Wellington Water

Tuesday 6 September 2022

OIA IRO-282
[redacted]
Email: [redacted]

Kia ora [redacted]

Official information request for copies of correspondence as a consequence of the Panel's Minute #4.

I write regarding your official information request dated Monday 8 August 2022 for copies of all correspondence between GWRC and PCC/WWL, within PCC, within WWL and to and from WWL, that has been a consequence of the Panel's Minute #4 – excluding previously provided material in response to OIA IRO-259.

We have considered your request in accordance with the Local Government Official Information and meetings Act 1987 (the Act) and have determined that we are able to grant part of the information you have requested.

Please see attached in our email response to you the 'Titahi Bay Wastewater Treatment Plant Out Fall Coastal vegetation feature report'.

Pursuant to Section 7(2)(f)(i) of the Act, maintaining the effective conduct of public affairs though free and frank opinions by or between officers, we have decided that we are unable to grant your request for all correspondence that has been as a consequence of the Panel's Minute #4.

You have the right to seek an investigation and review by the Ombudsman of this decision. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

Ngā mihi

[redacted]
Manager, Customer Experience
Wellington Water Ltd

Boffa Miskell

Titahi Bay Wastewater Treatment plant Out Fall Coastal vegetation feature

Wetland assessment
Prepared for Stantec
30 August 2022

Executive Summary

A coastal vegetation feature was surveyed (August 5.08.2022). The Clarkson (2013 and MfE 2020) wetland delineation protocol was used.

The feature was found to be a small (2m by 20m linear) saline natural wetland. It is 50% above and 50% below mean high water springs. It is in a gravel and cobble substrate with no evidence of sewage fungi, slimes or sediments. It is around 70m from the outfall pipe and 60m north of the concrete barrier.

It is a significant wetland and therefore protected under the regional plan (PNRP) and a threatened indigenous vegetation type in the CMA and so protected by the New Zealand Coastal Policy Statement policy 11.

The NPS FM does not address all of this feature, because only half of it is a natural inland wetland. However, the NES FM (2020) is not limited to “inland” wetlands; instead, it addresses (one has to assume all) “natural wetlands”.

There will, however, be no adverse effects on the wetland from the treated wastewater discharge, because of where that discharge is, and how much of it and how often it might come in to contact with around 50% of the feature.

Even where a diluted form of the treated wastewater did come into contact with the feature only the nutrient component is likely to have any effect, and that effect is most likely beneficial (as useful nutrient).

CONTENTS

Appendices

1.0 Introduction

I understand that through the hearing process a suggestion has arisen as to the presence of a natural wetland within 100m of the outfall. The feature in question was indicated to me by this aerial.

Explicitly we understand that the hearing panel in its Minute has asked for knowledge of:

a) What the vegetation is.

b) What parts, if any, lie above or below mean high water springs.

c) Whether and to what extent the vegetation is affected by the current discharge.

d) Whether and to what extent the vegetation would be affected by the future discharge (up to 2043).

e) The status of the vegetation under the New Zealand Coastal Policy Statement (NZCPS), Proposed Natural Resources Plan (PNRP), or any other relevant document or classification system.

f) What regulation(s) of the NES-F, if any, we should consider the vegetation under.

2.0 Method

2.1 Identifying the vegetation community in question

The question of what the vegetation is has been answered from a site visit by myself on Friday 5th August 2022 between midday and 1pm. High tide was around 3pm on that day.

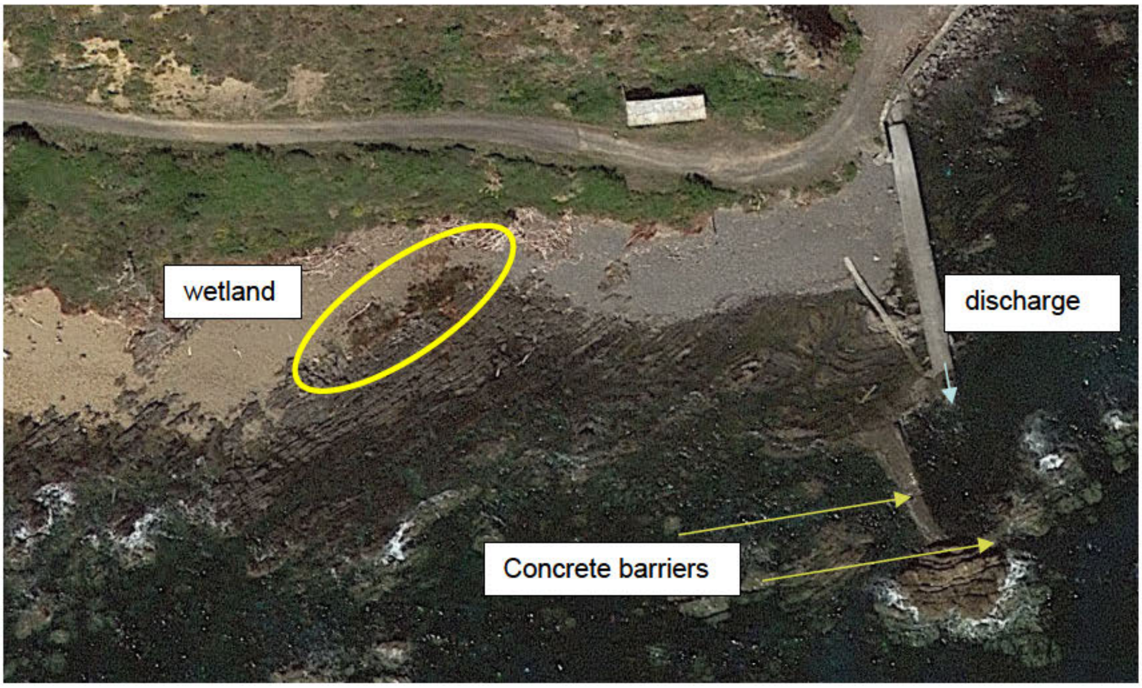
I used a process and methods agreed on with GWRC (see Appendix 1). I acknowledge that I undertook the site assessment before GWRC's review of the methodology had been completed. However, using the rapid assessment part of the method I was able to determine without any difficulty that this feature is a 'natural wetland' and the elements of the methodology on which GWRC provided feedback were not material to the assessment in this case.

