NAPIER WASTEWATER TREATMENT PLANT

Performance Evaluation

NAPIER
CITY COUNCIL
Te Kaunihera o Ahuriri

Purpose of the evaluation

Napier City Council holds a consent for the discharge of treated wastewater from the Napier Wastewater Treatment Plant (WWTP) at Awatoto via an ocean outfall to Hawke Bay.

The consent sets limits for some contaminants and requires monitoring of treated wastewater quality and the receiving environment.

It also requires a performance evaluation report to be prepared every three years, which includes a summary of the monitoring results, any non-compliance with consent conditions, an evaluation of any trends and provides an opportunity for public response. This report has been prepared to meet that consent condition, for the period 1 July 2020 to 30 June 2024.

Summary of monitoring and non-compliance

The WWTP has been largely compliant with its resource consent over the past few years. Key findings are:

- Treated wastewater consistently complied with the consent limits for total suspended solids, biochemical oxygen demand and oil and grease loads since May 2022. The load limits were exceeded 12 times prior to that. Since 2020 there has been a downward trend in total suspended solids, biochemical oxygen demand, and oil and grease loads in the treated wastewater.
- The metal and ammonia loads in the treated wastewater were all within the consent limits, apart from zinc which had five instances of high zinc loading.
- Sediment quality near the outfall was consistently within guideline values. Biodiversity south of the outfall was lower than in other areas near the outfall, and this has declined over time, suggesting some negative impacts from the discharge.
- Seawater quality near the outfall was consistently within the consent limits for pH, temperature and dissolved oxygen.
- The concentrations of pathogen indicators (faecal coliforms and Enterococci) showed that water quality near the outfall did not meet recreational water quality guidelines. Water quality at the shoreline was fair after Cyclone Gabrielle, improving to good by July 2023.
- There were five instances where the treated wastewater has not met the “no toxicity to marine organisms” requirement.

Cyclone Gabrielle

On 13 and 14 February 2023, Cyclone Gabrielle caused widespread flooding and subsequent silting when the Tutaekuri River stopbank failed. The WWTP was seriously affected by flooding and could not operate, so untreated wastewater had to be discharged until it was fixed.

During this period, industrial premises were not allowed to discharge into the wastewater system. Instead, they were advised to use sucker trucks to discharge trade waste to the Hastings WWTP while the Napier WWTP was not operational.

NCC released additional public communications during this period, asking the public to reduce water use to ease the pressure on the system.

The WWTP temporarily operated under the Severe Weather Emergency Legislation Act 2023, rather than its resource consent. The WWTP was fully recommissioned on 28 August 2023.

Metal and ammonia loads in treated wastewater

The load of various contaminants in the treated wastewater is measured over seven days every quarter (ammonia, cadmium, chromium, copper, lead, mercury, nickel and zinc).

All contaminants except zinc were consistently below the consent limits. There were five times when the consent limit for zinc was exceeded (Figure 1). It's not clear why zinc was sometimes above the limit.

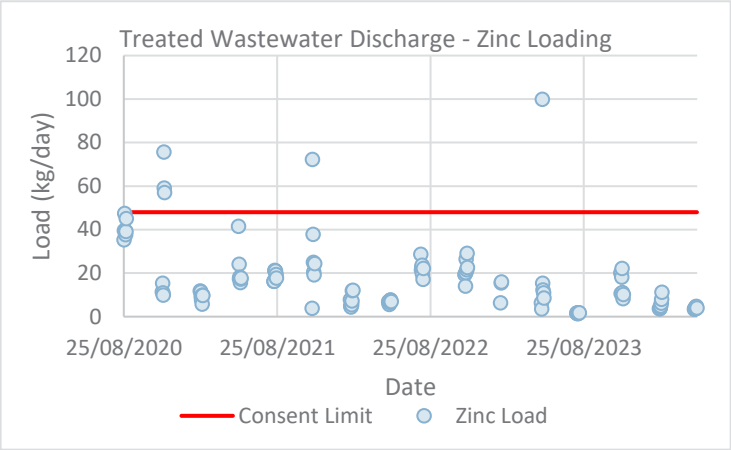


Figure 1: Treated wastewater discharge - zinc loading

Faecal coliforms and Enterococci near the outfall

The concentrations of pathogen indicators (faecal coliforms and Enterococci) did not meet recreational water quality guidelines around the outfall. Water quality at the shoreline was fair after Cyclone Gabrielle, improving to good by July 2023.

Every three months, samples are taken from five locations at 250 m, 300 m and 500 m from the outfall and the concentrations of pathogen indicators (faecal coliforms and Enterococci) are measured. Figures 2 and 3 show the 95th percentile of the test results. There are no consent limits for these parameters, so we compared the results with the recreational water quality guidelines. Most of the test results indicate poor to very poor water quality compared with these guidelines. The control site taken 1000 m from the outfall showed the background water quality was fair.

