Construction of a New Sewage Pumpstation and Rising Main in Herolds Bay, Western Cape.

Specialist Aquatic Assessment

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May 2024

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1. INTRODUCTION

The Herolds Bay Pump Station no. 1 is located at the Herold's Bay beachfront, at the main parking lot on Uitspanning Street and can be accessed by following the R404 into Herolds Bay. The pump station was refurbished in 2004 and is the main sewage pump station in Herolds Bay, receiving all sewage gravity flows from the area and pumped flows from two smaller pump stations along the cove. The sewage is subsequently pumped to the Herolds Bay Wastewater Treatment Works (WWTW) (Figure 1). The pump station's current operating capacity is 19 L/s. The pump station was originally designed to convey 11 L/s of flow per pump (duty standby operation) with a head of 190 m. Both pumps feed into a single 160 mm diameter uPVC class 12 pipe rising main. The length of the pipeline is 1 375 m and discharges into the Herolds Bay WWTW located at 138 masl.

The harsh operating conditions (highly corrosive environment and sand loading) result in high maintenance requirements and frequent breakdowns of operations. The lack of critical spares and high variations in seasonal inflows compound the situation. Based on the development plans received from the George Municipality, the sewage that this pumpstation will have to accommodate in the future will increase to 52 L/s to service the full developable area in and beyond the current urban edge. Based on these challenges, the municipality therefore plans to construct a new pump station and associated rising main.

Figure 1: Map indicating the location of Pump Station 1 and the route of the existing rising main.

1.1 Key Legislative Requirements

1.1.1 National Environmental Management Act (NEMA, 1998)

According to the protocols specified in GN 1540 (Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental screening tool (screening tool). An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of:

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

The screening tool classified the whole development footprint as being of **Very High** aquatic biodiversity as the area falls within a Strategic Water Source Area (Outeniqua).

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

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

1.1.2 National Water Act (NWA, 1998)

The Department of Water & Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (NWA) (Act No. 36 of 1998) aims to protect water resources, through:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means:

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

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.

According to Section 21 (c) and (i) of the NWA, any water use activities that do occur within the regulated area of a watercourse must be assessed using the DWS Risk Assessment Matrix (GN 4167 of 2023) to determine the impact of construction and operational activities on the flow, water quality, habitat and biotic characteristics of the watercourse. Low Risk activities require a General Authorisation (GA), while Medium or High Risk activities require a Water Use License (WUL).

2. METHODS

2.1 Desktop Assessment

A desktop assessment was conducted to contextualise the watercourse in terms of its local and regional setting, and conservation planning. An understanding of the biophysical attributes and conservation and water resource management plans of the area assists in the assessment of the importance and sensitivity of the watercourse, the setting of management objectives and the assessment of the significance of anticipated impacts. The following data sources and GIS spatial information were consulted to inform the desktop assessment:

- National Freshwater Ecosystem Priority Area (NFEPA) atlas (Nel at al., 2011);
- Western Cape Biodiversity Spatial Plan (WCBSP, 2017);
- 1:50 000 Topographical Maps (CD:NGI, 2020); and
- Recent and historical satellite imagery (Google Earth).

2.2 Baseline Assessment

A site visit was conducted on the 28th of July 2023, with the objective of assessing and classifying affected watercourses, determining their Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS), and assessing the impacts of the proposed sewage upgrades.

2.2.1 Watercourse Classification

Classification of the watercourse is important as this determines the PES and EIS assessment methodologies that can be applied. Furthermore, classification of the watercourse provides a

fundamental understanding of the hydrological and geomorphic drivers that characterise the watercourse and therefore assists in the interpretation of impacts to the watercourse. The watercourse was categorised into discrete hydrogeomorphic units (HGMs) based on their geomorphic characteristics, source of water and pattern of water flow through the watercourse. These HGMs were then classified according to Ollis et al. (2013).

2.2.2 Present Ecological State

An important factor that influences the diversity and abundance of aquatic communities is the condition of the surrounding physico-chemical habitat. Habitat loss, alteration, or degradation generally results in a decline in species diversity. The PES of the watercourse was assessed using the Index of Habitat Integrity (IHI; Kleynhans, 1996). The IHI was regarded as the most appropriate method for assessing riverine habitats as it is not dependent on flow in the watercourse and, therefore, produces results that are directly comparable across perennial and non-perennial systems. The IHI was developed as a rapid assessment of the severity of impacts on criteria affecting habitat integrity within a river reach. Instream (water abstraction; flow modification; bed modification; channel modification; physico-chemical modification; inundation; alien macrophytes; rubbish dumping) and riparian (vegetation removal, invasive vegetation, bank erosion, channel modification, water abstraction, inundation, flow modification, physico-chemistry) criteria are assessed as part of the index. Each of the criteria are given a score (from 0 to 25, corresponding to no and very high impact, respectively – Table 1) based on their degree of modification, along with a confidence rating based on the level of confidence in the score.

Weighting scores are used to assess the extent of modification for each criterion (x):

$$Weighted\ Score = \frac{IHI_x}{25} \times Weight_x$$

Where;

- IHI = rating score for the criteria (Table 1);
- 25 = maximum possible score for a criterion; and
- Weight = Weighting score for the criteria (Table 2).

Table 1: Descriptive classes for the assessment of habitat modifications (Kleynhans, 1996)

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

Table 2: Criteria and weights used for the assessment of instream and riparian zone habitat integrity

Instream Criteria	Weight	Riparian Zone Criteria	Weight
Water abstraction	14	Indigenous vegetation removal	13
Flow modification	13	Exotic vegetation encroachment	12
Bed modification	13	Bank erosion	14
Channel modification	13	Channel modification	12
Water quality	14	Water abstraction	13
Inundation	10	Inundation	11
Exotic macrophytes	9	Flow modification	12
Exotic fauna	8	Water quality	13
Solid waste disposal	6		
TOTAL	**100**		**100**

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

Integrity Class	Description	IHI Score (%)
A	Unmodified, natural.	> 90
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 – 90
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 – 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0 - 19

The estimated impacts of all criteria calculated this way are summed, expressed as a percentage and subtracted from 100 to arrive at an assessment of habitat integrity for the instream and riparian components, respectively. An IHI class indicating the present ecological state of the river reach is then determined based on the resulting score (ranging from Natural to Critically Modified – Table 3).

2.2.3 Ecological Importance and Sensitivity

The ecological importance of a river 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 (resilience) (Resh et al. 1988; Milner 1994). Both abiotic and biotic components of the system are taken into consideration in the assessment of ecological importance and sensitivity.