3.0 Results

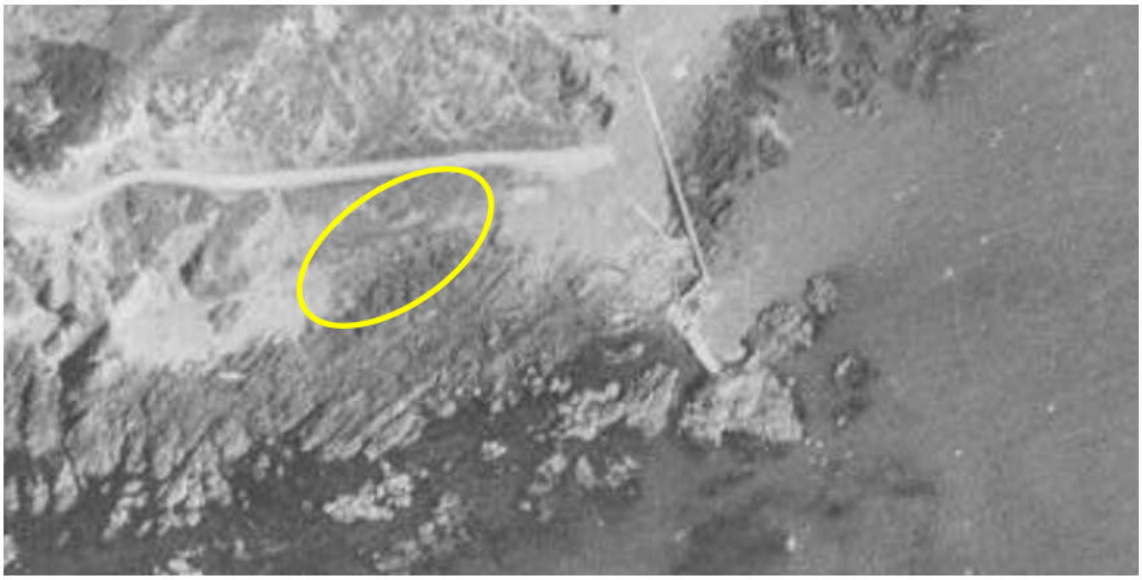
The initial approach was to view the site in retrolens (a website with good quality historical aerials) and look for evidence in the literature of the presence of a wetland historically.

The “wetland” feature is 60m directly west of the concrete barrier, 67m from the outfall. It is 20m long and averaging 2m wide; 4m at widest, 1m at narrowest.

2022. An observable similar coloured and sized feature has been present on google earth aerials since 2006. The yellow circle on the aerial depicts the feature.

