Aquatic Biodiversity Impact Assessment

Proposed Apartment Building on Erf 4439, Simons Town, Cape Town

For: Lornay Consulting

August 2024

DELTA ECOLOGY

Report Information

Document name	Aquatic Biodiversity Impact Assessment Erf 4439, Simons Town V1.0		
Number of pages	50		
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Citation

Zdanow, L., van Zyl, K. and Morton, R. 2024. Aquatic Biodiversity Impact Assessment Erf 4439, Simons Town V1.0. Delta Ecology. RSA.

Executive Summary

The applicant proposes to develop an apartment building on Erf 4439 in Simon's Town, Cape Town. The proposed development consists of 19 flats covering a total footprint of ±1700m² within the southern portion of Erf 4439.

A single non-perennial drainage line was confirmed and delineated during fieldwork undertaken on the 21st of June 2024. This drainage line was identified within a steep valley which is located to the north of the proposed development footprint and traverses the site in a west to east direction.

The non-perennial drainage line was assessed using current best practice assessment methodologies to determine the IHI, PES, EIS, ES, and REC metrics. The results of these assessments are as follows:

Table i: Results of the watercourse status quo assessment.

	IHI	EIS	ES (Highest)	REC
Non-perennial drainage line	C/D	Low / marginal	Moderately Low	C/D

The site was disturbed historically, and the vegetation community was dominated by disturbance tolerant alien grasses, along with ruderal and woody species particularly in the drainage line. Rubble and garden waste was noted in various places including in the drainage line. The non-perennial drainage line was found to be moderately to largely degraded, achieving a PES Score within the C/D category.

The degradation and general nature of the drainage line also resulted in a Low/Marginal EIS score indicating that the non-perennial drainage line is not important from an ecological or biodiversity planning perspective. ES scores indicated that the non-perennial drainage line provides a negligible to moderately low contribution to ecosystem services.

Aquatic biodiversity impacts associated with the development were identified and assessed using both an impact assessment methodology compliant with NEMA requirements and the RAM prescribed by GN 4167 of 2023.

The five potential aquatic impacts identified were assessed first without and then with application of mitigation measures. Construction and operational phase impacts prior to the implementation of mitigation measures ranged from "Low" to "Medium" impact categories. However, with the successful implementation of mitigation measures, all impacts may be reduced to "Low" and "Very Low" impact categories.

The "No Go" Alternative would likely result in the site remaining as is and would therefore result in "Low" negative significance impact score to the onsite drainage line due to the continuation of current disturbances (alien invasive spread and water quality impairment).

The result of the RAM was an overall "Low Risk" rating for the proposed development, assuming that all mitigation measures will be implemented. It is therefore the opinion of the specialist that the proposed development should be approved subject to application of the mitigation measures listed in this report. It is furthermore the opinion of the specialist that the project should be registered under the GN509 (2016) General Authorisation.

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Louise is the Managing Director of EnviroSwift KZN (Pty) Ltd; and is an associate of Delta Ecology. She has a BSc Honours degree in Botany from the University of Cape Town. She began working as an environmental specialist in 2012 and has since gained extensive experience in conducting freshwater as well as vegetation assessments in the residential, mining, renewable energy and infrastructure development sectors. She has also completed several short courses in wetland assessment methodologies and plant identification. Louise is a registered Professional Natural Scientist (Pr. Sci. Nat.) with the South African Council for Natural Scientific Professions (SACNASP, Reg. no. 114072) and is a member of the South African Wetland Society.

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Kimberley van Zyl is an ecologist and environmental scientist with over 9 years' experience in the environmental management field. She holds a MSc. degree in Water Resource Management from the University of Pretoria and her professional affiliations include the South African Council for Natural Scientific Professions (SACNASP) and the Southern African Society of Aquatic Scientists (SASAqS). Kimberley's work experience has exposed her to a range of projects across various business sectors such as mining, agriculture, and construction, as well as the public sector. A full CV can be provided on request.

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Robyn Morton has a MSc. degree in Conservation Sciences from the Cape Peninsula University of Technology. Throughout her studies, internships, and consultancy experience, she has gained valuable and informed insight into the functioning of natural and socio-ecological systems, as well as many key research and monitoring skills. Prior to her consulting career, Robyn worked for Zandvlei Estuary Nature Reserve for 4 years and gained experience in the field of urban wetland and estuary management. Robyn specialises in aquatic ecology and is currently working for Delta Ecology as a junior associate under the guidance of Kimberley van Zyl.

1. Introduction

The applicant proposes to develop an apartment building on Erf 4439 in Simon's Town, Cape Town (hereafter referred to as the proposed development) (**Figure 1-1**). The proposed development consists of 19 flats covering a total footprint of ±1700m² within the southern portion of Erf 4439 (**Figure 1-2**).

According to the national web-based environmental screening tool report generated for the proposed development area, the Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (**Figure 1-3**) (DFFE, 2024). The classification trigger is the location of the site within a Strategic Water Source Area (SWSA) for Surface Water (Table Mountain). Furthermore, the National Geo-spatial (NGI) river line vector data (NGI, 2019) indicates the presence of a non-perennial river running through Erf 4439.

The "Very High" sensitivity rating was confirmed during a field assessment conducted on the 21st of June 2024 during which a non-perennial river was delineated running through the north of Erf 4439, within 32 m of the proposed development. The proposed development will therefore require a full Aquatic Biodiversity Specialist Assessments in terms of the specialist protocols contained in GN 320 of March 2020 (GN 320) promulgated in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020 (as amended).

Given the presence of aquatic biodiversity constraints associated with the proposed site, Delta Ecology was appointed to undertake an aquatic biodiversity assessment of the proposed development site, with the aim of (1) assessing the likely risks of the development activity on the relevant aquatic systems and (2) identifying suitable mitigation measures where and as needed.

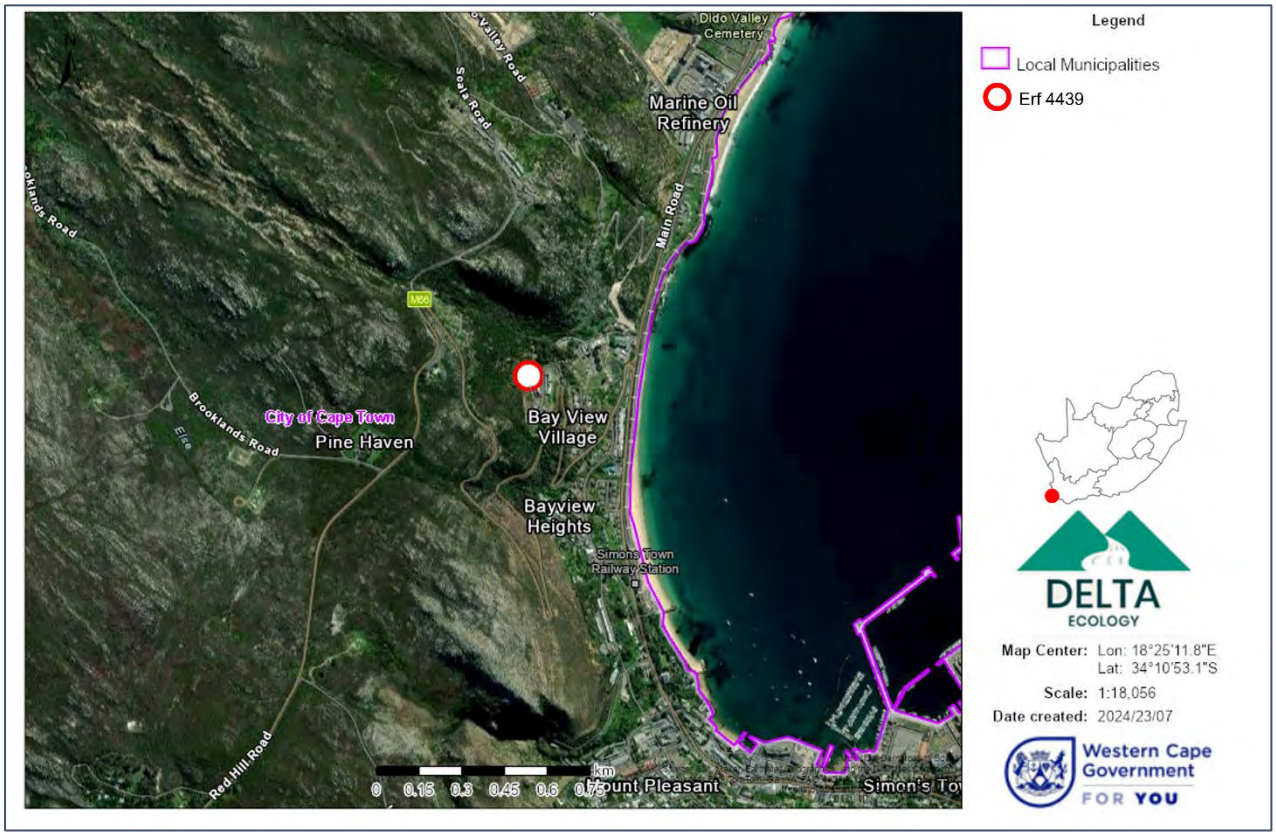

Figure 1-1: Location of the proposed site.