The ecological importance and sensitivity (EIS) of the watercourse was assessed using a method developed by Kleynhans (1999). In summary, several biological and aquatic habitat determinants are assigned a score ranging from 1 (low importance or sensitivity) to 4 (high importance or sensitivity). These determinants include the following:

- **Biodiversity support:**
  - Presence of Red Data species;
  - Presence of unique instream and riparian biota;
  - Use of the ecosystem for migration, breeding or feeding.
- **Importance in the larger landscape:**
  - Protection status of the watercourse;
  - Protection status of the vegetation type;
  - Regional context regarding ecological integrity;
  - Size and rarity of the wetland types present;
  - Diversity of habitat types within the wetland.
- **Sensitivity of the watercourse:**
  - Sensitivity of watercourse to changes in flooding regime;
  - Sensitivity of watercourse to changes in low flow regime, and
  - Sensitivity to water quality changes.

The median value of the scores for all determinants is used to assign an EIS category according to Table 4.

Table 4: 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: Quaternaries/delineations that are considered to be unique on a national or even international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use.	>3 and <=4	A
High: Quaternaries/delineations that are considered to be unique on a national scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be sensitive to flow modifications but in some cases, may have a substantial capacity for use.	>2 and <=3	B
Moderate: Quaternaries/delineations that are considered to be unique on a provincial or local scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually not very sensitive to flow modifications and often have a substantial capacity for use	>1 and <=2	C
Low/marginal: Quaternaries/delineations that are not unique at any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have a substantial capacity for use.	>0 and <=1	D

3. ASSUMPTIONS & LIMITATIONS

- With ecology being dynamic and complex, there is the likelihood that some aspects (some of which may be important) may have been overlooked. Similarly, sampling by its nature, means that generally not all aspects of ecosystems can be assessed and identified;
- This assessment is based on the findings of a visual assessment of the site combined with available desktop resources. This study was not informed by detailed hydraulic, hydrological, faunal or floral assessments;
- The PES and EIS assessments undertaken are largely qualitative assessment tools and thus the results are open to professional opinion and interpretation. An effort has been made to substantiate all claims where applicable and necessary.

4. PROJECT DESCRIPTION

The new pumpstation (PS4) will be located immediately to the north of the Skimmelkrans Lane. A new rising main will be constructed to connect the existing pump station (PS1) to PS4 (along Skimmelkrans Lane) and then from PS4 to the Herolds Bay WWTW (along Spekie Gericke Drive) (Figure 3 and Figure 4). The existing 160 mm rising main that runs from PS1 to the intersection of Skimmelkrans and Spekie Gericke Drive will be repurposed to divert sewage back from PS4 to a new emergency storage tank located next to PS1. The storage tank will provide 6 hours of emergency storage capacity, specifically designed to prevent spillages onto Herolds Bay beach in the event of breakdowns or power failure. The new rising main will cross a non-perennial watercourse at the same location where the existing rising main crosses. Both pipes will be protected with a steel pipe bridge. After the crossing, two alternative alignment options have been assessed. Option 1 will involve burying the pipeline within Skimmelkrans Lane to PS4. Option 2 will involve suspending the pipeline along the

edge of Skimmelkrans Lane above the adjacent watercourse – attached either beneath the cantilevered boardwalk, or to the concrete channel wall. From PS4 the pipeline will be buried alongside the length of existing pipeline - beneath the road surface along the length of Spekie Gericke Drive and up the hill to the WWTW (Figure 3).

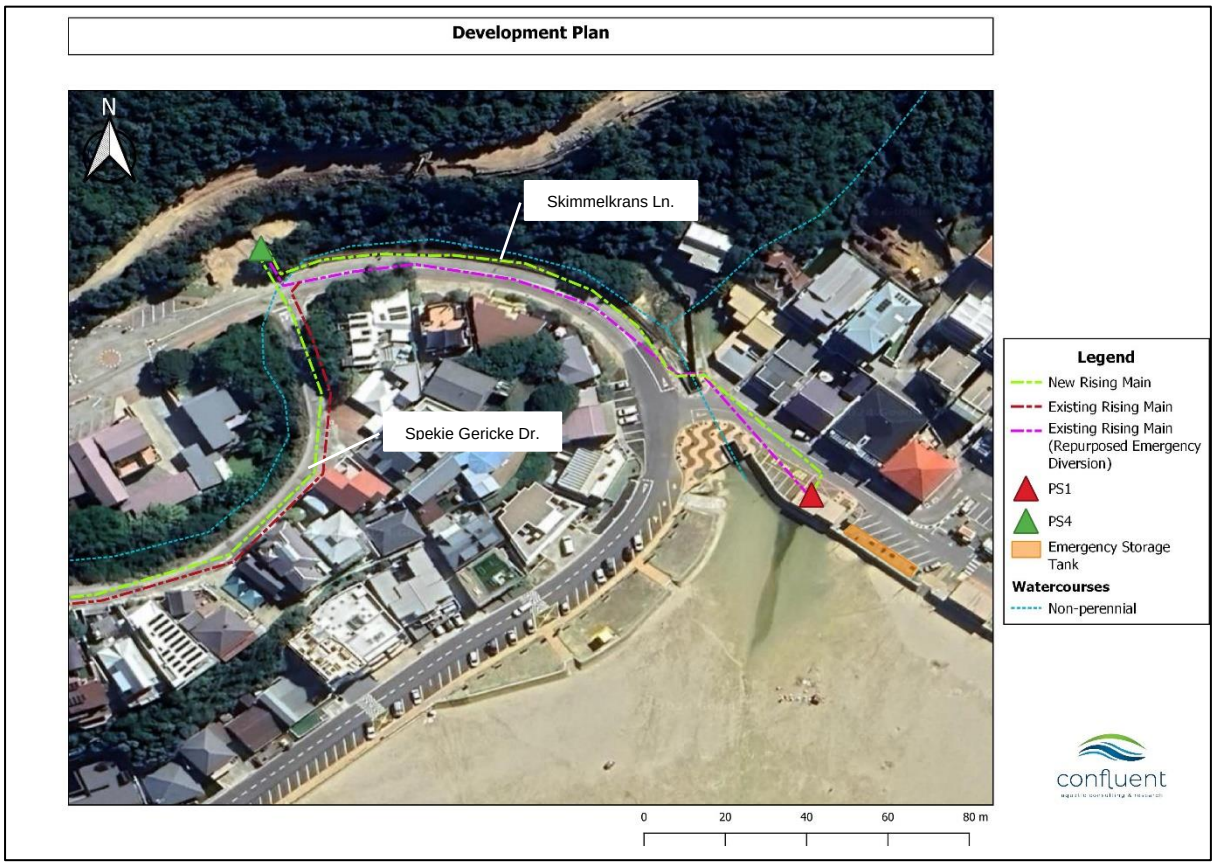

Figure 2: Map indicating, pump stations, existing and new sewage pipelines relative to watercourses.