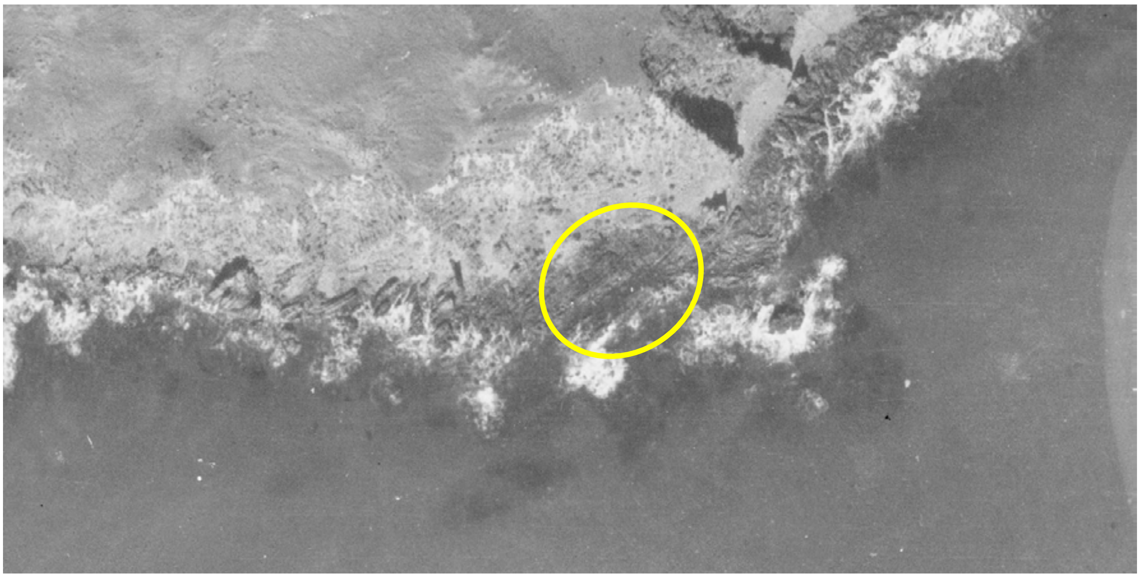


1973. The feature is not, however, clearly evident in early black and white photography, but some form of feature is apparent in 1973.



and 1969

1944. Aerials incapable of determining the presence, but the coastline is significantly different.



The feature, or at least a vegetation type, appears to have been present there since at least 1969.

The concrete barrier has been there since the 1960's.

The first wastewater outfall went in in 1951.

3.1 On Site

My site survey method of identifying the vegetation feature is laid out in detail in Appendix 1. In essence, a site survey was used to rapidly determine the vegetation area, boundaries and if it is obviously a wetland community because of the species presence being clearly and unambiguously FACW or Obligative dominated. The next step was to determine if any of the PNRP / NPS FM (2020) exclusions might be in play. Where it is not obvious or where an exclusion might be in play this would lead to representative plots and a range of indices as well as consideration of the hydrology (see Appendix 1).

3.2 Results

Looking from the above track the feature is clearly evident and discrete, because of its form, texture and colour.

I walked around the entire feature. It is on the gravel bank leading down into and on to the solid rock foreshore of the inner most part of the small bay north of the outfall.

The dominant substrate under the feature was gravel and cobble, not sands or soils. Some of the lower most feature expands onto the harder rock on a thin organic layer.

The slope of the gravel bank is mild (2 or 3 degrees) and then flattens to hard rock.

There is storm debris above the feature (large woody debris) and up to the escarpment bank, meaning storms and king high tides cover this area. But, looking at the seaweed deposition and small debris as well as the “beach” slope I estimate that around ½ of the feature typically receives some high tide saline water intrusion. That is, the feature sits across the Mean High Springs mark.

This is borne out to a degree by the plant assemblage.

The vegetation cover is very clearly that of a natural wetland. A saline, coastal, wetland.

I say this because the dominant cover by far (>90%) is Oioi (*Apodasmia similis*) which is FACW[1] (Clarkson 2021). The other components of the wetland are – sea side - sea primrose (*Samolus repens var repens*) (FACW) (3%), remuremu (*Selliera radicans*) (FACW) (3%), glasswort (*Sarcocornia quinqueflora*) (FACW) (1%), and scattered above and below the oioi, buck’s thorn plantain (*Plantago coronopus (introduced)*) (FAC) (3%). Up slope are remnants of a sprayed gorse, Pampas and a taupata (*Coprosma repens*).

This is a common but limited set of plants expected in a saline wetland (Haacks & Thannheiser 2003[2]).

The feature is clearly FACW plant dominated, and the edges of the upper and sides are clearly demarked by the absence of vegetation (cobble and gravels) and the lower boundary by a dispersed diffusion of sea primrose and remuremu.

No plots are required to understand that the feature is a coastal saline natural wetland and can not be excluded as a constructed wetland, pasture, geothermal or even a wetland induced by the construction of a waterbody.

Thus, there is no purpose or requirement to continue through the delineation protocol (dominance test etc) as described in MfE (2020) and the initially proposed method (Appendix 1).

3.3 Mean High Water Springs

While I did not survey at high tide it was apparent to me because of the gradients, the plants and the debris line of high tide, that the lower 50% or so of the feature is below MHW (where the remuremu and sea primrose are found) and the upper 50% is (I believe) above the normal high tide mark (Oioi and a seedling taupata).

Therefore, for a short duration 20-30 minutes (the tide at its fullest) the lower half of the feature is submerged in sea water twice a day.

3.4 Significance

Is this natural wetland significant in terms of section 6(c) of the RMA?

The decision version of the pNRP, which does not differentiate inland from coastal wetland – treating both as natural wetland, makes all natural wetlands automatically significant (a recent

[1] FACW means the plant is facultative wet, see Appendix 1

[2] Phytocoenologia 33(2-3), 267-288. June 2003

revision, however, includes a caveat which appears to ensure the natural wetland is predominantly indigenous before this is applies).

> "*Note that, because of the rarity of wetlands in the Wellington Region, all natural wetlands will meet the representativeness and rarity criteria listed in Policy 23 of the Regional Policy Statement 2013 and are therefore ecosystems and habitats with significant indigenous biodiversity values managed under Policy P40*."