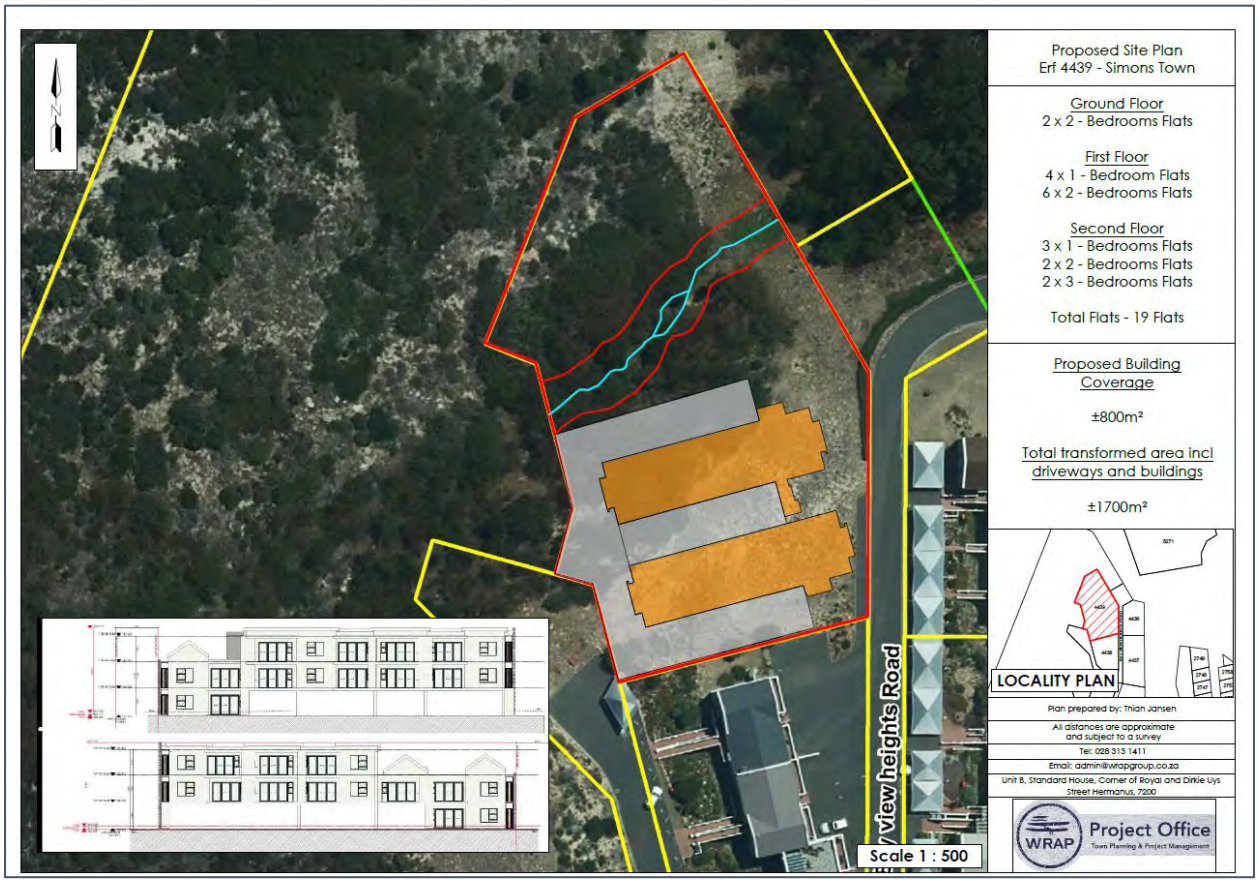

Figure 1-2: Conceptual layout of the proposed development.

1.1. Terms of Reference

The terms of reference agreed upon for this Aquatic Biodiversity Assessment include:

1. A desktop background assessment to identify potential aquatic biodiversity constraints within the proposed site as well as within the 500 m regulated proximity thereof;
2. A site assessment to confirm potential aquatic biodiversity constraints within the proposed site;
3. Delineation of all watercourses likely to be directly impacted by proposed infrastructure development activities using a combination of site-based and desktop methodologies as appropriate;
4. Determination of the Present Ecological State (PES), Ecological Importance and Sensitivity, (EIS), Ecosystem Service Assessment (ESA) and Recommended Ecological Category (REC) of the watercourse(s) on site;
5. Assessment of potential aquatic biodiversity impacts of the proposed development on the watercourses present within the study area and application of the Risk Assessment Matrix (RAM) stipulated by Notice No 4167 of GG 49833, 2023 promulgated in terms of the National Water Act (NWA) Act 36 of 1998).
6. Provide mitigation measures to reduce aquatic biodiversity impact as far as possible.

1.2. Limitations and Assumptions

The following limitations and assumptions apply to this assessment:

- The site assessment was undertaken on the 21st of June 2024, both in the winter season. Therefore, this assessment does not cover complete seasonal variation in conditions at the site. This is however, in the opinion of the specialist, of no material consequence to outcome of this assessment.
- The watercourse was delineated using a Garmin E-trex 20 handheld GPS with an expected accuracy of 3 m or less at the 95% confidence interval. In the opinion of the specialist, this limitation is of no material significance to the assessment and all aquatic biodiversity constraints have been adequately identified.
- The information provided by the client forms the basis of the planning and layouts discussed.
- No alternatives were available for assessment at the time of writing this report. This requirement of GNR982 (as amended by GN517) could therefore not be addressed.
- Formal vegetation sampling was not done by the specialist, however general observations pertaining to vegetation were recorded based on onsite visual observations. Furthermore, only dominant, and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications.
- Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions, species' seasonality, and migrations. Since environmental impact studies deal with dynamic natural systems, additional information may come to light at a later stage.
- Description of the depth of the regional water table and geohydrological and hydro pedological processes falls outside the scope of the current assessment.
- Flood line calculations fall outside the scope of the current assessment.
- A Species of Conservation Concern (SCC) scan, fauna and flora assessments were not included in the current study.
- Watercourse delineation plotted digitally may be offset by at least five meters to either side. Furthermore, it is important to note that, during the course of converting spatial data to final drawings, several steps in the process may affect the accuracy of areas delineated in the current report. It is therefore suggested that the no-go areas identified in the current report be pegged in the field in collaboration with the surveyor for precise boundaries. The scale at which maps and drawings are presented in the current report may become distorted should they be reproduced by, for example, photocopying and printing.
- The calculation of buffer zones does not consider climate change or future changes to watercourses resulting from increasing catchment transformation.
- Notwithstanding the above limitations, the specialist is of the opinion that the aquatic biodiversity constraints for the site have been adequately identified for the purposes of this aquatic biodiversity assessment.

1.3. Use of this report

This report reflects the professional judgement of its author and, as such, the full and unedited contents of this should be presented in any application to relevant authorities. Any summary of the findings should only be produced with the approval of the author.

2. Site Sensitivity Verification

According to the web-based environmental screening tool report generated for the site, the Combined Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (DFFE, 2023). The classification trigger is the location of the site within a SWSA for Surface Water (Table Mountain).

As per the NEMA (Act No. 107 of 1998) Regulations of 2020 (as amended) (GN R. 320 of 2020), prior to initiation of specialist assessments, the current land use, and the potential environmental sensitivity of the site (s) - as identified by the national web-based environmental screening tool - must be confirmed by undertaking an Initial Site Sensitivity Verification. This Initial Site Sensitivity Verification aims to confirm or dispute the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool.

According to the National Wetlands Map Version 5 (NWM5) and the National Freshwater Ecosystem Priority Areas (NFEPA) datasets, there are no wetlands indicated on the property. The only wetland indicated is a NWM5 seep wetland which is located within the 500 m regulated area. However, the NGI river line vector data (NGI, 2019) indicates the presence of a non-perennial river flowing through the site. Additionally, two non-perennial rivers are present within the 500 m regulated proximity of the site.

The Initial Site Sensitivity Verification was undertaken by a desktop assessment of the area, as well as a site visit conducted on the 21st of June 2024. Given the confirmed presence of a non-perennial river running through the north of Erf 4439, within 32 m of the proposed development, the site was deemed to be of "Very High" aquatic sensitivity.

According to GN R. 320 of 2020, if the specialist determines that the Aquatic Biodiversity sensitivity of the site is "Very High", then a full Aquatic Biodiversity Impact Assessment must be compiled.

3. Methodology

The methodology used in this report, including a desktop background assessment, one site visit, and the delineation, classification and assessment of the watercourse associated with the proposed site, is outlined in the subsections below.

3.1. Desktop Assessment

A review of desktop resources was undertaken to determine the nature of the proposed site, the presence of watercourses in the vicinity, and the significance of the site in terms of biodiversity planning. The following desktop resources were consulted:

- Topographical and watercourse information from the Department of Rural Development and Land Reform (DRDLR);
- The South African Atlas of Climatology and Agrohydrology (1997, 2007, and 2009);
- Geological information from the Council for Geoscience;

- The South African National Biodiversity Institute (SANBI, 2018) National Vegetation Map (NVM);
- The South African National Biodiversity Institute NWM5 (CSIR 2018);
- The NFEPA (CSIR, 2011) wetland, wetland vegetation group classification, river, and FEPA datasets;
- The Chief Directorate: NGI (DRDLR) Rivers dataset;
- The Western Cape Biodiversity Spatial Plan (WCBSP 2017).

3.2. Watercourse Classification

The Ollis, Snaddon, Job, & Mbona (2013) Classification System for Wetlands and Other Aquatic Ecosystems in South Africa, as used in this assessment, is a tiered structured classification system that provides a uniform description of wetland types based on their hydrogeomorphic characteristics. This classification system categorises wetlands / watercourses into 7 distinct hydrogeomorphic units described in **Figure 3-1**.

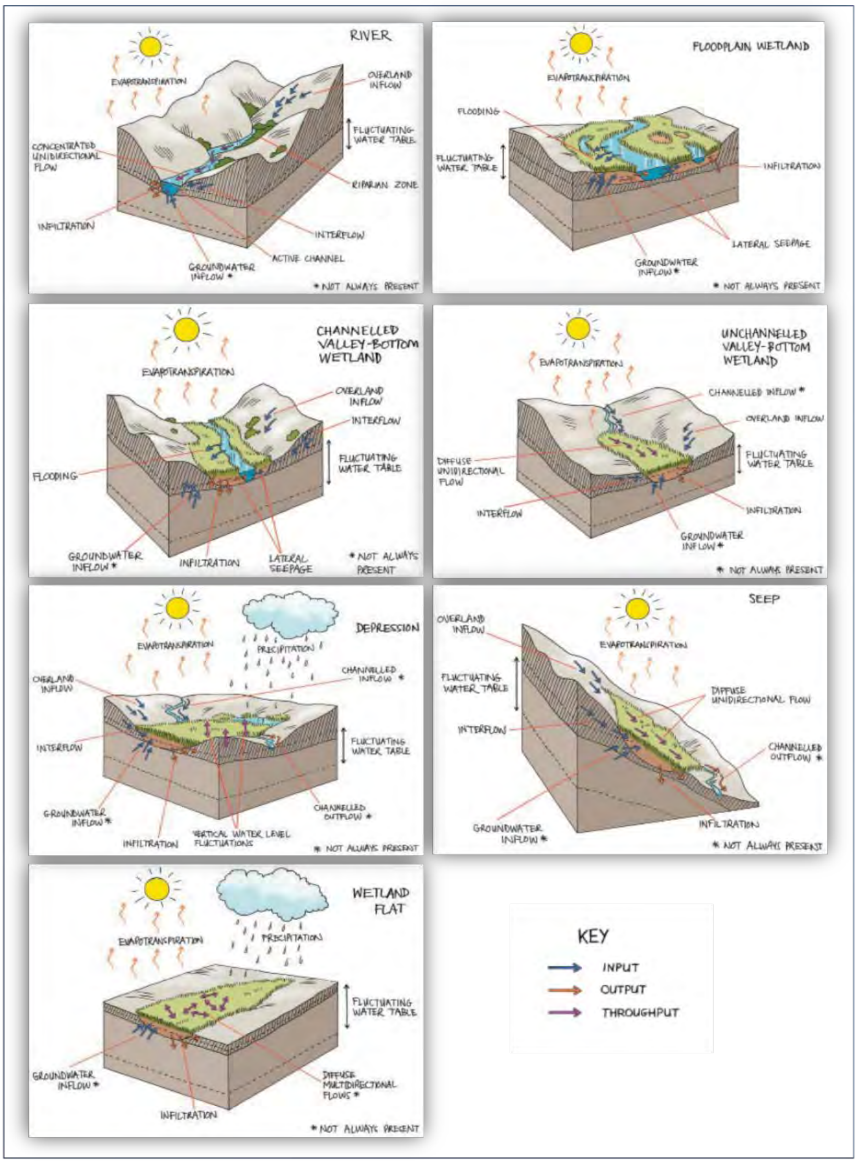

Figure 3-1: Wetland Hydrogeomorphic Types as defined in the Classification System for Wetlands and Other Aquatic Ecosystems in South Africa (Ollis *et al.*, 2013)