After Cyclone Gabrielle, NCC undertook additional monitoring along the shoreline, which showed the water quality did not meet recreational water quality guidelines for 4 months after the cyclone but did meet these guidelines from 20 July 2023 (Figures 4 and 5).

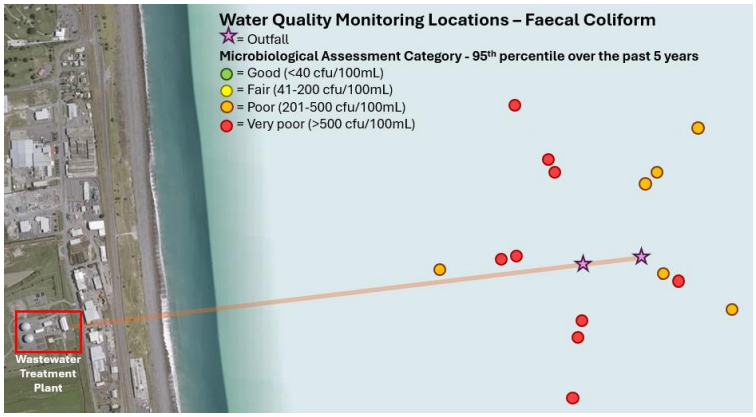


Figure 2: Faecal coliform monitoring around the outfall

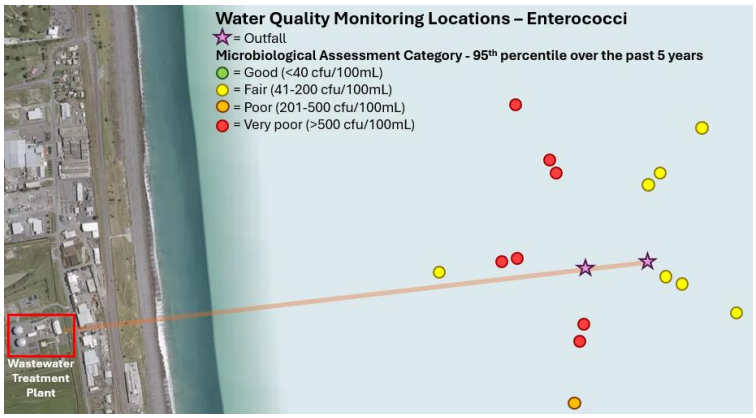


Figure 3: Enterococci monitoring around the outfall

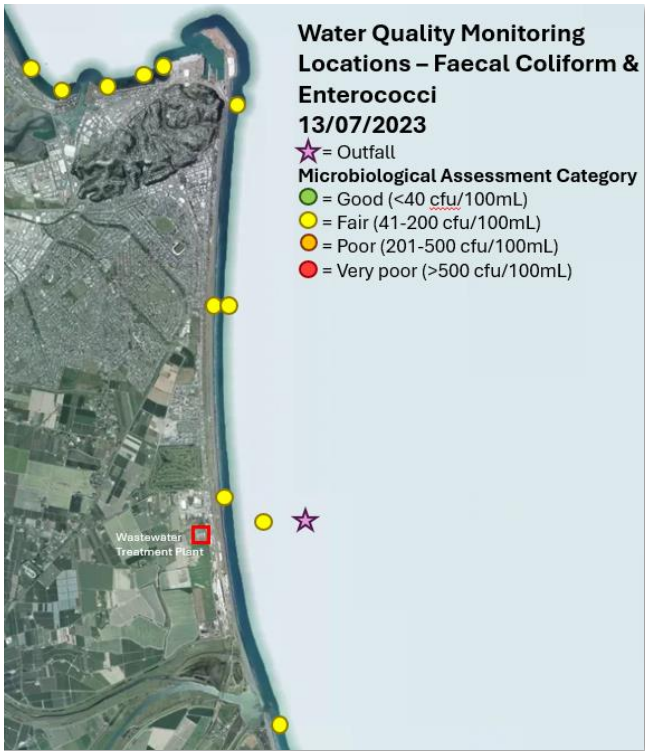


Figure 4: Coastal recreational water quality monitoring 13 July 2023

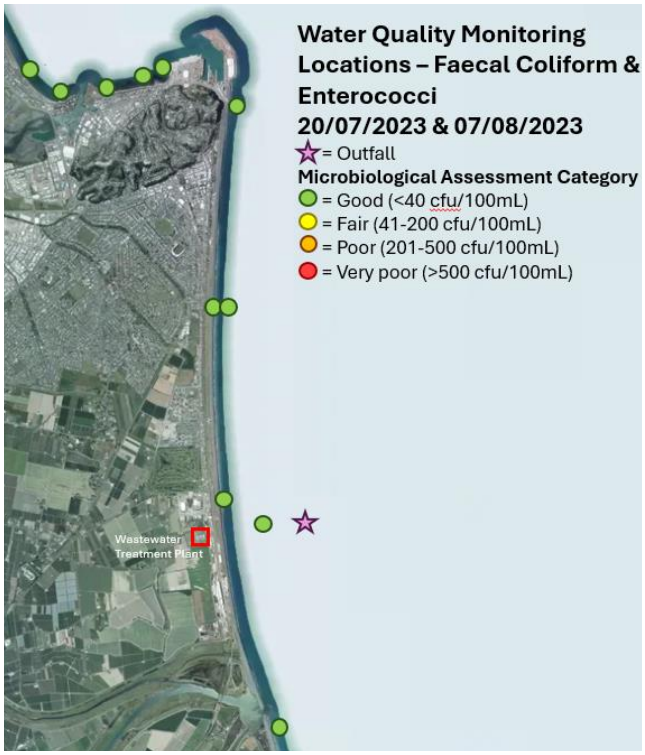


Figure 5: Coastal recreational water quality monitoring 20 July and 7 August

Faecal coliforms and Enterococci in treated wastewater

The concentration of faecal coliforms and Enterococci (indicators of pathogens) in the treated wastewater is consistent throughout the day.

The concentration of faecal coliforms and Enterococci in the treated wastewater is measured throughout one day every three months.

Figure 6 and Figure 7 show the average, maximum and minimum concentration throughout the day. There is no clear difference in concentration at various times of the day.