Some evidence shows that the salt marsh extent of the Porirua harbour is 14.7% of the pre-European state (GWRC 2020[3]). It is possible this is a trend common across the region and that salt marsh as a whole are depleted (<30% of its original), but it has not been proven by spatial analysis that saline wetlands are as depleted from their original cover as are inland freshwater wetlands. Therefore, it is not clear that the statement in the footnote to the definition of natural wetland in the PNRP holds true for saline wetlands (but it is likely).

And so, for caution, I have used the Regional Policy set of criteria in policy 23, RPS (even though these were designed with terrestrial systems in mind). I repeat this set of criteria in Appendix 2.

In short – Representativeness – I consider that the feature does represent well a saline (normally estuarine situation) wetland plant community which can be simple in species richness as this one. It is characteristic of and typical of such indigenous dominated saline plant communities. It is also likely that the community present is underrepresented spatially (<30% remaining) regionally.

Rarity – There are no rare or threatened plant species in this community. The feature itself however, might be considered "rare" or threatened by a reduced abundance.

Diversity – the feature does have a natural diversity of species, and physical features.

Context – the feature is too small and isolated to form the connectivity or habitat conditions of this criteria.

It is likely that the feature does meet at least three of the criteria, making it a 'significant' natural area.

It is however, a very small community and in an unusual setting for a salt marsh and is not of any particular habitat value for fauna. It is clearly however, persistent and viable.

3.5 NZ CPS (2010)

The NZ CPS through policy 11 seeks to protect indigenous biological diversity in the coastal environment. I note that it is not an identification method for wetlands but a process to consider the protection of ecological features in the coastal environment.

Two parts of the policy apply to the wetland feature: 11(a) – avoid adverse effects where:

A(iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare,

[3] Stevens L. & Forrest, B. 2020. Broad Scale intertidal habitat mapping of Te Awarua-o-Porirua Harbour. A Salt Ecology Report ofr GWRC October 2020 (Porirua-Harbour-broad-scale-monitoring-2020.pdf (gw.govt.nz).)

And

11 b – avoid significant adverse effects where:

b(i) areas of predominantly indigenous vegetation in the coastal environment;

I consider both of these policy requirements are met.

3.6 The PNRP (2022)

As noted, the PNRP current version, while it removed reference to saltmarsh in the definitions, does not exclude inclusion of a natural wetland in the CMA or make reference to freshwater wetland only. I note that this site does not seem to be included in the PNRP schedule F4 (Sites of significant biological diversity values in the coastal marine area). Saltmarsh is referenced in Schedule 5 (Habitats with significant indigenous biodiversity values in the coastal marine area) and the feature is a salt marsh community although not as described in Schedule 5 ("grow in the upper margins of most NZ estuaries"). Therefore, it would seem that the PNRP does include this natural saline wetland.

3.7 The NPS FM (2020)

This policy only refers to inland freshwater wetlands and therefore excludes consideration of wetlands in the CMA. I consider that half the feature (technically) is within the CMA and half is a natural "inland" wetland therefore technically I assume the NPS FM can apply to half the feature – which ecologically is absurd.

3.8 The NES FM (2020)

This document only talks about natural wetlands. It does not reference inland freshwater or saline or CMA just about natural wetlands and so therefore it would seem that the NES FM (2020) does apply to this feature.

4.0 Effects

The feature has been present for at least the last 20 years and I suggest since at least the 1970's. Prior to around 1989 the discharge was not treated but also the volume was less than today - and so the feature is likely to have been present under a range of "contaminant" concentrations. That process has not removed or caused any obvious vegetation quality issue. The terrain does not suggest that the feature should be greater in extent and is not because of any issue.

Having examined the outfall location and this feature it seems clear to me that the concrete barrier out to the island and then another between the larger and smaller island south generally precludes the direct movement of treated wastewater into the wetlands bay except at high tide when there is a strong southerly swell (Figure 1). Treated wastewater is forced south and out and into the north-south tidal stream.