3.3. Riparian Area Delineation

Riparian areas were identified using the method described in the DWAF, (2008) Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas. This method is the accepted best practice method for identifying and delineating riparian areas in South Africa and its use is required by GN 509. The method makes use of four key field indicators (refer to **Box 1**):

Box 1. Four indicators of riparian areas as described in DWAF (2008)

1. The **position in the landscape** – riparian areas are only likely to develop on valley bottom landscape units.
2. The **soil form** – Riparian areas are often (but not always) associated with alluvial soils and recently deposited material.
3. **Topography** associated with riparian areas – riparian areas may have clearly identifiable banks associated with alluvial deposited material adjacent to the active channel.
4. The presence of **aquatic vegetation communities.**

The identification of riparian areas relies heavily on vegetative indicators. Using vegetation, the outer boundary of a riparian area can be defined as the point where a distinctive change occurs in the:

- species composition relative to the adjacent terrestrial area; and
- physical structure, such as vigour or robustness of growth forms of species similar to that of adjacent terrestrial areas. Growth form refers to the health, compactness, crowding, size, structure and/or numbers of individual plants.

In addition to indicators of structural differences in vegetation, indicator species themselves can be used to denote riparian areas. Riparian plant species classification categories are as follows:

- Obligate riparian species occur almost exclusively in the riparian zone (> 90% probability)
- Preferential riparian species are preferentially, but not exclusively, found in the riparian zone (>75% probability). Preferential riparian species may harden to drought conditions but will always indicate sites with increased moisture availability.

3.4. Habitat Integrity Assessment

The Index of Habitat Integrity (IHI) assessment is a tool used to assess the habitat integrity of a river based on the intensity and extent of anthropogenic disturbances that impact both the instream and riparian habitat. The assessment of habitat integrity is based on an interpretation of the deviation from the reference condition (Kleynhans *et al.*, 2008). The disturbances assessed include abiotic factors such as water abstraction, weirs, dams, pollution and the dumping or rubble and biotic factors such as the presence of alien plants and aquatic animals which modify habitat (Kleynhans, 1996). These changes are all related and interpreted in terms of modification of the drivers of the system, namely hydrology, geomorphology, and physico-chemical conditions and how these changes would impact on the natural riverine habitats. The severity of each of these impacts is assessed, using scores as a measure of impact (**Table 3-1**). Descriptions of each criterion are provided to assist with the assessment (**Table 3-2**).

Table 3-1: Scoring procedures used to determine the Index of Habitat Integrity

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

Table 3-2: Descriptions of criteria used in the IHI assessments

CRITERION	DESCRIPTION (KLEYNHANS, 1996)
Water abstraction	Direct abstraction from within the specified river/river reach as well as upstream (including tributaries) must be considered (excludes indirect abstraction by for example exotic vegetation). The presence of any of the following can be used as an indication of abstraction: cultivated lands, water pumps, canals, pipelines, cities, towns, settlements, mines, impoundments, weirs, industries. Water abstraction has a direct impact on habitat type, abundance, and size; is implicated in flow, bed, channel and water quality characteristics; and riparian vegetation may be influenced by a decrease in water quantity.
Extent of inundation	Destruction of instream habitat (e.g. riffle, rapid) and riparian zone habitat through submerging with water by, for example, construction of an in-channel impoundment such as a dam or weir. Leads to a reduction in habitat available to aquatic fauna and may obstruct movement of aquatic fauna; influences water quality and sediment transport.
Water quality	The following aspects should be considered: untreated sewage, urban and industrial runoff, agricultural runoff, mining effluent, effects of impoundments. Ranking may be based on direct measurements or indirectly via observation of agricultural activities, human settlements, and industrial activities in the area. Water quality is aggravated by a decrease in the volume of water during low or no flow conditions.
Flow modification	This relates to the consequence of abstraction or regulation by impoundments. Changes in temporal and spatial characteristics of flow such as an increase in duration of low flow season can have an impact on habitat attributes, resulting in low availability of certain habitat types or water at the start of the breeding, flowering, or growing season.
Bed modification	This is regarded as the result of increased input of sediment from the catchment or a decrease in the ability of the river to transport sediment. The effect is a reduction in the quality of habitat for biota. Indirect indications of sedimentation are stream bank and catchment erosion. Purposeful alteration of the stream bed, e.g. the

CRITERION	DESCRIPTION (KLEYNHANS, 1996)
	removal of rapids for navigation is also included. Extensive algal growth is also considered to be bed modification.
Channel modification	This may be the result of a change in flow which alters channel characteristics causing a change in instream and riparian habitat. Purposeful channel modification to improve drainage is also included.
Presence of exotic aquatic fauna	The disturbance of the stream bottom during exotic fish feeding may influence, for example, the water quality and lead to increased turbidity. This leads to a change in habitat quality.
Presence of exotic macrophytes	Exotic macrophytes may alter habitat by obstruction of flow and may influence water quality. Consider the extent of infestation over instream area by exotic macrophytes, the species involved and its invasive abilities.
Solid Waste disposal	The amount and type of waste present in and on the banks of a river (e.g. litter, building rubble) is an obvious indicator of external influences on stream and a general indication of the misuse and mismanagement of the river.
Decrease of indigenous vegetation from the riparian zone	This refers to physical removal of indigenous vegetation for farming, firewood, and overgrazing. Impairment of the riparian buffer zone may lead to movement of sediment and other catchment runoff products (e.g. nutrients) into the river.
Exotic vegetation encroachment	This excludes natural vegetation due to vigorous growth, causing bank instability and decreasing the buffering function of the riparian zone. Encroachment of exotic vegetation leads to changes in the quality and proportion of natural allochthonous organic matter input and diversity of the riparian zone habitat is reduced.
Bank erosion	A decrease in bank stability will cause sedimentation and possible collapse of the riverbank resulting in a loss or modification of both instream and riparian habitats. Increased erosion can be the result of natural vegetation removal, overgrazing or encroachment of exotic vegetation.

The score that has been allocated to an impact is then moderated by a weighting system, devised by Kleynhans (1996). Assignment of weights is based on the perceived relative threat of the impact to the habitat integrity of a riverine ecosystem. The total score for each impact is equal to the assigned score multiplied by the weight of that impact (**Table 3-3**).

Table 3-3: Weights assigned to each criterion

INSTREAM CRITERION	WGT	RIPARIAN ZONE CRITERION	WGT
Water abstraction	14	Water abstraction	13
Extent of inundation	10	Extent of inundation	11
Water quality	14	Water quality	13
Flow modification	7	Flow modification	7
Bed modification	13	Channel modification	12
Channel modification	13	Indigenous vegetation removal	13
Presence of exotic macrophytes	9	Exotic vegetation encroachment	12
Presence of exotic fauna	8	Bank erosion	14
Solid waste disposal	6		

Based on the relative weights of the criteria, the impacts of each criterion are estimated as follows:

Rating for the criterion /maximum value (25) x the weight (percent).

The estimated impacts of all criteria calculated in this way are summed, expressed as a percentage, and subtracted from 100 to arrive at a present status score for the instream and riparian components, respectively. The Index of Habitat Integrity scores (%) for the instream and riparian zone components are then used to place these two components into a specific class. These classes are indicated in **Table 3-4**. The assessment method in determining the severity of modifications to habitat integrity is a largely field-based site assessment, supplemented with information from aerial photographs (google earth images).

Table 3-4: IHI classes and their description.

CLASS	DESCRIPTION	SCORE (%)
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 assumption is that ecosystem functioning is essentially unchanged.	80 - 89
C	Moderately modified. A loss or change in natural habitat and biota has occurred, but basic ecosystem functioning appears predominately unchanged.	60 – 79
D	Largely modified. A loss of natural habitat and biota and a reduction in basic ecosystem functioning is assumed to have occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and ecosystem functioning is extensive.	20 – 39
F	Modifications have reached a critical level and there has been an almost complete loss of natural habitat and biota. In the worst cases, the basic ecosystem functioning has been destroyed.	0 - 19

3.5. Ecosystem Service Assessment

WET-EcoServices Version 2 (Kotze *et al.* 2020) is a structured and rapid field-based evaluation tool designed to assess the Ecosystem Services (ES) based on its Hydrogeomorphic (HGM) unit. The tool accounts for 16 ecosystem services which are derived from regulating (e.g., flood attenuation), provisioning (e.g., water supply), supporting (e.g., biodiversity maintenance), and cultural (e.g., tourism and recreation) services. The tool evaluates the scale of ecosystem services supplied (in terms of a score out of 4 per service) relative to other wetlands and furthermore compares the scale of service supply to the demand for each service. The scores are divided into seven categories as per **Table 3-5**.

The tool offers two levels of assessment, namely Level 1 (a rapid desktop assessment) and Level 2 (a detailed field-based indicator assessment). Level 1 is designed for conducting rapid desktop assessments of many wetlands across provincial and national scales. Ratings are assigned based on the Hydrogeomorphic unit of the wetland. Level 2 is designed for conducting robust in-field assessments of ecosystem services for respective wetland types. The level 2 Ecosystem Service assessment was applied in this case.

Table 3-5: Ecosystem Services Importance Categories Scores as defined in WET-EcoServices Version 2 (Kotze *et al.* 2020).

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

3.6. Ecological Importance and Sensitivity Assessment

The Ecological Importance and Sensitivity (EIS) was determined for the watercourse using an adapted version of the Duthie *et al.*, 1999, methodology. The EIS is a rapid scoring system designed to identify the EIS of floodplains to disturbances across multiple scales (i.e., catchment to international scales). In this case, it has been adapted to for application to "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. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Duthie *et al.*, 1999).

A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates "None" and 4 indicates "Very high importance" and the median of the determinants indicates the EIS category for the watercourse (**Table 3-6**). Weighting of the relative importance of the various determinants of ecological importance and sensitivity was not proposed. However, the relative confidence of each rating should be estimated based on a scale of four categories where 1 indicated "Marginal/low confidence" and 4 indicated "Very High confidence". The median score for the biotic and habitat determinants can be interpreted and translated into an EMC (**Table 3-6**), however for the purposes of this assessment, the Recommended Ecological Category (REC) methodology as described in Rountree et al., (2013) was utilized (see **Section 3.7** below).

