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5

Table 14: Scores used to rate the frequency of the activity

Annually or less	1
Bi-annually	2
Monthly	3
Weekly	4
Daily	5

Table 15: Scores used to rate the frequency of the activity's impact on resource quality

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

Table 16: Scores used to rate the extent to which the activity is governed by legislation

No legislation	1
Fully covered by legislation (wetlands are legally governed)	5

Table 17: Scores used to rate the ability to identify and react to impacts of the activity on resource quality, people and property.

Immediately	1
Without much effort	2
Need some effort	3

Remote and difficult to observe	4
Covered	5

Table 18: Rating classes

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
170 – 300	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

Table 19: Calculations used to determine the risk of the activity to water resource quality

Consequence = Severity + Spatial Scale + Duration
Likelihood = Frequency of Activity + Frequency of Incident + Legal Issues + Detection
Significance\Risk = Consequence x Likelihood