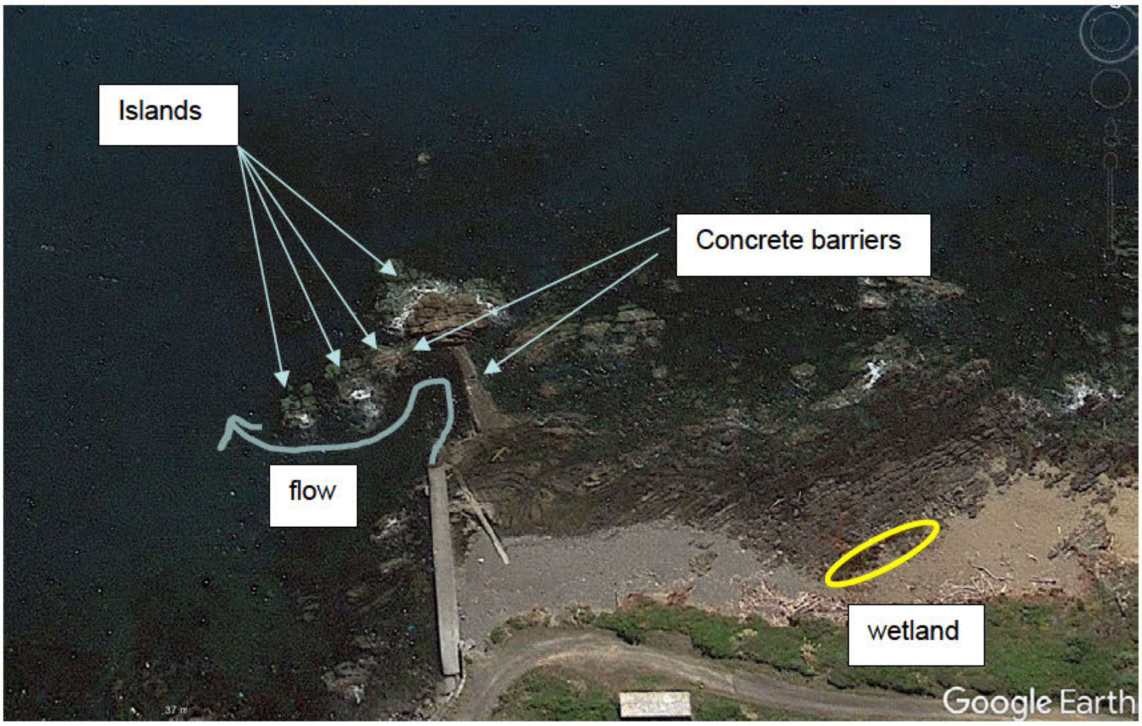


Figure 1. Barriers and out fall predominant flow

There would have to be a set of events related to water movement and wind that would allow the wastewater (diluted in the ocean) to escape around the island and barriers, travel north and then be driven back east and south into the bay and then at a high tide be washed up into the lower half of the wetland. This seems an unlikely (or infrequent) set of circumstances. More likely is that the diffuse (and highly diluted) general ocean water is periodically moved into the lower wetland at high tide.

In which case it is unlikely that there is sediments related to the out fall, indeed there is no evidence in the wetland of sedimentation.

Plants, as opposed to animals are not typically harmed by faecal matter or bacteria of human waste in and of itself; they do not suffer intestinal toxicity from *E. coli* for example. The only potential adverse effect is related to a nutrient boost (nitrogen products in the main, and ammonia of those products) where such a boost was greater than the plants' tolerance. Too much nutrient present in the environment, however, is usually simply not used by the plant, but it could be the cause of competition (weeds etc). Some research suggests root biomass growth slows but foliage biomass increases with eutrophication in salt marsh (Alldred et al 2010)[4]. Otherwise, excessive elemental nitrogen in the soil can cause, by osmosis, water depletion from the plant while leaving salts behind. As a result, some leaves can take on a burnt look from dehydration. However, that is not the usually the case in saline plants who are adapted for just that situation and this effect is not seen. Generally, a periodic and occasional nutrient boost will not be adverse, and based on my observations on site there was no sign of problematic algae or sewage fungi in this case.

Dudley & Shima (2010)[5] looked at water quality and the detection of sewage by measures on the coast of Titahi Bay (including areas about the wetland). While they were examining submerged kelp N and C and invertebrates they determined that Nitrogen uptake was greatest

[4] Alldred, M; Liberti, A; Baines, S. 2010. Impact of salinity and nutrients on salt marsh stability. Ecosphere 8(11): e02010

[5] : Bruce D Dudley & Jeffrey S Shima (2010) Algal and invertebrate bioindicators detect sewage effluent along the coast of Titahi Bay, Wellington, New Zealand, New Zealand Journal of Marine and Freshwater Research, 44:1, 39-51,

in the kelp nearest the outfall which dropped away quickly but that there was no harmful effect. They determine that the kelp was not a good indicator of sewage. Their research supports my opinion that the oioi -sea primrose-remuremu will only benefit and not be adversely affected should increased nutrient reach the wetland.

The wetland currently looks healthy.

I understand that the average discharge rates are predicated to increase from 306 L/s in 2018 to 440 L/s in 2043, and that the treatment of this discharge is unlikely to be better and may be poorer because of volume. These changes (remembering that the discharge is diluted in the ocean and then has a long circuitous route to the wetland and then only introduced to the wetland twice a day for less than an hour each time) will not impact directly than it does now. The increase, when considered against all of the mitigating factors, is tiny and the plant material still has its barriers and mechanisms to manage the nutrient and salinity etc of its environment.

For all the reasons set out above I cannot see how the future discharge (even if with more contaminant and at a greater volume (but still diluted enormously by the ocean)), could adversely affect this natural wetland feature.