Table 3-6: Ecological Importance and Sensitivity Categories (DWAF, 1999).

EIS CATEGORY	RANGE OF MEDIAN	RECOMMENDED ECOLOGICAL MANAGEMENT CLASS
Very high Watercourses that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these watercourses is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of other major rivers.	>3 and <=4	A
High Watercourses that are considered to be ecologically important and sensitive. The biodiversity of these watercourses may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of other major rivers.	>2 and <=3	B
Moderate Watercourses that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these watercourses is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of other major rivers.	>1 and <=2	C
Low/marginal Watercourses that are not ecologically important and sensitive at any scale. The biodiversity of these watercourses is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of other major rivers.	>0 and <=1	D

3.7. Recommended Ecological Category

The method for determining the REC for water resources is described in Rountree *et al*. (2013). The REC is determined once the PES and EIS scores for the watercourse have been determined. The objective of the REC is to define the management objective for watercourses and does so in accordance with the following rules:

- A watercourse within PES Category A (unmodified) cannot be rehabilitated. The management objective will therefore always be to maintain the existing PES Category.
- A watercourse within PES Category B, C or D with a "Low-marginal" or "Moderate" EIS score must also be maintained in the pre-development PES category.
- A watercourse within PES Category B, C or D with a "High" or "Very High" EIS score must, where practically possible, be rehabilitated to a PES category that is one higher than the pre-development category. E.g. a wetland with a pre-development PES score of C and a "High" EIS score must be rehabilitated to a PES category B. Where this is not practically

possible, maintenance of the pre-development PES category will be the management objective.
- PES Categories E or F are considered unsuitable and always require rehabilitation to a PES Category D.

3.8. Buffer Determination

The Buffer Zone Tool (Macfarlane & Bredin, 2017) is a rapid, excel based, scoring tool designed to determine an appropriate buffer around rivers, wetlands and estuaries.

The tool offers two levels of assessment:
1. A desktop-based assessment and
2. A detailed rapid field-based assessment.

All three watercourse types (river, wetland, and estuary) can be assessed using the desktop-based assessment tool. When a field-based assessment is undertaken, different tools are available for each watercourse type. In this case, field-based assessments were undertaken.

3.9. Impact and Risk Assessment

The risk assessment utilised the methodology and RAM stipulated by Notice No 4167 of GG 49833, 2023 promulgated in terms of the NWA (Act 36 of 1998) and can be found in Annexure 1. The impact assessment utilised the Delta Ecology impact assessment methodology as specified in Annexure 2.

4. Desktop Assessment

A review of desktop resources was undertaken. A summary of key desktop information relevant to this assessment is provided below.

4.1. Biophysical Context

The proposed site is located on steeply sloped terrain. The site falls from approximately 75 m.a.s.l in the southeast to 52 m.a.s.l in the east with an average gradient of 22% across the site (**Figure 4-1**).

According to the South African Atlas of Climatology and Agrohydrology (Schulze 2009) obtained from CapeFarmMapper ver.3.2.4, the mean annual rainfall received for the area is 682 mm, mostly during the winter months, with the highest rainfall occurring from May to August.

According to the Council for Geoscience geological map (ENPAT), the soils in this region are dominated by Glenrosa and/or Mispah forms (other soils may occur), lime is rare or absent in the entire landscape. Geology in the region is typified by quartzitic sandstone with siltstone, shale and conglomerate beds of the Peninsula Formation, Table Mountain Group.

According to the SANBI Vegetation Map (2018), the natural vegetation in this area consists of Cape Flats Dune Strandveld which is listed as Endangered (EN) and Moderately Protected (MP) (**Figure 4-1**). According to the NFEPA spatial dataset (SANBI, 2011), this area corresponds to the Southwest Sandstone Fynbos wetland vegetation type (where wetlands are present) which is also listed as Critically Endangered (CR) and ranges from Zero Protection (ZP) to MP depending on the wetland type.

The general biophysical characteristics of the proposed sites are summarised in **Table 4-1.**

Table 4-1: General characteristics of the proposed site.

Site attribute	Description	Data source
Eco-region	Southern Folded Mountains	Department of Water Affairs Level 1 Ecoregions (Department of Water and Sanitation (DWS), 2011)
Terrestrial Vegetation Type	Cape Flats Dune Strandveld (EN – MP)	National Vegetation Map of South Africa, 2018 (SANBI, 2018)
Dominant Geology and Soils	Mainly quartzitic sandstone with siltstone, shale and conglomerate beds of the Peninsula Formation, Table Mountain Group. Glenrosa and/or Mispah forms (other soils may occur), lime rare or absent in the entire landscape	Cape Farm Mapper (ENPAT, 2021)
Soil Erodibility Factor (K)	0.58 (High Erodibility)	SA Atlas of Climatology and Agrohydrology (Schulze, 2009)
Soil Depth & Clay Percentage (%)	>= 750 mm & <15%	Soil types and descriptions for the Western Cape, Department of Agriculture, Forestry and Fisheries (DAFF, 2021)
Mean Annual Precipitation (mm)	682 mm	SA Atlas of Climatology and Agrohydrology (Schulze, 2009)
Rainfall seasonality	Winter rainfall	
Mean Annual Temperature (°C)	16.10°C	
Water Management Area	Breede - Olifants	Water Management Areas (DWS, 2023)
Quaternary Catchment	G22A	South African Quaternary Catchments Database (Schulze et al. 2007)
Wetland Vegetation Group (for wetlands within the applicable terrestrial vegetation type)	Southwest Sandstone Fynbos (CR – MP)	NFEPA Wetland Vegetation Types (SANBI, 2011)

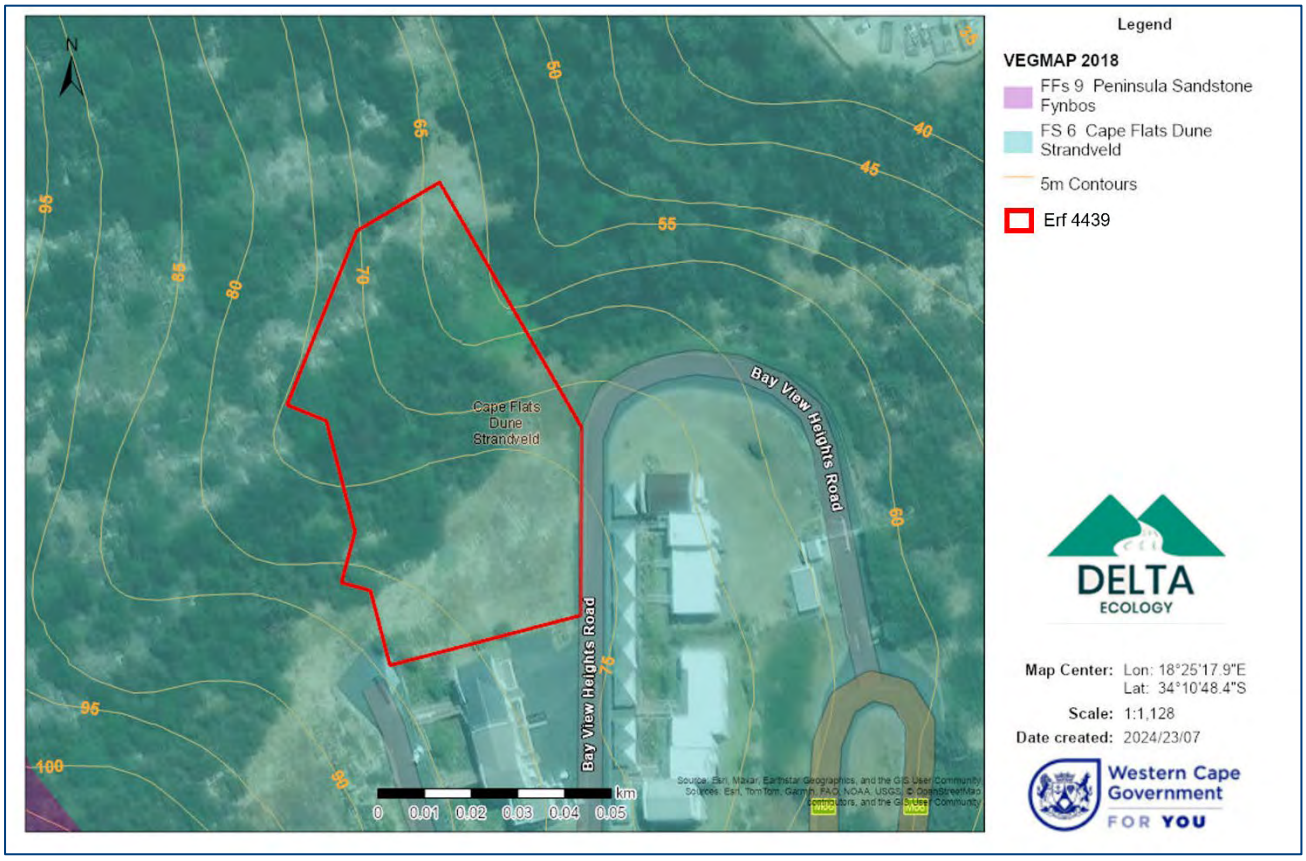

Figure 4-1: Vegetation and topography map.

4.2. Biodiversity Planning Context

The regional setting, in terms of the Level 1 Department of Water Affairs (DWA) (now DWS) Ecoregions, is the Southern Folded Mountains (**Table 4-1**). The site under evaluation is located within the Breede - Olifants Water Management Area, quaternary catchment G22A. The applicable sub-quaternary catchment is not demarcated as a FEPA and no FEPA rivers occur within the proposed site or within 500 m thereof (CSIR, 2011).

According to the NFEPA (2011) and NWM5 (2018) dataset, there are no wetlands and rivers indicated within the proposed site (**Figure 4-2**). However, NWM5 (2018) does indicate a seep wetland within the 500 m regulated proximity of the site. Furthermore, the NGI River line vector data (NGI, 2019) indicates the presence of a non-perennial river flowing through the site (**Figure 4-2**), as well as two non-perennial rivers within the 500 m regulated proximity of the site.

The WCBSP (2017) indicates the presence of a terrestrial Critical Biodiversity Area 1 (CBA 1) within the northern section of the site (**Figure 4-3**). The WCBSP also identifies aquatic CBAs, aquatic Ecological Support Areas (ESA 1), terrestrial CBAs, terrestrial ESAs, and the Table Mountain National Park within the regulated proximity of the site (**Figure 4-3**). This would indicate that the northern portion of the site is of high biological value for conserving terrestrial biodiversity and maintaining ecosystem functioning.