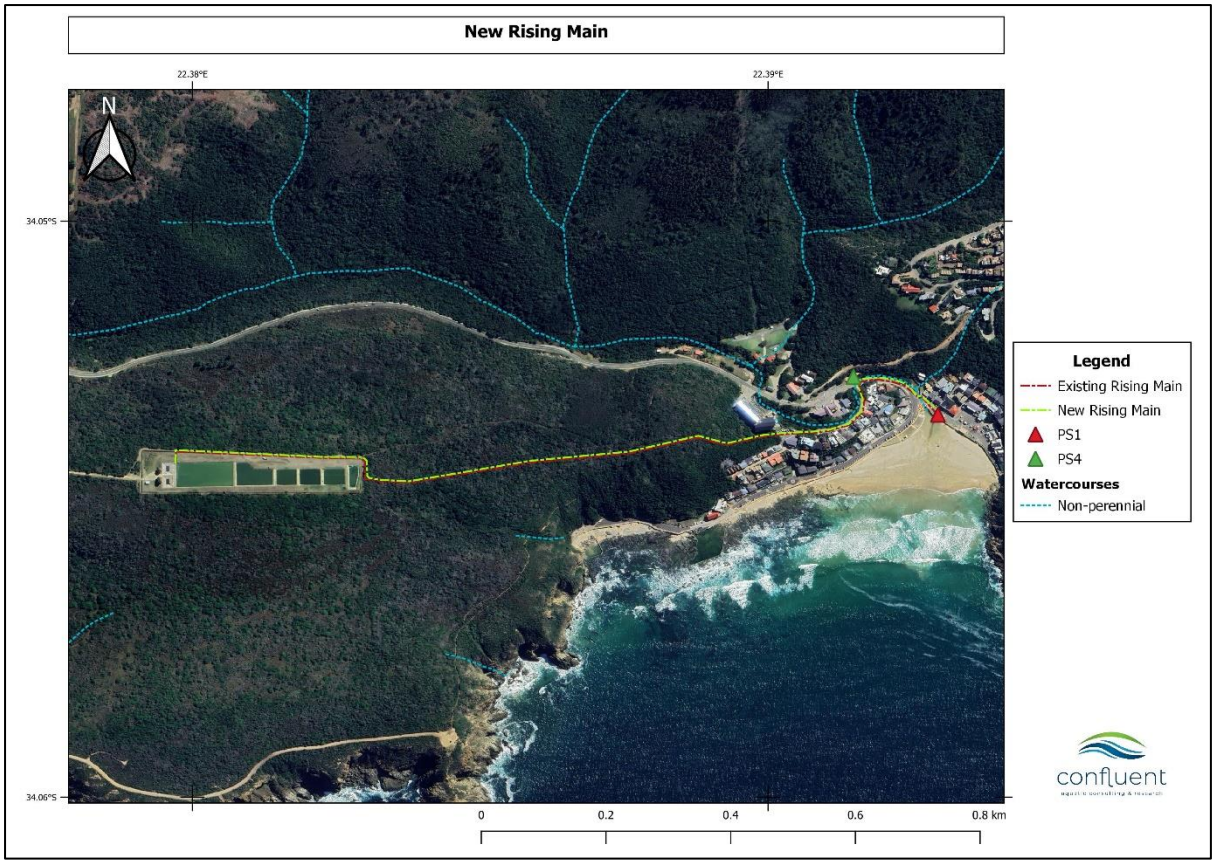

Figure 3: Map indicating, pump stations, existing and new sewage pipelines relative to watercourses.

5. DESKTOP ASSESSMENT

Herolds Bay is situated in quaternary catchment K30B of the Breede-Gouritz Water Management Area (Figure 4). The catchment area falls within the South-Eastern Coastal Belt (Ecoregion Level 1: 20). The terrain is described as low mountains and moderately undulating plains with moderate relief. Altitude ranges between 0 - 1300 m.a.m.s.l. The Mean Annual Precipitation (MAP) is relatively high, ranging between 500-800 mm and is a-seasonal, occurring throughout the year.

Soils in the catchment area are relatively shallow consisting of a diagnostic pedocutanic duplex soil, with a clear textural contrast between the A and B horizon. The B horizon is however heavily enriched with clay, which serves as a barrier to both root growth and water movement. Sub-surface water therefore tends to flow laterally over the top of the B horizon, through the more coarsely textured A horizon. In addition, the area falls within a very high intensity rainfall zone. For these reasons soils are highly erodible.

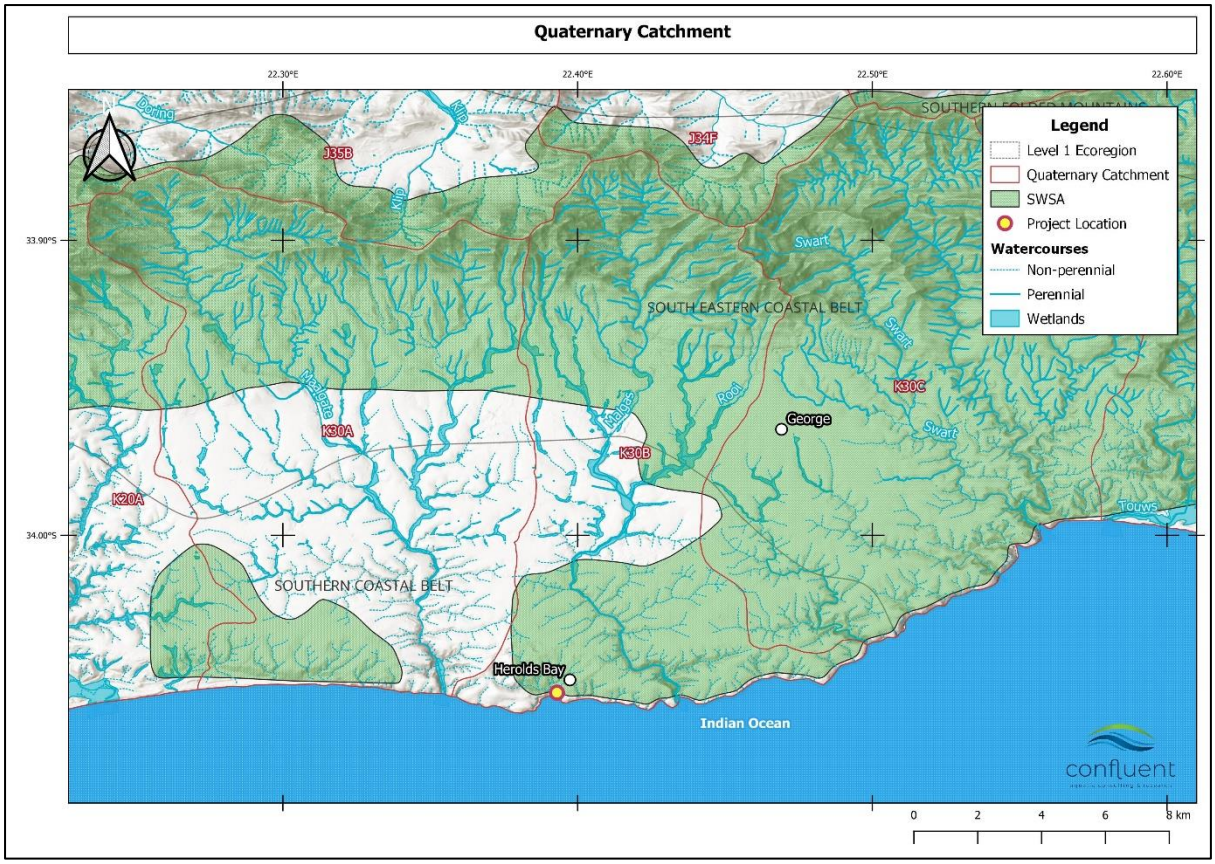

Figure 4: Location of quaternary catchment K30B.