I further understand that monitoring of the wetland has been proposed, however, I suggest firstly that monitoring is not needed (the risk of adverse effects is near zero, if not zero). The second, and also salient point, is that it would not be possible to implement a monitoring regime that could inform one of the discharge's direct effect to the feature. It would be near impossible to prove that a changed level of nutrient delivered by the wastewater outfall was responsible for a die back of the oioi (or other vegetation change), if it occurred, rather than some other factor (such as increased exposure due to climate change) being responsible. A general condition measure of the heath of the wetland will mean nothing in terms of causes of change if change was detected.

Sediment impact.

As with the discussion on nutrients and other wastewater contaminants, suspended sediments also have a long and unlikely journey to reach the wetland. I understand from Mr Cameron's evidence that TSS (which can loosely be translated as the amount of suspended sediment) discharged typically will be around 6 g/m^3 (0.006/L) (currently consented for a geometric mean of 30 g/m^3). But that at unusual flow times the discharge might rise to 104 g/m^3. These are very low amounts of suspended sediments (TSS). Freshwater systems under rain events in Porirua (data from TG monitoring) typically include sediment in solution (TSS) from 300 to 3000 (g/m^3)[6]. The lower end of these rain events had no impacts at all on any monitoring aquatic or wetland system receiving them because this was not enough material where deposition occurred, to smoother entirely any plant or fish. Even the 104 g/m3 upper limit predicted from the wastewater discharge, if it was collected in one place would not be enough to cover any kind of substantial area to any kind of meaningful effect depth.

None of this considers that the solids in solution in the discharge, once that energy of release has occurred, will drop out of suspension fairly quickly (10's of meters from the discharge point the larger sediment particles will fall, due to gravity, to the bed and become fairly well contained to the bed and a few centimetres above the bed where the ocean swell is normal). Furthermore, the smaller suspended particles will form bonds with other suspended particles and become larger and so drop out of suspension also. Then that discharge (that quantum which has not dropped out of the water column) has to have occurred at a high tide (to perhaps breach the concrete barrier – which in itself will stop most suspended sediment movement) and that there be a long shore drift from the south to north, and a push of a westerly wind to move suspended

[6] See also Hughes, Quinn, McKergrow (2012) Land use influences on suspended sediment yields and event sediment dynamics within two headwater catchments, Waikato, New Zealand, New Zealand Journal of Marine and Freshwater Research, 46:3, 315-333

material towards the wetland (some 70m distance). That material must reach the wetland (still in suspension) before the tide turns. There are only two high tides a tide of around 1 hour each). This is a sequence of events that must occur together when a discharge is more than the typical making it a very rare event (if it could even occur) that any suspended sediment from the discharge ever actually deposits on the wetland in the CMA. Furthermore, there may be suspended sediments stirred from the bottom under storm conditions driven on to the coast and that seabed sediment will have come for numerous sources including out of Porirua harbour and there would be no way of telling the source of any such suspended sediment deposition in the wetland.

As I have stated, I did not see any evidence of such deposits during my survey in the wetland and I think it sufficiently rare and of such low quantity, without any way of guaranteeing the source, that a sediment discharge from the waste water to the wetland should be considered as never occurring.

5.0 Conclusion

The feature is a small (2m by 20m linear) saline natural wetland. It is 50% above and 50% below mean hide springs. It is in a gravel and cobble substrate with no evidence of sewage fungi, slimes or sediments. It is around 70m from the outfall pipe and 60m north of the concrete barrier.

It is a 'significant' and under-represented (rare / threatened) wetland (in terms of the planning tests) and therefore protected under the regional plan (PNRP) and the New Zealand Coastal Policy Statement policy 11.

The NPS FM partially addresses this wetland. In addition, as the NES FM (20920) is not limited to the "inland" or freshwater component of wetland, it addresses (one has to assume all) "natural wetlands".

There will, however, be no adverse effects because of the treated wastewater discharge. This is because of where that discharge is and how much of it, how often that might come in to contact with around 50% of the feature.

Even where a highly diluted form of the treated wastewater did come into contact with the feature only the nutrient component is likely to have any effect and that effect is most likely beneficial (as useful nutrient).

Dr Vaughan Keesing

Senior Ecologist

Boffa Miskell ltd

30.08.2022.

Appendix 1: Method Description

The proposed method for this assessment :

1. View the site in retrolens and look for evidence in the literature of its presence historically.
2. Go to site and view form a vantage point the feature in question (photograph)
3. Determine the heterogeneity of the vegetation, are there 1 or more distinct vegetation communities – roughly map the feature and communities.
4. Check the context and note wider aspects - is the topography and visually present hydrology suggestive of potential wetland?
5. Are there unusual circumstances or effects in play on or influencing the feature?
6. Enter and rapidly assess the vegetation cover dominance and classification (FACU through toOBL (where dominance of FACW and OBKL indicates wetland likely)) -can it be clearly determined to be wetland or dryland?
7. If it cannot be determined- select representative plot positions in each of the identified vegetation communities, several may be required if the communities are variable in cover, record this variability if present.
8. Undertake plot/s placement and species cover percentage cover estimates
9. Apply the wetland dominance test,
10. Using the data and context test natural wetland exclusions
11. If result still ambiguous use the other indicators (noting that given the situation soil cores or soil testing for hydric (in CMA) may not be available or applicable to test.
12. Lastly utilise the prevalence indices.
13. Conclude if a natural wetland under the PNRP and / or the NPS FM
14. Test for significance under policy 23 of the GWRC RPS.
15. Utilise this result to examine NZCPS policy 11 applicability.
16. Use literature, research and similar effects records from experience to determine the likelihood of adverse effects related to the proposed discharge (water level, sedimentation, contaminants), Consider future state up to 2043 and consider also climate change effects.