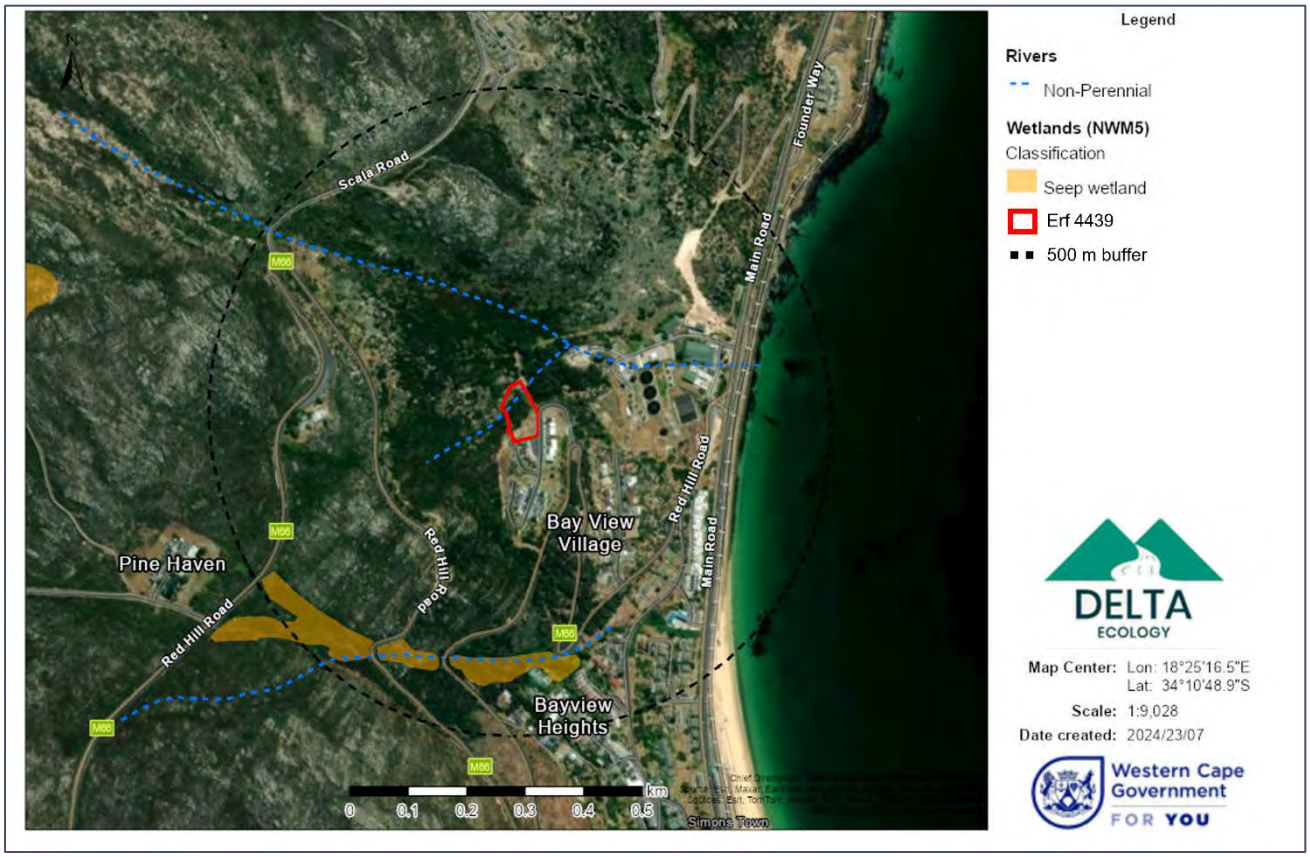

Figure 4-2: Watercourses associated with site.

Figure 4-3: CBAs, ESAs and protected areas indicated by the WCBSP (2017).

5. Site Description

The proposed site is situated on steeply sloped terrain, on the lower slopes of the Table Mountain National Park, in Simon's Town. The site is surrounded by low shrubland vegetation, with some residential homes to the south, Bay View Heights Road to the southeast and Simon's Town Water Treatment Plant to the east, downslope of the site.

The proposed development area is situated in the southern portion of the site, where historical vegetation clearing has occurred, resulting in sparse natural vegetation coverage (**Figure 5-1**). Upon assessment of the site, a non-perennial drainage line was identified within a steep valley located in the north of the proposed development footprint. This drainage line traverses the site in a west to east direction (**Figure 5-2** -**Figure 5-5)**.

The drainage line comprises a narrow active channel (approximately 0.5 - 1 m wide), with a relatively shallow bed dominated by sand (approximately 0.5 m deep). The drainage line is a non-perennial system which only contains natural surface water flow during the wet season and is fed by direct rainfall and interflow. The riparian area of the drainage line is dominated by alien *Eucalyptus* spp (**Figure 5-6**), interspersed with *Acacia saligna* (Port Jackson) and *Cenchrus clandestinus* (Kikuyu Grass).

Figure 5-1: Overview of the development area.

Figure 5-2: The valley within which the non-perennial drainage line flows.

Figure 5-3: The riparian area dominated by *Eucalyptus* spp.

Figure 5-4: Overview of the narrow active channel of the non-perennial drainage line.

Figure 5-5: Overview of the narrow active channel of the non-perennial drainage line.

Figure 5-6: *Eucalyptus* trees dominating the steep valley and riparian area of the non-perennial drainage line.

Figure 5-7: Delineation of the non-perennial drainage line, i.e. the active channel and the riparian area.

6. Watercourse Status Quo Assessment

In this study, the drainage line present within the proposed site was assessed to determine its PES. EIS, and ES. These metrics were used to determine the management objective expressed in terms of the REC.

6.1. Present Ecological State

The PES of the drainage line was assessed using the Kleynhans *et al.* (2008) IHI method which assesses 5 metric groups, namely hydrological modification, physico-chemical modification, bed modification, bank modification, and connectivity modification. The riparian zone habitat integrity assessment is based on three metric groups, namely hydrological modification, bank structure modification, and direct riparian zone modification.

The assessment resulted in scores of 68 and 52 for the instream and riparian components respectively. The scores fall within the PES category of C (Moderately Modified) for the instream component and D (Largely Modified) for the riparian component. The key factors that influenced the scoring are summarised below.

Instream Habitat Integrity:

- There is no direct abstraction from the watercourse for domestic use. However, *Eucalyptus* trees within the riparian area would use a significantly greater volume of water when compared to natural vegetation.
- Garden waste, logs and rubble have been dumped in the drainage line. This dumping has resulted in inundation during storm conditions (when there is significant flow). This has resulted in a broadening of the watercourse and riparian zone and a loss of the central channel in these areas due to sediment deposition.
- Water quality impacts are limited to runoff from the few houses' upslope, and from the roads in the catchment that drain into the watercourse. Moderate nutrient loading and input of toxicants such as oils, petrochemicals and compounds from tar, concrete and tyre rubber are likely. The instream habitat is however not highly sensitive to water quality impairment given the non-perennial nature and the lack of sensitive species present.
- Catchment hardening and direct supply of stormwater from roads via a culvert outlet has increased both storm peak flow and total runoff, which in turn increases the likelihood and severity of erosion. Seasonality remains largely unaffected.
- Some substrate changes have occurred as a result of dumped garden waste and rubble, along with the dense infestation of *Eucalyptus* trees.
- Minimal channel erosion was observed.
- Exotic instream fauna were not noted on the site and is not likely to be present given the non-perennial nature of the drainage line.

Riparian Habitat Integrity:

- There is no direct abstraction from the watercourse for domestic use. However, *Eucalyptus* trees within the riparian area would use a significantly greater volume of water when compared to natural vegetation.
- Water quality impairment, including nutrient loading and toxicant supply, tend to favour dense growth of alien invasive species, as observed throughout the watercourse.

- The increase in storm peak flows has increased the frequency and extent of overtopping into riparian areas but has reduced the duration of saturation. This favours opportunistic cosmopolitan species such as the alien invasive species observed within the drainage line, rather than true riparian species.
- Historical disturbance during development of the adjacent houses and associated infrastructure has resulted in an almost complete loss of indigenous riparian vegetation. The majority of the drainage line is dominated by exotic, large tree species that are not analogous to any indigenous elements in the natural instream vegetation community.

Table 6-1: IHI Score Rating Results.

INSTREAM CRITERIA	Score	Weighting	RIPARIAN CRITERIA	Score	Weighting
Water abstraction	12	14	Water abstraction	12	13
Extent of inundation	6	10	Extent of inundation	5	11
Water quality	6	14	Water quality	6	13
Flow modification	5	7	Flow modification	10	7
Bed modification	5	13	Channel modification	5	12
Channel modification	5	13	Indigenous vegetation removal	10	13
Exotic vegetation encroachment	15	9	Exotic vegetation encroachment	15	12
Presence of exotic fauna	1	8	Bank erosion	5	14
Solid waste disposal	8	6			
Instream Habitat Integrity Score (PES)	**68**		**Riparian Habitat Integrity Score**	**52**	
Integrity Category	**C**			**D**	

Table 6-2: Descriptions and definitions of the integrity class scores.

CLASS	DESCRIPTION	SCORE (%)
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 assumption is that ecosystem functioning is essentially unchanged.	80 - 89
C	Moderately modified. A loss or change in natural habitat and biota has occurred, but basic ecosystem functioning appears predominately unchanged.	60 – 79
D	Largely modified. A loss of natural habitat and biota and a reduction in basic ecosystem functioning is assumed to have occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and ecosystem functioning is extensive.	20 – 39

6.2. Ecological Importance and Sensitivity

The EIS method described in the "Resource Directed Measures for Protection of Water Resources" (Duthie et al. 1999) was used to assess the onsite non-perennial drainage line. This resulted in an overall "Low/marginal" EIS rating category for the drainage line. The key aspects considered during the EIS assessment are summarised below:

- No rare or endangered species were noted during fieldwork and the disturbed/transformed nature of the site makes their presence in the seed bank highly unlikely.
- No significant populations of unique species were noted on site.
- Indigenous species/taxon richness was low, given that the site is dominated by invasive species.
- The non-perennial drainage line offered a moderate amount of aquatic habitat, such as instream boulders, sand and a small amount of gravel.
- The watercourse flows for approximately 120 m downslope, after which it is diverted due to the Simons Town Water Treatment Plant. The watercourse is therefore a moderately important link or migration corridor to other natural features largely upslope of the development area.
- The non-perennial drainage line has no base flow and species sensitive to dry conditions are not present. The primary sensitivity to changes in flow in this case is to increased flood peak flows and resulting erosion. The score for sensitivity to changes in flow is in keeping with the high soil erodibility and steep slopes.
- Non-perennial systems are by nature not sensitive to water quality changes as the species present are exposed to poor water quality during dry periods under natural conditions, and long periods (most of the time in this case) without water at all.
- The watercourse is small, has a surface roughness that varies from moderate to low across the site and is not able to store significant volumes of sediment.
- The site is privately owned and earmarked for residential development. The watercourse holds no protection status.
- The score for the degree of change in state from the reference state is in keeping with the PES category of C-D.