5.1 National Freshwater Ecosystem Priority Areas

The study site is located within sub-quaternary catchment (SQC) 9151 (Figure 5), which, according to the National Freshwater Ecosystem Priority Atlas (NFEPA, Nel *et al.,* 2011), has not been classified as a FEPA (Freshwater Ecosystem Priority Area). The project area therefore falls within an SQC that is not considered as being a priority for maintaining freshwater biodiversity at a national scale.

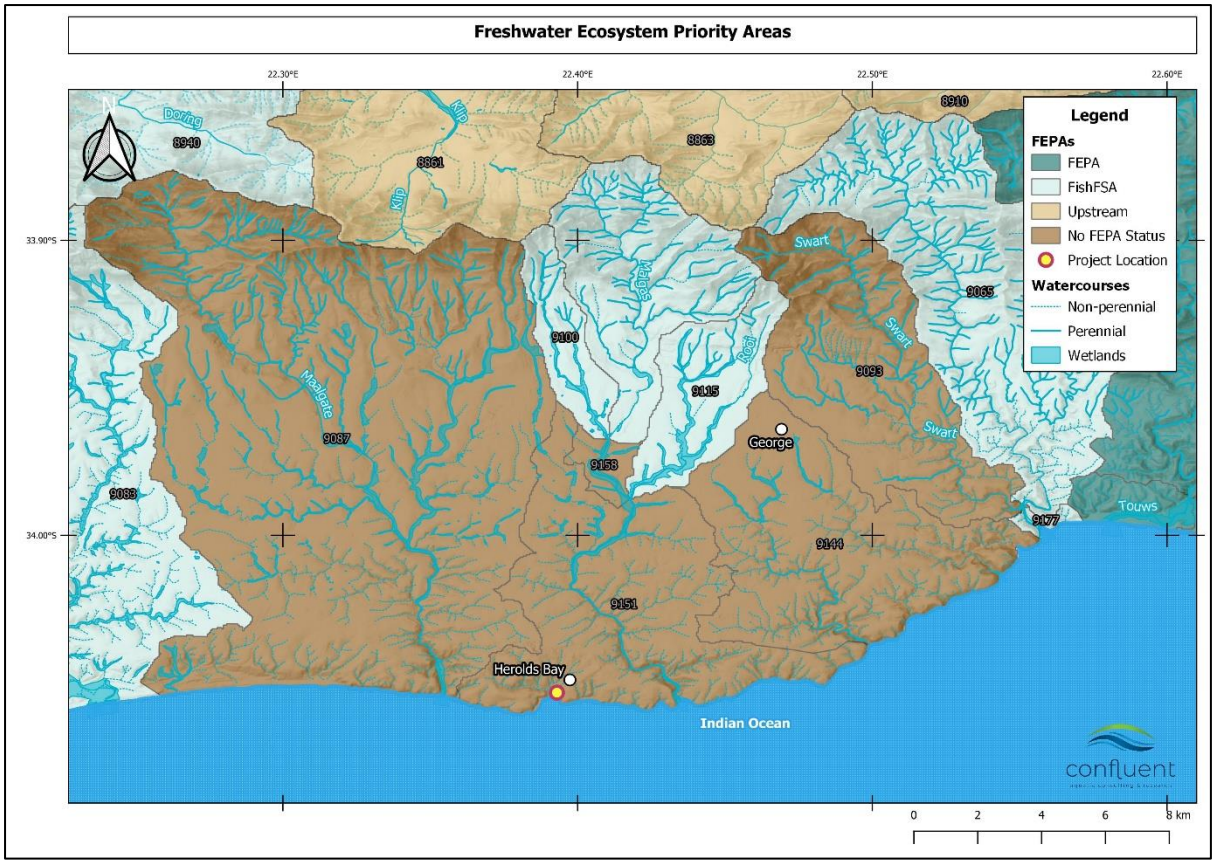

Figure 5: Map of the study site in relation to NFEPA sub-quaternary reaches.

5.2 Western Cape Biodiversity Spatial Plan

The Western Cape Biodiversity Spatial Plan (2016) covers both terrestrial and freshwater habitats. According to the plan, the watercourse running immediately to the north of Skimmelkrans Lane is classified as an Ecological Support Area (ESA2) (Figure 6). These are considered as degraded areas that are not important in terms of meeting biodiversity targets but do play an important role in providing supporting ecological functions (in this case faunal movement and water provision). A section of the rising main stretching from the end of Spekie Gericke Drive to the WWTW is indicated to cross a Critical Biodiversity Area (CBA1) wetland (Figure 6). CBA1 wetlands are considered to be in a natural or near-natural state and are essential for meeting biodiversity targets. Development should avoid these areas where possible or result only in low, biodiversity sensitive impacts.

Table 5: WCBSP categories and management objectives relevant to the alignment of the new rising main.