Relevant policies and protocols

GWRC PNRP (Appeals version 2022)

A natural wetland is - a permanently or intermittently wet area, shallow water and land water margin that supports a natural ecosystem of plants and animals that are adapted to wet conditions, including in the beds of lakes and rivers, the coastal marine area (e.g. saltmarsh), and groundwater-fed wetlands (e.g. springs).

Here the PNRP does not distinguish wetland in the CMA as separate as does the NPS FM (2020)

Natural wetlands do not include:

(a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing former natural wetland); or

(b) a geothermal wetland; or

(c) any area of improved pasture that, at 3 September 2020, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain derived water pooling.

In the case of uncertainty or dispute about the existence or extent of a natural wetland, a regional council must have regard to the Wetland Delineation Protocols available at https://environment.govt.nz/publications/wetland-delineation-protocols/. This is the Clarkson (2013, 2018) wetlands delineation process also now include din the NPS FM (2020) as MfE wetland delineation protocol (2020).

The definition of a wetland in New Zealand is outlined in the RMA (Resource Management Act, 1991):

"Wetland includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions"

A 'Natural Wetland' is defined in the NPS-FM using the same definition as 'Wetland' in the RMA, but with the following exclusions:

(*a*) *A wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former Natural Wetland); or*

(b) A geothermal wetland; or

(c) Any area of improved pasture that, at the commencement sate, is dominated by (that is more than 50 per cent of) exotic pasture species and is subject to temporary rain-derived water pooling.

A revised definition of the exclusions is proposed by MfE (but not yet confirmed) in the Exposure Draft of the NPS-FM. The anticipated date for confirmation of these changes is around November 2022. The proposed changes are below:

(a) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural wetland as part of giving effect to the effects management hierarchy; or

(b) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or

(c) a geothermal wetland; or

(d) a wetland that:

(i) is within an area of pasture; and

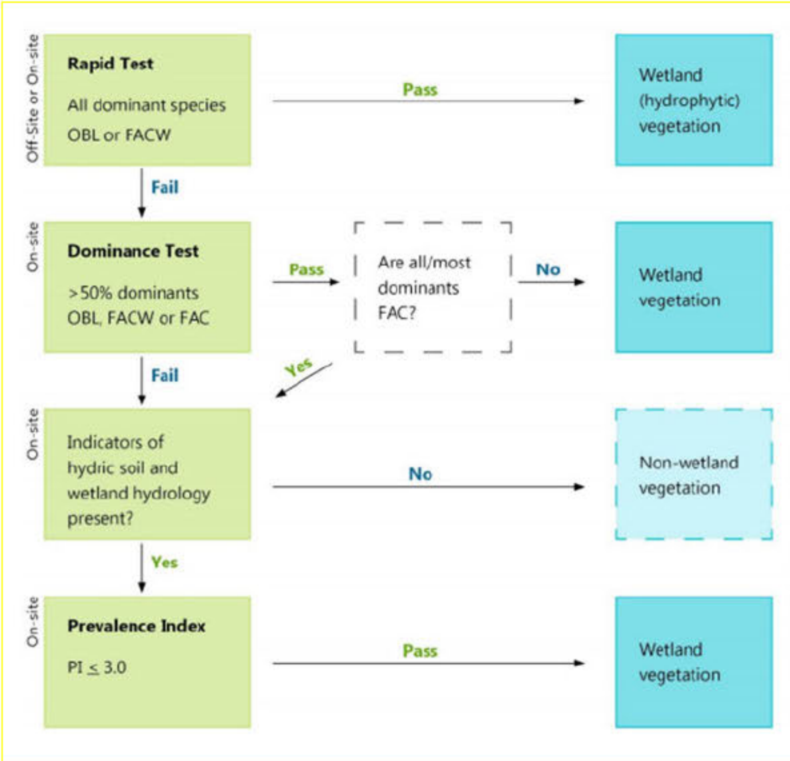
(ii) has ground cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species (see clause 1.8)); and

(iii) is not known to contain threatened species

"**Natural inland wetland**" also means a natural wetland that is not in the coastal mariner area (CMA).

Natural wetland assessment

The below flow chart, published in the wetland delineation protocols (Ministry for the Environment, 2020) outlines the pathway for identifying natural wetlands. However, this does not incorporate initial exclusions from the policy definitions (pasture coverage), so a Pasture Test is carried out following the Rapid Test to determine if the exclusion is met.