Table 6-3: Score sheet for determining the EIS of the relevant section of the non-perennial drainage line.

Determinant	Score (0-4)	Confidence (1-4)
PRIMARY DETERMINANTS		
Rare and endangered Species	0	3
Populations of unique Species	0	3
Species/taxon richness*	1	3
Diversity of habitat types or features*	2	4
Migration route/breeding and feeding site for riverine species: Importance in terms of the link it provides for biological functioning.	2	3

Determinant	Score (0-4)	Confidence (1-4)
Sensitivity to changes in the natural hydrological regime*: Determined by the size of the feature, available habitat types and frequency of flood events.	2	3
Sensitivity to water quality changes*: Determined by the size of the feature, available habitat types and frequency of flood events.	1	3
Energy dissipation and particulate/element removal: Roughness coefficient/Storage capacity and size.	1	3
MODIFYING DETERMINANTS		
Protected status: Ramsar Site, National Park, Wilderness area and Nature Reserve.	1	4
Ecological integrity: Degree of change of the flood regime, water quality and habitat from reference conditions.	2	4
TOTAL	12	33
MEDIAN	1	3
OVERALL EIS	**Marginal/Low**	**High**

Score guideline Very high = 4; High = 3, Moderate = 2; Marginal/Low = 1; None = 0
Confidence rating Very high confidence = 4; High confidence = 3; Moderate confidence = 2; Marginal/low confidence = 1
* a rating of zero is not appropriate in this context.

Table 6-4: Descriptions and definitions of the EIS class scores.

EIS Category	Range of Median	Recommended Ecological Management Class
Very high Watercourses that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these watercourses is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High	>2 and <=3	B

Watercourses that are considered to be ecologically important and sensitive. The biodiversity of these watercourses may be sensitive to flow and habitat modifications.		
Moderate Watercourses that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these watercourses is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal Watercourses that are not ecologically important and sensitive at any scale. The biodiversity of these watercourses is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

6.3. Ecosystem Services

The non-perennial drainage line's contribution to ecosystem services was assessed using the WET-EcoServices Version 2 methodology. All importance scores were within the 'Very Low' – 'Low' categories, apart from biodiversity maintenance and harvetable resources which scored 'Moderately Low' due to the threatened status of the vegetation type which could potentially be rehabilitated, and the presence of harvestable firewood from the invasive tree species. The score categories and their descriptions are provided in the table below.

Table 6-5: The outcome of the ecosystem services assessment for the non-perennial drainage line.

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	1.0	0.1	0.0	Very Low
	Stream flow regulation	-	-	#VALUE!	#VALUE!
	Sediment trapping	1.0	0.1	0.0	Very Low
	Erosion control	1.6	0.8	0.5	Very Low
	Phosphate assimilation	1.1	0.0	0.0	Very Low
	Nitrate assimilation	1.1	0.1	0.0	Very Low
	Toxicant assimilation	1.1	0.3	0.0	Very Low
	Carbon storage	0.8	0.0	0.0	Very Low
	Biodiversity maintenance	2.2	2.0	1.7	Moderately Low
PROVISIONING SERVICES	Water for human use	1.5	0.3	0.2	Very Low
	Harvestable resources	2.5	1.3	1.7	Moderately Low

	Food for livestock	1.0	0.0	0.0	Very Low
	Cultivated foods	2.5	0.0	1.0	Low
CULTURAL SERVICES	Tourism and Recreation	0.5	0.7	0.0	Very Low
	Education and Research	0.3	0.0	0.0	Very Low
	Cultural and Spiritual	2.0	0.0	0.5	Very Low

6.4. Recommended Ecological Category

According to the Rountree *et al*. (2013) method for determining REC, the management objective for any watercourse within the EIS "Low-marginal" category with a PES score within category D to B must be to maintain the watercourse's ecological state within the pre-construction category. In this case, the non-perennial drainage line has a PES of C/D respectively, and the management objective is to maintain the watercourse's ecological state within the pre-construction category.

6.5. Buffer Determination

An appropriate buffer of 16 m for the drainage line, during the construction and operational phases of the proposed development, has been determined using the method described in the Buffer Zone Guidelines for Rivers, Wetlands and Estuaries (Macfarlane and Bredin, 2016). The recommended buffer is shown in **Figure 6-1** below. It is noted that the complete avoidance of the buffer area will not be possible, as the proposed apartment building encroaches into the buffer zone. It is recommended that all non-essential construction and operational related activities must be strictly prohibited within the 16 m buffer (e.g. construction camps, laydown areas, mixing of cement, stockpiling of soils, ablution facilities etc).

Figure 6-1: Buffer area of 16 m surrounding the non-perennial stream.

7. Aquatic Impact Identification

The proposed development consists of 19 flats covering a total footprint of ±1700m² within the southern portion of Erf 4439. The proposed development will not be located directly within the non-perennial drainage line, however the north to north-western portion of the development falls within the recommended 16 m buffer. The potential impacts of the proposed project on aquatic biodiversity are summarised below:

Construction Phase

1. Riparian vegetation disturbance where the proposed development is located directly adjacent to the non-perennial drainage line.
2. Increased runoff, erosion and sedimentation within the non-perennial drainage line due to clearing and compaction.
3. Water quality impairment due to potential spillage and release of potentially contaminated stormwater runoff into the non-perennial drainage line.

Operational Phase

4. Alteration of the flow regime, and associated erosion of the non-perennial drainage line due to catchment hardening.

5. Water quality impairment due to stormwater runoff into the non-perennial drainage line and potential sewage leaks and spills.

8. Impact Assessment

The five potential aquatic impacts identified in Section 7 were assessed first without and then with application of mitigation measures. All of the post mitigation impact scores fell within the "Low" or "Very Low" impact categories. The 'no go' scenario was assessed and found to also be of "Low" impact significance as this scenario would still result in gradual decline of PES due to continuing erosion, channel incision and growth of alien invasive vegetation. No indirect impacts were noted.

8.1. Construction Phase

Table 8-1: Assessment results for Impact 1

Impact 1: Disturbance of Riparian Habitat	
Description	**No infrastructure is proposed within the non-perennial drainage line and the direct loss of aquatic habitat is therefore not applicable. However, the proposed development is located directly adjacent to the riparian zone of the non-perennial drainage line. The movement of construction vehicles and personnel during construction, the setting up of the construction camp / laydown areas, the establishment of temporary access roads as well as the inappropriate storage or dumping of building material, excavated material, and removed vegetation in areas of open space surrounding the development footprint is therefore likely to result in the disturbance of the non-perennial drainage line. This disturbance will result in the loss of vegetation and will encourage the proliferation of AIPS.**
Mitigation Measures	**Locate site camps, laydown areas, stockpile areas, construction material, equipment storage areas, vehicle parking areas, bunded vehicle servicing areas and re-fuelling areas in designated areas of already hardened surface or disturbed areas located outside of the non-perennial drainage line and associated 16 m buffer area. These areas should preferably be located on level ground in a previously disturbed area of vegetation approved by the Environmental Control Officer (ECO). Cut and fill must be avoided where possible during the set-up of the construction site camp.** **Clearly demarcate the construction footprint (including construction camp, access roads, stockpile areas and working servitudes) with orange hazard tape, fencing or similar prior to the commencement of any activity, and strictly prohibit the movement of construction vehicles and personnel outside of the demarcated areas. Portions of the non-perennial drainage line and its associated buffer area that are located outside of the demarcated construction footprint must be designated as no-go area.** **Demarcation of the construction footprint/working servitude must be signed off by an ECO (or similar). Demarcation should not be removed until construction is complete, and rehabilitation has taken place.** **Limit access into the construction footprint to existing access roads.** **Prohibit the dumping of excavated material, building materials or removed vegetation within the non-perennial drainage line and its associated buffer area. Building material must be stored at the designated storage area located outside of the no-go area. Spoil material must be appropriately disposed of at a registered waste disposal facility.**

	Topsoils and subsoils removed from the construction footprint must be stored separately at the designated stockpile area for future rehabilitation. **Vegetation clearance should be restricted to the relevant development components and indigenous vegetation cover should be maintained as far as practically possible.** **Vegetation which is considered suitable for rehabilitation activities after construction (such as indigenous grasses and other herbaceous species) should be carefully removed from the construction footprint and stored at an appropriate facility for use in later rehabilitation activities.** **Clear and remove any rubble or litter that may have been accidentally deposited into the no-go area as a result of construction activities and dispose of at an appropriate registered facility.** **An ECO must inspect the construction footprint on a weekly basis and must take immediate measures to address unforeseen disturbances to the non-perennial drainage line and its associated buffer area. Any disturbed / compacted areas falling outside of the demarcated construction footprint must be immediately rehabilitated. Depending on the extent of damage the method of rehabilitation may require input from an aquatic specialist / suitably qualified contractor.** **Once construction has been completed, orange hazard fences as well as all construction waste, rubble, and equipment must be removed from the construction footprint.** **In line with the NEMBA, all AIPS listed under the amended AIPS Lists (DEFF: GN1003, 2020) must either be removed or controlled on land under the management of the proponent. An AIPS control plan must therefore be compiled which includes measures to control and prevent the proliferation of AIPS during the construction phase.** **A Rehabilitation, Maintenance and Management Plan (RMMP) must be drafted by a suitably qualified specialist to address the rehabilitation of any disturbed / bare areas which fall outside of the direct construction footprint. Rehabilitation must take place as soon as possible after construction is completed, and monitoring of rehabilitated areas must be undertaken. A suitably qualified professional must supervise the rehabilitation and monitoring activities.**

	Impact Without Mitigation		**Impact With Mitigation**	
Factor		-		-
Consequence				
Intensity of Impact	2	Low/ Slightly Harmful	1	Very Low/ Non-Harmful
Duration of Impact	3	One year to 5 years	2	One month to one year
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	2	Low cost / Moderately high likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	2	Low	1	Very Low
Probability				

Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	5	Definite	4	Likely
Impact Significance				
Consequence	1,72	Low	1.18	Medium
Probability	5	Very High	2,5	Very High
Impact Significance	**2,38**	**Low**	**1.45**	**Very Low**