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

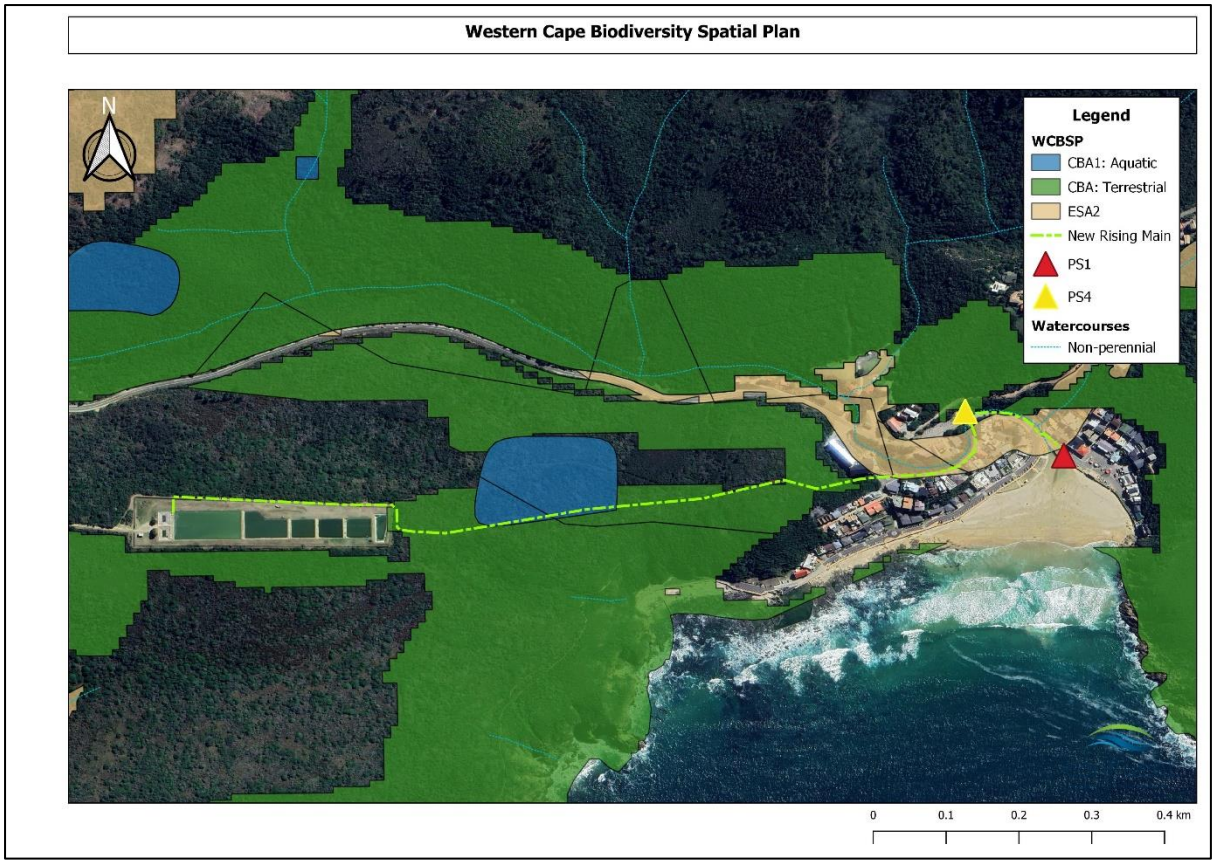

Figure 6: Map of the rising main alignment in relation to the Western Cape Biodiversity Spatial Plan (WCBSP).

6. SITE ASSESSMENT

6.1 Watercourse Classification

The pipeline crosses the lower most, transitional section of the watercourse which can be best described a small temporarily closed estuary (Figure 7). This estuarine zone is located below the 5 m contour, which is typically used to delineate the Estuarine Functional Zone (EFZ). It is perched above normal tidal levels and is only occasionally influenced by extreme tidal events (e.g. spring tides and storm surges). The bed substrate is sandy (of marine origin) and flooding from the catchment area occasionally opens up a narrow, shallow channel that can pass through the Herolds Bay Beach to the sea (Figure 8). The banks of this estuarine zone have been stabilised by various methods, including gabion baskets and retaining walls (Figure 8). Freshwater flows from the catchment area are intermittent and as a result there is frequently no open surface water body present. Occasional tidal surges or freshwater inflows can result in a temporary open surface water body of no more than 1 000 m^2 in extent.

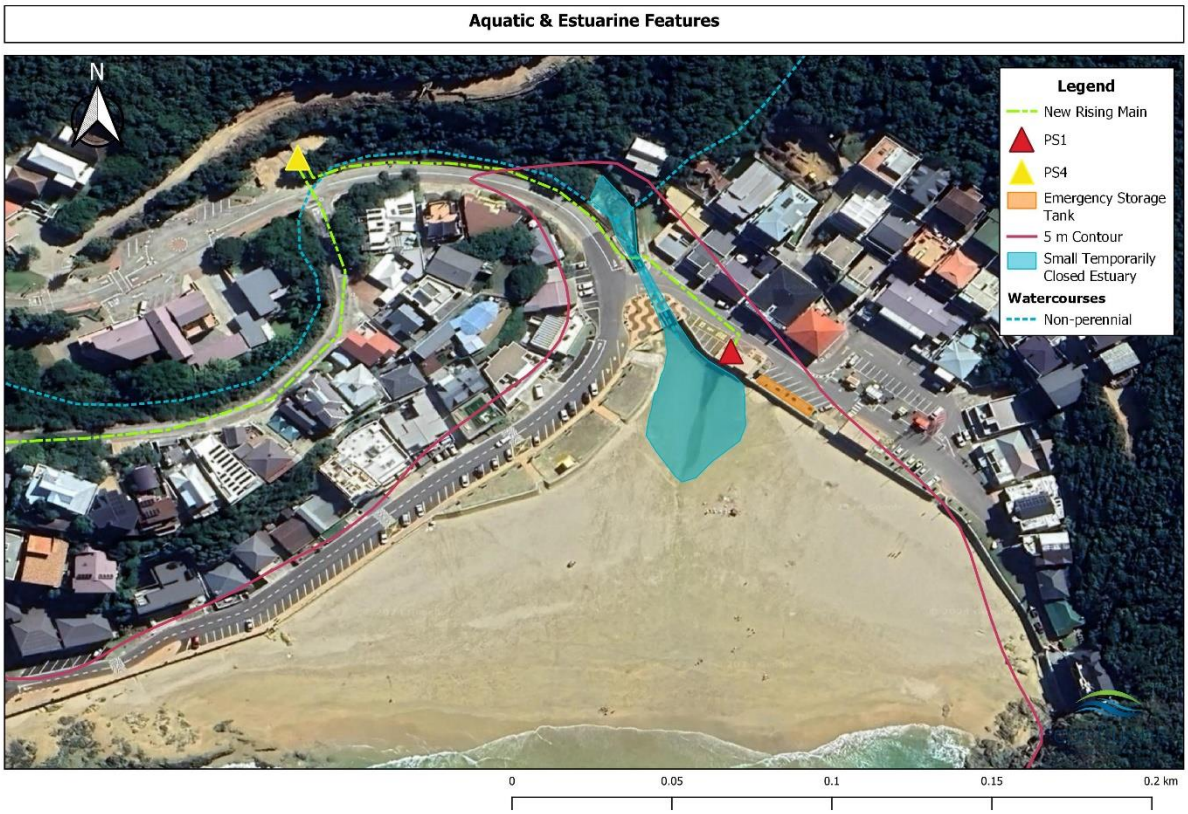

Figure 7: Map indicating the non-perennial watercourse running along Skimmelkrans Lane terminating into a small temporarily closed estuary at the Herolds Bay beach.

Further upstream, the watercourse grades into a freshwater non-perennial stream with a distinct channel, characterised by a bedrock and boulder substrate. The channel is narrow and confined by a steep, well vegetated slope to the north. Skimmelkrans Lane runs immediately along the southern edge of the watercourse. The southern banks have been filled in and lined with concrete retaining walls to support the road. Further upstream the watercourse runs beneath Skimmelkrans Lane and then runs along Spekie Gericke Drive, before cutting underneath the R404 and up towards its catchment area to the north.