The procedure for determining natural wetland status is carried out by establishing broad vegetation communities of a feature and the outer boundaries of a feature and then rapidly visually assessing the dominant species in the communities of the feature, using topography (and hydrology) to assist with these broad areas. Once these areas are identified, three tests (Pasture test, Dominance Index, and Prevalence Index) are conducted to determine wetland viability or otherwise. These tests require at least one representative 2 x 2 m vegetation plot in each established community, whereby the percent cover of all species within the plot is estimated (based on above-ground live biomass). Locations of areas and the delineations which resulted from this are identified in Figure 1.

Each vegetation species identified within a 2 x 2 m vegetation plot is allocated to a prescribed category based on its degree of affinity for water, as described by Clarkson (2013). These categories are:

- **OBL**: Obligate. Almost always is a hydrophyte, rarely in uplands (estimated probability >99% occurrence in wetlands)
- **FACW**: Facultative Wetland. Usually is a hydrophyte but occasionally found in uplands (estimated probability 67–99% occurrence in wetlands)

- **FAC**: Facultative. Commonly occurs as either a hydrophyte or non-hydrophyte (estimated probability 34–66% occurrence in wetlands)
- **FACU**: Facultative Upland. Occasionally is a hydrophyte but usually occurs in uplands (estimated probability 1–33% occurrence in wetlands)
- **UPL**: Obligate Upland. Rarely is a hydrophyte, almost always in uplands (estimated probability <1% occurrence in wetlands)

These categories, in conjunction with percent cover estimates from each plot, feed into the resulting Pasture Test, Dominance Index and Prevalence Index results:

Pasture Test

A Pasture Test considers that if a plot is more than 50% covered in pasture species, it is not considered a "natural wetland", irrespective of the Prevalence/Dominance outcomes, and no further testing is required, as the area meets the natural wetland exclusion definition. It is noted that 'pasture' is currently undefined, but the draft exposure of the NPS-FM provides a restricted list of species which are likely to be the only species considered to be 'pasture' once the draft exposure changes are made, and those have been used in this report.

Dominance Index

This test ascertains the "dominant" species following a 50/20 rule, whereby all species are ranked according to their percentage cover, and the highest covering species are sequentially selected until cumulative coverage exceeds 50%. Any other species which comprise at least 20% coverage are also selected. If more than 50% of the dominant species are OBL, FACW, or FAC species, then the "Dominance Test" threshold is met and the area is considered a natural wetland. However, if there is a large FAC species presence, a Natural Wetland status is assigned with caution. In such a case, hydric soil indicators are used using guidance from the hydric soils guide (Fraser et al., 2018), followed by a Prevalence Test (described below) if further ambiguity is present.

Hydric soils

Hydric soils are considered in ambiguous scenarios, whereby soil is observed to a depth and features typical of hydric soils (e.g. iron mottling, peat, gleying) are noted to aid with wetland determination.

Prevalence Index

Using the vegetation plot percent cover data, a Prevalence Index Score is calculated for each plot. Mathematically, this score must fall between 1 and 5, with 1 indicating entirely wetland species (OBL), and 5 indicating entirely upland species (UPL). A score below 3 is indicative of a wetland/hydrophilic community, though Clarkson (2013) cautions that a score between 2.5 and 3.5 is not reliable for determining a hydrophilic community on vegetation measures alone.

Appendix 2 – Policy 23 criteria from the GWRC operative RPS

District and regional plans shall identify and evaluate indigenous ecosystems and habitats with significant indigenous biodiversity values; these ecosystems and habitats will be considered significant if they meet one or more of the following [ecological] criteria.

Representativeness: the ecosystems or habitats that are typical and characteristic examples of the full range of the original or current natural diversity of ecosystem and habitat types in a district or in the region, and:

- (i) are no longer commonplace (less than about 30% remaining); or
- (ii) are poorly represented in existing protected areas (less than about 20% legally protected).

(b) Rarity: the ecosystem or habitat has biological or physical features that are scarce or threatened in a local, regional or national context. This can include individual species, rare and distinctive biological communities and physical features that are unusual or rare.

(c) Diversity: the ecosystem or habitat has a natural diversity of ecological units, ecosystems, species and physical features within an area.

(d) Ecological context of an area: the ecosystem or habitat:

- (i) enhances connectivity or otherwise buffers representative, rare or diverse indigenous ecosystems and habitats; or
- (ii) provides seasonal or core habitat for protected or threatened indigenous species.

Appendix 3 – Policy 11 NZCPS (2010)

To protect indigenous biological diversity in the coastal environment:

a. avoid adverse effects of activities on:
    i. indigenous taxa[4] that are listed as threatened[5] or at risk in the New Zealand Threat Classification System lists;
    ii. taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;
    iii. indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare[6];
    iv. habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;
    v. areas containing nationally significant examples of indigenous community types; and
    vi. areas set aside for full or partial protection of indigenous biological diversity under other legislation; and
b. avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:
    i. areas of predominantly indigenous vegetation in the coastal environment;
    ii. habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;
    iii. indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;
    iv. habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;
    v. habitats, including areas and routes, important to migratory species; and

vi. ecological corridors, and areas important for linking or maintaining biological values identified under this policy.