Table 8-2: Assessment results for Impact 2

Impact 2: Erosion and Sedimentation of the Non-perennial Drainage Line	
Description	**The removal of vegetation and stripping of soils from the construction footprint will result in the exposure of soils to erosive elements. An increase in stormwater runoff and velocities from exposed and compacted areas, particularly during peak rainfall periods, may result in the formation of erosion gullies and rills in the downslope non-perennial drainage line. In addition, destabilisation of soils during the removal of vegetation and excavation activities, as well as the stockpiling of soils may result in an increase in the runoff of sediment laden stormwater into the downslope non-perennial drainage line from the construction footprint, particularly during the rainy season.**
Mitigation Measures	**Undertake initial clearing in the early dry season (November to January) if possible.** **Locate soil stockpile areas in designated areas of already hardened surface or disturbed areas on site. These areas should preferably be located on level ground in a previously disturbed area of vegetation approved by the ECO. Stockpile areas must not be located within the no-go area (i.e. the non-perennial drainage line and 16 m buffer area).** **Design a Stormwater Management Plan (SWMP) prior to the commencement of construction related activities which details how stormwater runoff from cleared and compacted surfaces will be controlled to prevent the erosion and sedimentation of the downslope non-perennial drainage line. No stormwater runoff should flow directly into the downslope aquatic environment. Flow dissipaters should be constructed to reduce the velocity of flow which should be released as diffuse as opposed to channelled flow.** **Implement erosion control measures where required. Examples of erosion control measures include:** • **Covering steep/unstable/erosion prone areas with geotextiles.** • **Covering areas prone to erosion with brush packing, straw bales, mulch.** • **Stabilizing cleared/disturbed areas susceptible to erosion with sandbags.** • **Constructing silt fences / traps in areas prone to erosion, to retain sediment-laden runoff. Silt fences must be adequately maintained. Furthermore, the ECO / site manager must monitor sediment fences / traps after every heavy rainfall event and any sediment that has accumulated must be removed by hand.** **The site manager / ECO must check the downslope non-perennial drainage line as well as the recommended buffer area for erosion damage and sedimentation weekly and**

	after every heavy rainfall event. Should erosion or sedimentation be noted, immediate corrective measures must be undertaken. Stormwater/erosion/sediment control measures are to remain in place until construction has been completed and operational storm water management infrastructure is in place and operating correctly. Implement rehabilitation and monitoring measures as recommended by an RMMP to stabilise soils and prevent erosion and sedimentation during the operational phase.

	Impact Without Mitigation		Impact With Mitigation	
Factor		-		-
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low / Slightly Harmful
Duration of Impact	5	Beyond 20 years / Permanent	2	1 month to 1 year
Extent / spatial scale of impact	1	Limited to local catchment	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	None
Cumulative Impact	2	Low	1	Very Low
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	5	Definite	3	Possible
Impact Significance				
Consequence	2.45	Low	1.54	Low
Probability	5	Very High	2	Low
Impact Significance	**2.96**	**Medium**	**1.63**	**Low**

Table 8-3: Assessment results for Impact 3

Impact 3: Water quality impairment	
Description	The movement of construction vehicles and the use of machinery during construction increases the possibility of the contamination of the non-perennial drainage line by hydrocarbons, oils and grease which may leak from the vehicles / machinery or spill during poor dispensing practices and enter the non-perennial drainage line directly, or indirectly with stormwater runoff. There is also a possibility that the non-perennial drainage line will be contaminated by the runoff/spillage of cement and other construction related materials from the construction footprint. Contamination of the non-perennial drainage line by sewage may occur as a result of leakages from portable chemical toilet facilities, or the informal use of surrounding areas by workers. Additional impacts to the non-perennial drainage line as a result of the disposal of solid waste (including litter and building material) may also occur. The significance of the impact is however limited by the low sensitivity of the drainage line to water quality changes.
Mitigation Measures	Locate topsoil stockpiles, construction material, equipment storage areas, bunded concrete batching areas as well as vehicle parking areas, bunded vehicle servicing and re-fuelling areas in designated areas outside of the no-go area. These areas should preferably be located on level ground in a previously disturbed area of vegetation. Fuel, chemicals, and other hazardous substances should preferably be stored offsite, or as far away as possible from the no-go area. These substances must be stored in suitable secure weather-proof containers with impermeable and bunded floors to limit pilferage, spillage into the environment, flooding, or storm damage. Inspect all storage facilities, vehicles, and machinery daily for the early detection of deterioration or leaks, and strictly prohibit the use of any vehicles or machinery from which leakage has been detected. Mixing and transferring of chemicals or hazardous substances must take place outside of the non-perennial drainage line and its associated buffer area, and must take place on drip trays, shutter boards or other impermeable surfaces. Drip trays must be utilised at all fuel dispensing areas. Vehicles and machinery should preferably be cleaned off site. Should cleaning be required on site it must only take place within designated areas outside of the non-perennial drainage line and its associated buffer area and should only occur on bunded areas with a water/oil/grease separator. Dispose of used oils, wash water from cement and other pollutants at an appropriate licensed landfill site. Avoid the use of infill material or construction material with pollution / leaching potential. Where possible, in situ earthen materials must be used during construction in order to reduce the risk of leachate from imported materials contaminating the non-perennial drainage line areas. Concrete should preferably be imported as "ready-mix" concrete from a local supplier. Should onsite concrete mixing be required it must not be done on exposed soils. Concrete must be mixed on an impermeable surface in an area of low environmental sensitivity identified by the ECO outside of the no-go area. Surplus or waste concrete must be sent back to the supplier who will dispose of it. Construct temporary bunds around areas where cement is to be cast in situ.

	Dispose of concrete and cement-related mortars in an environmental sensitive manner (can be toxic to aquatic life). Disposal of any of these waste materials into the stormwater system or the non-perennial drainage line is strictly prohibited. Washout must not be discharged into the no-go area or the stormwater system. A washout area should be designated, and wash water should be treated on-site. Clean up any spillages immediately with the use of a chemical spill kit and dispose of contaminated material at an appropriately registered facility. Provide portable toilets where work is being undertaken (1 toilet per 10 workers). These toilets must be located within an area designated by the ECO outside of the no-go area and should preferably be located on level ground. Portable toilets must be regularly serviced and maintained. Provide an adequate number of bins on site and encourage construction personnel to dispose of their waste responsibly. Waste generated by construction personnel must be removed from the site and disposed of at a registered waste disposal facility on a weekly basis.

	Impact Without Mitigation		Impact With Mitigation	
Factor		-		-
Consequence				
Intensity of Impact	2	Low / Slightly Harmful	1	Very Low / Non-harmful
Duration of Impact	2	1 month to 1 year	1	Up to one month
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	None
Cumulative Impact	1	Very Low	1	Very Low
Probability				
Frequency of the Activity	4	Monthly to annually	4	Monthly to annually
Likelihood of the Incident / Impact occurring	3	Possible	2	Unlikely
Impact Significance				

Consequence	1.72	Low	1.09	Very Low
Probability	3.5	Medium	3	Medium
Impact Significance	**2,08**	**Low**	**1.47**	**Very Low**

8.2. Operational Phase

Table 8-4: Assessment results for Impact 5

Impact 4: Altered flow regime and erosion of non-perennial drainage line		
Description	**An increase in stormwater runoff volumes and velocities from the bare / hardened surfaces associated with the proposed development, or from areas left bare as a result of construction related activities may result in channel and headcut erosion as well as sedimentation of the downslope non-perennial drainage line.**	
Mitigation Measures	**Design a SWMP in order to control stormwater runoff from hardened surfaces and prevent the erosion and sedimentation of the non-perennial drainage line. Runoff from the proposed development must not increase from the pre-development to the post-development scenario. Clean and dirty water must be separated and controlled via systems that do not result in erosion features developing.** **Discharge stormwater from rooftops into rain harvesting tanks. This will limit the volumes of stormwater runoff that will reach the non-perennial drainage line. Where possible, water collected in rain harvesting tanks can be utilized for flushing of toilets, washing etc.** **Implement rehabilitation and monitoring measures as recommended by an RMMP to reduce runoff from bare compacted soils and prevent erosion and sedimentation during the operational phase.** **Stormwater runoff should preferably be discharged as diffuse flow into well vegetated areas outside of the non-perennial drainage line and its associated buffer area.** **Energy dissipaters / erosion protection measures (such as lining with stones, grass, reno-mattresses, or gabions) must be constructed where stormwater is released in order to reduce the runoff velocity and therefore erosion.** **Sheet runoff from hardened surfaces must be intercepted and the treatment and infiltration of runoff must be promoted.** **Sediment traps should be incorporated into stormwater drains / swales upstream of discharge points.** **Monitor the proposed development and adjacent non-perennial drainage line for erosion and sedimentation after heavy rainfall events. Any erosion noted must be immediately addressed. Rehabilitation measures may include the removal of accumulated sediment by hand, filling of erosion gullies and rills, the stabilisation of gullies with silt fences, riprap, and the revegetation of stabilised areas.** **Stormwater systems will require ongoing maintenance. Any build-up of silt or debris within stormwater drains or swales will need to be cleared to ensure the continued functioning of the systems.** **Any damage to stormwater infrastructure, and any flaws identified in the functionality of stormwater infrastructure, must be rectified immediately.**	
	Impact Without Mitigation	**Impact With Mitigation**

Factor		-		-
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low/ Slightly Harmful
Duration of Impact	5	Beyond 20 years / Permanent	5	Beyond 20 years / Permanent
Extent / spatial scale of impact	2	Local catchment	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost rehabilitation / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	Very Low
Cumulative Impact	2	Low	1	Very Low
Probability				
Frequency of the Activity	5	Weekly to monthly	5	Weekly to monthly
Likelihood of the Incident / Impact occurring	5	Definite	4	Likely
Impact Significance				
Consequence	2.73	Medium	1.82	Low
Probability	5	Very High	4.5	High
Impact Significance	**3.18**	**Medium**	**2.30**	**Low**

Table 8-5: Assessment results for Impact 5

Impact 6: Water quality impairment	
Description	**The water quality of the non-perennial drainage line may be impacted as a result of the runoff of contaminated stormwater from the urban surface of the proposed development. Contaminants may include hydrocarbons, detergents, fertilizers and heavy minerals. However, with the inclusion of stormwater design measures which allow for the infiltration and treatment of stormwater this impact can be greatly reduced.** **With a housing development there is also a long-term risk that the non-perennial drainage line may be impacted on as a result of sewage surcharge or as a result of the leakage of sewage from poorly maintained pipes, manholes or sewage pumps. The significance of the impact is however limited by the low sensitivity of the drainage line to water quality changes.**