No wetland was present in the area indicated as a CBA wetland (Figure 6). The designation of the area by the WCBSP as a CBA wetland most likely stems from the earlier NFEPA Wetland Atlas (Nel, 2011) which identified this area as a channelled valley-bottom wetland (Figure 9). The wetland is indicated to occur along a high lying ridge which slopes down to the north and south and is therefore not consistent with the terrain morphology required for a channelled valley bottom wetland to form (i.e. there is no valley within the delineated wetland area). The more recent NWMV5 (CSIR, 2018) map does not highlight this area as a wetland (Figure 9) and no wetland was observed across this area during the site visit. No additional watercourses are affected by the new rising main along its route from PS4 to the WWTW.

Figure 8: Photographs indicating the existing rising main crossing the estuarine zone (A); marine sediments and bank stabilisation along the edge of the estuarine zone (B and C); bedrock and boulder substrate along the non-perennial watercourse (D and E).

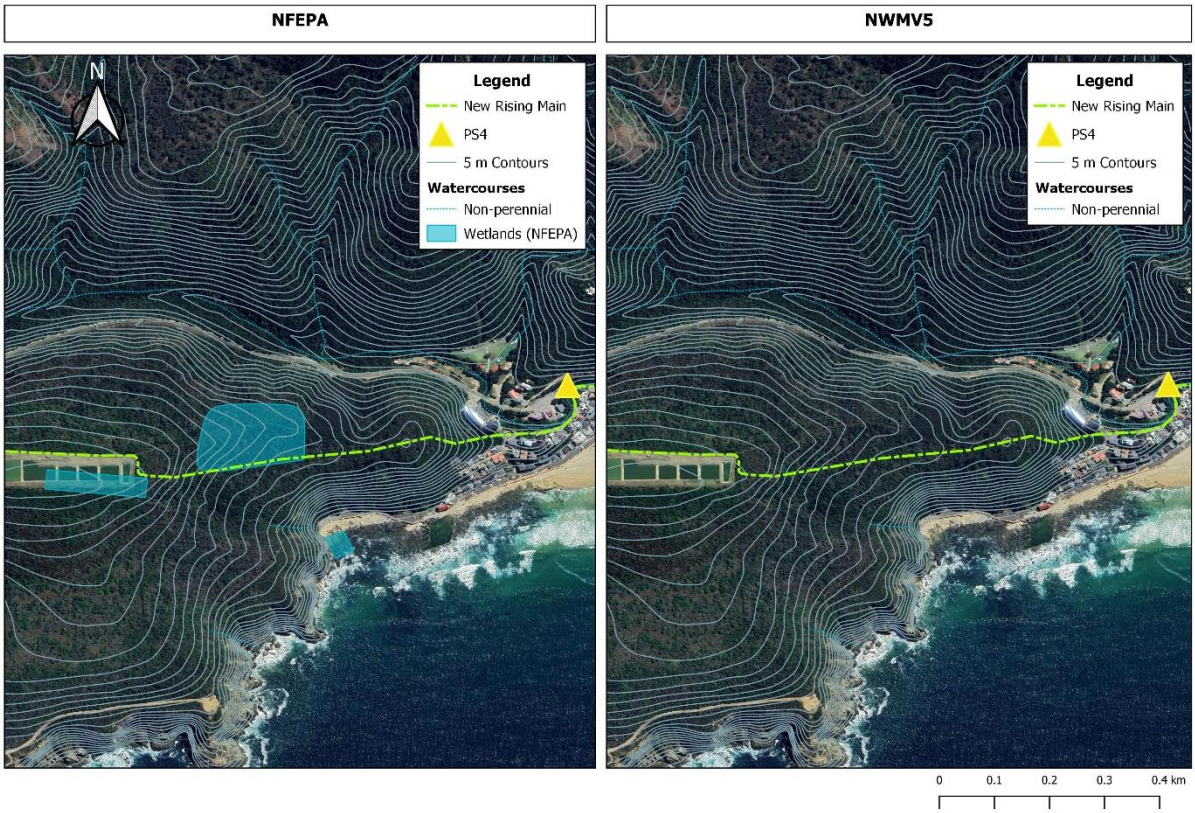

Figure 9: Comparison of wetlands mapped according to the NFEPA (Nel et al. 2011) and the NBA (CSIR, 2018).

6.2 Present Ecological State (PES)

The mid to upper reaches of the watercourse originate from a relatively undeveloped part of the catchment area and are relatively unimpacted. Vegetation is predominantly natural, albeit slightly invaded by *Acacia mearnsii*. Farming activities take place in the upper most reaches, where some storage and abstraction of water takes place. The lower most reaches of the watercourse pass through the urban area of Herolds Bay. The watercourse receives stormwater runoff from Skimmelkrans Lane and Spekie Gericke Drive, which will affect water quality and has resulted in some minor erosion of the banks. Parts of the watercourse have been canalised to accommodate roads (Skimmelkrans Lane), road crossings (and associated culverts) and residential properties. Minor dumping of waste, garden refuse and litter was observed. Instream habitat is relatively undisturbed and no major signs of bank erosion or sedimentation of the bed was observed. The lower reach of the watercourse adjacent to Skimmelkrans Lane is picturesque and displays relatively good aquatic habitat which can be viewed from an elevated boardwalk that runs alongside the watercourse. The lower most section of the watercourse is estuarine in nature and has been canalised to accommodate residential property and roads. Based on the impacts described above, the Present Ecological State (PES) of instream habitat of the watercourse is classified as **C - Moderately Modified** (Table 6). The riparian habitat is relatively intact, comprising predominantly of indigenous vegetation. Vegetation removal and channel modification has occurred at various points associated with road crossings, canalisation of the channel and residential encroachment (Table 7). The PES of riparian habitat is **Largely Natural** to **Moderately Modified** (**B/C**) and

overall, the PES (taking instream and riparian habitat into consideration) is **C – Moderately Modified.**

Table 6: Instream IHI scores for the watercourse adjacent to Skimmelkrans Lane.

Modification	Score
Water abstraction	**8 –** Abstraction by agriculture in upper reaches
Flow modification	**10 -** Increased flow from urban runoff and stormwater drainage
Bed modification	**6 -** Slight sedimentation from surrounding developments/construction sites
Channel modification	**13 –** Multiple culverts at road crossings and canalisation along the southern bank.
Physico-chemical modification	**8 -** Water quality moderately influenced by urban runoff from roads and surrounding developments.
Inundation	**5 –** Minimal inundation at road culverts.
Alien macrophytes	**0** – Minimal invasion by alien macrophytes.
Alien aquatic fauna	**0** – none
Rubbish dumping	**7 -** some garden refuse and building material discarded along the watercourse
IHI score	**66 (C- Moderately Modified)**

Table 7: Riparian IHI scores for the watercourse adjacent to Skimmelkrans Lane.

Modification	South
Vegetation removal	**10** – Riparian zone largely intact with removal along southern bank adjacent to Skimmelkrans Lane
Invasive vegetation	**10** – Moderate invasion throughout catchment area
Bank erosion	**10 -** Does occur in steeper sections along the channel.
Channel modification	**10 –** Infilling and canalisation of the channel in sections
Water abstraction	**0** – None
Inundation	**0** – None
Flow modification	**5** – More channelised flow due to stormwater infrastructure limits interaction with riparian zone to a slight extent
Physico-chemical modification	**0 –** None
IHI Score	**77 (C/B – Moderately Modified)**

6.3 Ecological Importance & Sensitivity (EIS)

Given the ephemeral hydroperiod, its location in an urbanised area and modifications to the bed and banks of the channel, the watercourse offers little with respect to instream and riparian habitat options and therefore supports relatively low biodiversity. It is relatively well connected to a broader hydrological network and offers a good migration route from the estuary all the way to the upper reaches of the catchment area. Overall, the EIS of the stream is considered to be **Low** (Table 8).

Table 8: Ecological Importance and Sensitivity scores for the the watercourse adjacent to Skimmelkrans Lane.

Determinant	Scores
Presence of Rare & Endangered Species	**1** – Low probability.
Populations of Unique Species	**1 –** Low probability.
Intolerant Biota	**1** - Very low proportion of the biota is expected to be dependent on flowing water for the completion of their life cycle.
Species/Taxon Richness	**1** - Moderate diversity of fauna and flora expected on a local scale.
Diversity of Habitat Types or Features	**2**– Moderate diversity of aquatic habitats due to estuarine features.
Refuge value of habitat types	**2** – Non-perennial and therefore offers limited refuge. Its location in an urban environment is however relatively important.
Sensitivity of habitat to flow changes	**1** – A relatively small non-perennial river which is not likely to be sensitive to changes in flow.
Sensitivity to flow related water quality changes	**2** - The stream is small but non-perennial and is therefore moderately sensitive to modifications in water quality.
Migration route for instream and riparian biota	**2** – Moderate importance due to estuarine characteristics and good connectivity to a broader hydrological network and catchment area.
Protection Status	**1** – ESA2 under the WCBSP.
EIS Score	**1 (Low EIS)**

7. IMPACT ASSESSMENT

Impact 1: Impacts of construction activities on habitat and water quality.

Construction activities will take place immediately adjacent to the watercourse and poor management of the construction sites and construction materials could impact on habitat and water quality. General construction impacts associated with vehicles, workers and storage of construction equipment and include the following:

- Pollution of watercourses through leakage of fuels, oils, and other pollutants from vehicles and construction machinery, or from washing of equipment and vehicles;
- The presence of construction workers on site will require the need for appropriate ablution facilities. Poor management of these facilities could potentially lead to sewage spills or leaks which could contaminate watercourses;
- Storage of construction materials or the temporary lay-down of equipment within an area that drains in the direction of the watercourse;
- Dumping of excavated material into the watercourse;
- Poor management of waste generated during construction activities;
- Increased pedestrian and vehicular traffic in close proximity to watercourses; and
- Mixing of concrete or cement in or in close proximity to watercourses.

Impact	Without Mitigation	With Mitigation
Intensity	High	Very low
Duration	Short term	Short term

Extent	Limited	Limited
Probability	Likely	Unlikely
Significance	**-50: Minor**	**-21: Negligible**
Reversibility	High	High
Irreplaceability	Low	Low
Confidence	High	High

Mitigation

- Excavators and all other machinery and vehicles must be checked for oil and fuel leaks daily. No machinery or vehicles with leaks are permitted to work in the watercourse;
- No fuel storage, refuelling, vehicle maintenance or vehicle depots to be allowed within 30m of the banks of the watercourse;
- Refuelling and fuel storage areas, and areas used for the servicing or parking of vehicles and machinery, must be located on impervious bases and should have bunds around them (sized to contain 110 % of the tank capacity) to contain any possible spills;
- The area(s) chosen for the stockpiling of imported building materials should be demarcated, and notices put up declaring what must be stockpiled where.
- Chemical toilets should be provided on-site at 1 toilet per 10 persons;
- Waste from chemical toilets must be disposed of regularly (at least once a week) in a responsible manner by a registered waste contractor;
- Cement/concrete used in the construction must not be mixed on bare ground or within the watercourse. An impermeable/bunded area must be established in such a way that cement slurry, runoff and cement water will be contained and will not flow into the surrounding environment, the stream or riparian zone or contaminate the soil;
- Workers must be properly instructed in the proper care of the environment, especially with respect to poaching, disturbance of nesting and roosting areas, disposal of human waste, garbage etc.;
- The watercourse should be inspected on a regular basis (at least weekly) by an appropriately qualified ECO for signs of disturbance, sedimentation and pollution during the construction phase. If signs of disturbance, sedimentation or pollution are noted, immediate action should be taken to remedy the situation and, if necessary, a freshwater ecologist should be consulted for advice on the most suitable remediation measures.

Impact 2: Impact of constructing new rising main across the estuarine zone on habitat and water quality.

The new rising main will cross the estuarine zone alongside the existing rising main. The pipeline will be elevated above the estuarine zone and no excavation of the bed will be required. The banks have already been transformed and are canalised by a combination of concrete retaining wall and gabion structures.

Impact	Without Mitigation	With Mitigation
Intensity	Moderate	Very low
Duration	Short term	Short term
Extent	Limited	Limited
Probability	Probably	Unlikely
Significance	**-36: Minor**	**-21: Negligible**
Reversibility	High	High
Irreplaceability	Low	Low

Confidence	High	High

Mitigation

- UV resistant material must be used for the section of pipeline crossing the estuary to ensure long-term lifespan.
- A steel bridge will be constructed to support the pipeline and provide protection against storm surges and flooding.
- Areas where instream access is required must be confined to clearly demarcated areas so as to prevent unnecessary disturbance of instream habitat outside of these areas.

Impact 3: Impact of construction of the rising main along Skimmelkrans Lane on habitat and water quality

Option 1 will involve burying the pipeline within Skimmelkrans Road. This will require the road surface to be excavated to bury the pipeline. Surface runoff through excavated section of the road surface could lead to input of sediment and other construction materials into the watercourse.

Option 2 will involve suspending the pipeline along the edge of Skimmelkrans Lane above the watercourse – attached either beneath the cantilevered boardwalk, or to the concrete channel wall. No excavation of the bed or banks of the watercourse will be required, but access to the watercourse may be required in order to fasten the pipeline to either of the existing structures.