Mitigation Measures	**Design a SWMP which will allow for the infiltration and treatment of stormwater. All stormwater must receive basic filtering and treatment prior to its release.** **Incorporate measures into the stormwater design to trap solid waste, debris and sediment carried by stormwater. Measures may include the use of curb inlet drain grates and debris baskets/bags.** **Stormwater generated from areas with a higher risk of contamination such as parking areas and roads must receive basic filtering and treatment prior to its release into surrounding areas. Treatment methods may include sand filter traps and oil-water separators which will require maintenance.** **Stormwater systems must be monitored and maintained into perpetuity and collections of debris and solid waste removed from grates and baskets. The developer must confirm who will be responsible for this monitoring and maintenance as well as their roles.** **Operational phase mitigation implemented during the design/construction phase:** • **Construct sewage pipelines in accordance with the relevant SANS / SABS specifications.** • **Design the pipelines to accommodate the operating and surge pressures.** • **Provide surge protection e.g air valves.** • **Allow for scour valves along pipelines in order to ensure sewage pipelines can be emptied in a controlled manner if required.** • **Allow for surcharge containment and emergency storage of 2 hours of peak flow at manholes located within areas upslope of the non-perennial drainage line. Containment/emergency storage may include a concrete box or earthen bund surrounding the manholes. The backup storage capacity of manholes may also be improved by raising the manholes by one meter.** **The sewage system must be monitored and maintained into perpetuity. The developer must confirm who will be responsible for this monitoring and maintenance as well as their roles.** **The non-perennial drainage line and its associated buffer area must be regularly inspected for waste. Any waste or litter noted must be immediately removed and disposed of at a registered waste disposal facility. The developer must confirm who will be responsible for this monitoring of the non-perennial drainage line. This recommendation should be included in the MMP for the project.**

	Impact Without Mitigation		Impact With Mitigation	
Factor		-		-
Consequence				
Intensity of Impact	2	Low / Slightly Harmful	1	Very Low / Non-harmful
Duration of Impact	2	1 month to 1 year	1	Up to one month
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost / Moderately high likelihood of success

Loss of irreplaceable resources	2	Low	1	Very Low
Cumulative Impact	2	Low	1	Very Low
Probability				
Frequency of the Activity	4	Monthly to annually	4	Monthly to annually
Likelihood of the Incident / Impact occurring	3	Possible	2	Unlikely
Impact Significance				
Consequence	1.82	Low	1.09	Very Low
Probability	3.5	Medium	3	Medium
Impact Significance	**2,15**	**Low**	**1.47**	**Very Low**

8.3. "No Go" Scenario

Table 8-6: Assessment results for the "No Go" Scenario.

"No Go" Scenario				
Description	**The proposed development area is currently in a largely modified condition. Although it is unknown whether the area would be developed in future, it is assumed that the area would remain as is. The 'no go' scenario was assessed and found to be of "Low" impact significance as this scenario would result in continuation of current impacts such as AIPS proliferation and erosion.**			
Mitigation Measures	**None**			
Impact Without Mitigation			**Impact With Mitigation**	
Consequence				
Intensity of Impact	2	Low / Slightly Harmful	0	Not Applicable
Duration of Impact	5	Beyond 20 years / Permanent	0	Not Applicable
Extent / spatial scale of impact	1	Limited to project site	0	Not Applicable
Reversibility	3	Moderate cost / Moderate likelihood of success	0	Not Applicable

Loss of irreplaceable resources	2	Low	0	Not Applicable
Cumulative Impact	1	Very Low	0	Not Applicable
Probability				
Frequency of the Activity	4	Monthly to annually	0	Not Applicable
Likelihood of the Incident / Impact occurring	5	Definite	0	Not Applicable
Impact Significance				
Consequence	2.09	Low	0.00	Not Applicable
Probability	5	Medium	0.00	Not Applicable
Impact Significance	**2.5**	**Low**	**0.00**	**Not Applicable**

9. Risk Assessment

The Risk Assessment Matrix prescribed by GN 4167 of 2023 was applied to the proposed project assuming full application of the essential mitigation measures. The result was an overall "Low Risk" rating for the proposed development which will require a General Authorisation. A summary of the reasoning behind the risk scores is provided below:

1. The proposed development will not impede flow or encroach on the watercourse.
2. The potential for erosion due to catchment hardening as a result of the proposed development can be effectively mitigated by means of the proposed mitigation measures.
3. The drainage line is non-perennial, which limits sensitivity and therefore risk for most impact classes.
4. No wetlands are associated with the drainage line.
5. There is limited indigenous vegetation communities within the proposed site.
6. No aquatic fauna is reliant on the drainage line.

The completed risk assessment matrix is attached as **Annexure 1**.

10. Conclusion and Recommendation

A single non-perennial drainage line was confirmed and delineated during fieldwork undertaken on the 21st of June 2024. This drainage line was identified within a steep valley which is located to the north of the proposed development footprint and traverses the site in a west to east direction.

The non-perennial drainage line was assessed using current best practice assessment methodologies to determine the IHI, PES, EIS, ES, and REC metrics. The results of these assessments are as follows:

Table 10-1: Results of the watercourse status quo assessment.

	IHI	EIS	ES (Highest)	REC
Non-perennial drainage line	C/D	Low / marginal	Moderately Low	C/D

The non-perennial drainage line was found to be moderately to largely degraded, achieving a PES Score within the C/D category. The degradation and general nature of the drainage line also resulted in a Low/Marginal EIS score indicating that the non-perennial drainage line is not important from an ecological or biodiversity planning perspective. ES scores indicated that the non-perennial drainage line provides a negligible to moderately low contribution to ecosystem services.

Aquatic biodiversity impacts associated with the development were identified and assessed using both an impact assessment methodology compliant with NEMA requirements and the RAM prescribed by GN 4167 of 2023.

The five potential aquatic impacts identified were assessed first without and then with application of mitigation measures. Construction and operational phase impacts prior to the implementation of mitigation measures ranged from "Low" to "Medium" impact categories. However, with the successful implementation of mitigation measures, all impacts may be reduced to "Low" and "Very Low" impact categories.

The "No Go" Alternative would likely result in the site remaining as is and would therefore result in "Low" negative significance impact score to the onsite drainage line due to the continuation of current disturbances (alien invasive spread and water quality impairment).

The result of the RAM was an overall "Low Risk" rating for the proposed development, assuming that all mitigation measures will be implemented. It is therefore the opinion of the specialist that the proposed development should be approved subject to application of the mitigation measures listed in this report. It is furthermore the opinion of the specialist that the project should be registered under the GN509 (2016) General Authorisation.

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Annexure 1: DWS Risk assessment

PROJECT: Simons Town Erf 4439

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1.1

Name of Assessor: Kimberley van Zyl **Signature:**

SACNASP Registration Number: Pr. Nat. Sci. Reg. No.117097 (Ecological Science)

Date of assessment: 16-Aug-24

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

Phase	Activity	Impact	Potentially affected watercourses			Significance (max = 100)	Risk Rating	Confidence level
			Name/s	PES	Overall Watercourse Importance			
CONSTRUCTION	<1> Vegetation clearing, associated catchment hardening, and construction of the apartment building.	<1a>Watercourse Loss & Habitat disturbance	Non-perennial DL	C/D	Moderate	21.6	L	High
		<1b>Alteration of flow	Non-perennial DL	C/D	Moderate	21.6	L	High
		<1c>Water quality impairement	Non-perennial DL	C/D	Moderate	16.2	L	High
		<1d>Increased sediment input and impaired geomorphology	Non-perennial DL	C/D	Moderate	16.2	L	High
OPERATIONAL	<2>Operation of the apartment building	<2a>Alteration of flow	Non-perennial DL	C/D	Moderate	26.4	L	High
		<2b>Water quality impairement	Non-perennial DL	C/D	Moderate	16.2	L	High

Annexure 2: Impact Assessment Methodology

Impact assessment methodologies are based on qualitative ratings of the various factors and represent a standardised method for presenting a substantiated specialist opinion regarding the significance of a particular class of impact. Delta Ecology has developed a rapid numerical impact assessment methodology, applied in this report, that incorporates a range of factors commonly assessed to which numerical values from 1 to 5 are assigned to each rating category. Six primary factors are used to determine Consequence and two primary factors are used to determine Probability. These two secondary factors are used to determine Impact Significance for each identified impact. Consequence, Probability and Impact Significance are determined by a set of formulae which incorporate weightings for each primary and secondary factor.

The weightings for each factor were determined by application of the formulae to over 50 pre-existing ecological impact assessments. These assessments employed other methodologies and were accepted by the relevant environmental authorities. These assessments were primarily from reports drafted by Delta Ecology staff during previous employment, but also included unrelated ecological impact assessments freely available on the internet. The weighting system has therefore been derived as a means of real-world formula calibration rather than by logic alone. The final methodology achieves impact significance ratings that are consistently in line with industry standards.

Key elements of the approach include a detailed description of the nature of the impact and of the proposed mitigation measures, assessment of each factor for both the "with mitigation" and "without mitigation" scenarios and includes the provision of a rationale for each rating where appropriate. The resulting impact significance ratings may be adjusted if necessary, in accordance with specialist opinion, given adequate motivation for the deviation from the standard methodology.

The various factors, formulae and weightings are provided in the table below:

Scoring of impacts			
Factor	**Weighting**	**Score**	**Description/Rating**
Consequence	**8**		
Intensity	4	1	Very Low / Non-harmful
		2	Low / Slightly Harmful
		3	Medium / Harmful
		4	High / Very Harmful
		5	Very High / Disastrous
Duration	1	1	Up to 1 month
		2	1 month to 1 year
		3	One year to 5 years
		4	5 to 20 years
		5	Beyond 20 years / Permanent
Spatial scale/extent	3	1	Limited to project site
		2	Limited to local catchment
		3	Multiple local catchments
		4	Limited to quaternary catchment
		5	Regional, National, International
Reversibility	1	1	Passive restoration / High likelihood of success
		2	Low cost rehabilitation / Moderately high likelihood of success
		3	Moderate cost / Moderate likelihood of success
		4	High cost / Low likelihood of success
		5	Very high cost / Very low likelihood of success

Loss of irreplaceable resources	1	1	None
		2	Low
		3	Medium
		4	High
		5	Very High
Cumulative Impact	1	1	Very Low
		2	Low
		3	Medium
		4	High
		5	Very High
Probability	**2**		
Frequency of the activity	1	1	Once off activity / less than once in 20 years
		2	5 to 20 years
		3	1 to 5 years
		4	Monthly to annually
		5	Weekly to Monthly
Likelihood of the Incident / Impact occuring	1	1	Highly unlikely
		2	Unlikely
		3	Possible
		4	Likely
		5	Definite
Consequence = (Intensity x 4) + Duration + (Extent x 3) + Reversibility + Loss of Irreplaceable Resources + Cumulative Impact) / 11			
Probability = (Frequency + Probability) / 2 OR = 5 where likelihood is definite			
Impact Significance = (Consequence x 8) + (Likelihood x 2) / 10			
Impact Significance Categories			
0 - 1.5			Very Low
1.6 - 2.5			Low
2.6 - 3.5			Medium
3.6 - 4.5			High
4.5 and above			Very High