Impact	**Without Mitigation**	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Intensity	Moderate	Low	Moderate	Low
Duration	Short term	Short term	Short term	Short term
Extent	Limited	Limited	Limited	Limited
Probability	Probably	Unlikely	Probably	Unlikely
Significance	**-36: Minor**	**-24: Negligible**	**-36: Minor**	**-24: Negligible**
Reversibility	High	High	High	High
Irreplaceability	Low	Low	Low	Low
Confidence	High	High	High	High

Mitigation

- No dumping of waste materials in the watercourse (Option 1 and Option 2);
- Works should preferably be scheduled for the dry season to reduce the likelihood of flooding and or stormwater flows through construction areas (Option 1 and 2);
- Surface runoff from the originating from the road surface upslope of the construction area, must be diverted (by means of a barrier – e.g. sandbags) to avoid stormwater flows through any excavated section of the road surface (Option 1);
- Any diversion of surface runoff must not cause erosion to the bed and banks of the watercourse (Option 1);
- A construction schedule must be clearly defined and broken down into phases, to avoid multiple sites being exposed simultaneously. The completion date for each phase of development must be indicated and all excavation and final/temporary road resurfacing operations must be completed before moving onto the next phase (Option 1);
- No construction materials to be stockpiled in the watercourse (Option 2);

- All waste materials must be removed from the watercourse (Option 2);
- UV resistant material should be used for the exposed section of pipeline to ensure long-term lifespan (Option 2);
- Areas where instream access is required must be confined to clearly demarcated areas to prevent unnecessary disturbance of instream and riparian habitat outside of these areas (Option 2).

7.1 Operational Phase

Impact 4: Impact on water quality caused by leaks or damage to rising main due to vandalism, flood events or storm surges.

Impacts under Option 1 are considered to be negligible as the likelihood of leaks caused by damage to the pipeline is considered to be very low.

Under Option 2, the pipeline would run below the cantilevered boardwalk and may be susceptible to vandalism or damage during extreme flooding events (from the upstream catchment area) or extreme tidal surges (from the sea – as experienced during September 2023) which could potentially result in discharge of untreated sewage into the watercourse. Any damage or leaks are likely to be detected quickly due to the fact that the pipeline is located in a busy part of the town.

Impact	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Intensity	Very High	No Mitigation Required	Very High	Very High
Duration	Brief		Brief	Brief
Extent	Very limited		Limited	Limited
Probability	Unlikely		Likely	Probably
Significance	**-27: Negligible**		**-50: Minor**	**-40: Minor**
Reversibility	High		High	High
Irreplaceability	Low		Low	Low
Confidence	High		High	High

Mitigation

- Storage at PS1 will allow for 6 hours to deal with emergency situations.
- The pipeline must be routinely inspected following extreme weather events, with the aim of responding rapidly to damaged infrastructure (Option 2).

8. DWS RISK ASSESSMENT

Risks of activities associated with the phases of development to watercourses were determined according to the risk assessment matrix developed as part of GN 4167 of 2023 (Section 21 (c) and (i) water use Risk Assessment Protocol). The first stage of the risk assessment is the identification of environmental activities, aspects and impacts and essentially mirror those that were identified in the impact assessment (see Section 7). The intensity of impact to receptors and resources (i.e. hydrology, water quality, geomorphology, biota and vegetation) is rated (from 0 to 5, representing negligible and very high impact, respectively), which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. Risks were then quantified based on the anticipated spatial scale,

duration and likelihood of occurrence and assumed the full implementation of recommended mitigation measures described in Section 7.

While Option 1 is located in close proximity to the watercourse, the pipeline will be buried beneath the road surface. The pipeline will not be located in the riparian zone of the watercourse, and, assuming the road is above the 100-year floodline, the pipeline is located outside of the regulated area of the watercourse. Nevertheless, risks associated with construction and operational phase activities have been assessed. Option 2 will fall within the alignment of the bed and banks of the watercourse and will therefore be located within the regulated area. The risk of the pipeline crossing the estuarine zone was not assessed as an estuary is not defined as a watercourse and therefore Section 21 c and i water uses (as defined by the NWA) are not applicable. All other risks/impacts were assessed given the proximity of the watercourse to the proposed rising main alignment options. Risks for both options are considered to be **Low** and would ordinarily qualify for a General Authorisation. Bulk and main sewage pipelines are however excluded from a General Authorisation when these pipelines are located within the regulated area of a watercourse. Option 2 would therefore most likely require a WULA. Consultation with BOCMA is recommended to determine whether authorisation is required for Option 1 as a floodline assessment was not available at the time of compiling this report.

Table 9: DWS Risk Assessment matrix for construction phase activities.

Phase	Activity	Impact	Watercourse		Intensity of Impact on Resource Quality					Overall Intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating (without mitigation)	Confidence level
			PES	Ecological Importance	Abiotic Habitat (Drivers)			Biota (Responses)											
					Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
CONSTRUCTION	Construction of Rising Main & Sewage Pump Station 4 (Option 1 & 2)	Spills and leaks of fuel and oil from operation and refuelling of vehicles and machinery	C	Low	1	2	2	1	1	**4**	1	2	**7**	**2**	**14**	40%	**5.6**	**L**	High
		Dumping of construction waste	C	Low	1	1	1	1	1	**2**	1	2	**5**	**2**	**10**	40%	**4**	**L**	High
		Disturbance of habitat caused by erosion of waste and/or construction material stockpiles.	C	Low	0	2	1	1	2	**4**	1	2	**7**	**2**	**14**	40%	**5.6**	**L**	High
	Construction of Rising Main along Skimmelkrans Lane (Option 1)	Sedimentation and pollution of watercourse caused by surface runoff through construction area	C	Low	1	2	1	2	2	**4**	1	2	**7**	**2**	**14**	40%	**5.6**	**L**	High
	Construction of Rising Main along Skimmelkrans Lane (Option 2)	Disturbance of habitat & water quality caused by construction activities within regulated area	C	Low	0	2	0	2	2	**4**	1	2	**7**	**2**	**14**	40%	**5.6**	**L**	High
OPERATIONAL	Operation of Rising Main (Option 1)	Sewage leaks caused by damage/vandalisim to pipeline	C	Low	0	4	0	2	4	**8**	1	2	**11**	**2**	**22**	20%	**4.4**	**L**	High
	Operation of Rising Main (Option 2)	Sewage leaks caused by damage/vandalisim to pipeline	C	Low	0	4	0	2	4	**8**	1	2	**11**	**2**	**22**	60%	**13.2**	**L**	High

9. CONCLUSION

The watercourse adjacent to the new pumpstation and rising main is a non-perennial watercourse which has been moderately modified from reference conditions, largely due to urbanisation along the lower most reaches. Given its small size and non-perennial characteristics, the EIS is low. At its lower most extent, the watercourse grades into a small temporarily closed estuary which periodically opens to the sea through the main Herolds Bay beach.

Activities associated with the construction and operational phase of the pumpstation and rising main can be realistically mitigated to a negligible to minor level of impact. Of the two alternatives, Option 1 is recommended as, due to the pipeline being buried beneath the road surface, impacts and risks associated with the operational phase of the pipeline are lower. Under Option 2 the pipeline will be above surface and aligned along the channel of the watercourse and thus more vulnerable to vandalism and environmental damage. In terms of the DWS Risk Assessment matrix, risks for both options are considered to be Low and would ordinarily qualify for a General Authorisation. Bulk and main sewage pipelines are however excluded from a General Authorisation when these pipelines are located within the regulated area of a watercourse. Option 2 would therefore most likely require a WULA. Consultation with BOCMA is recommended to determine whether authorisation is required for Option 1 as a floodline assessment was not available at the time of compiling this report.

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