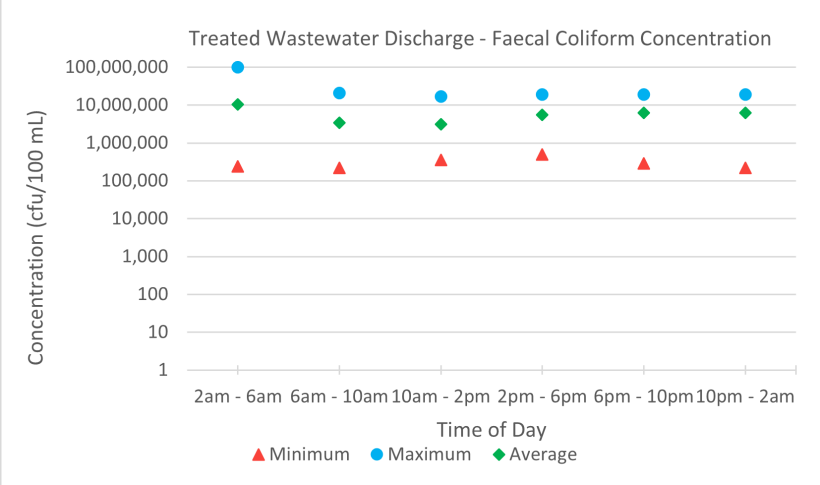


Figure 6: Faecal coliforms concentrations in treated wastewater

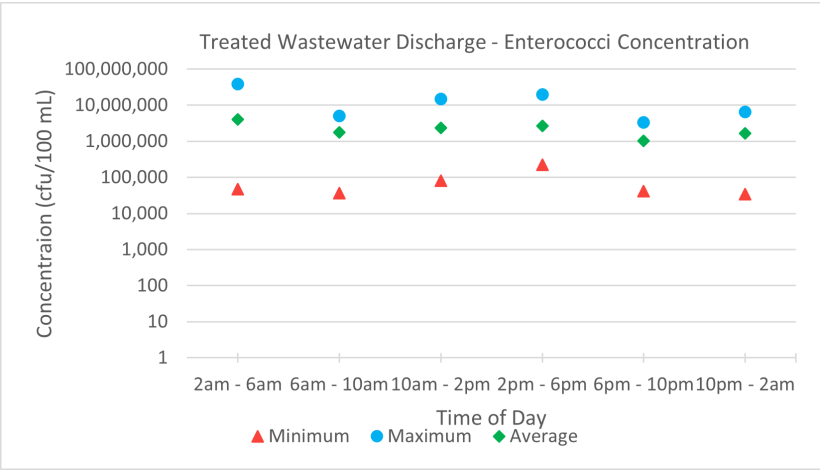


Figure 7: Enterococci concentrations in treated wastewater

Toxicity to marine organisms

There were five instances where the treated wastewater did not meet the "no toxicity to marine organisms" requirement.

Every three months, the toxicity of the treated wastewater to various organisms is tested. The consent requires that there is no environmentally significant and statistically detectable difference in toxicity between a water sample from uncontaminated water and the discharged wastewater when diluted 200 times with the uncontaminated water.

The testing results in Table 1 show the "no toxicity" requirements were generally met. However, there were five times when the "no toxicity" requirements were not met.

There were five times when the testing criteria was not met. This was because the increase in cell density was too high, organisms died during testing or the embryos in the control didn't have normal development.

- "No toxicity" requirements were not met
- Testing criteria not met
- No toxicity and environmental significance

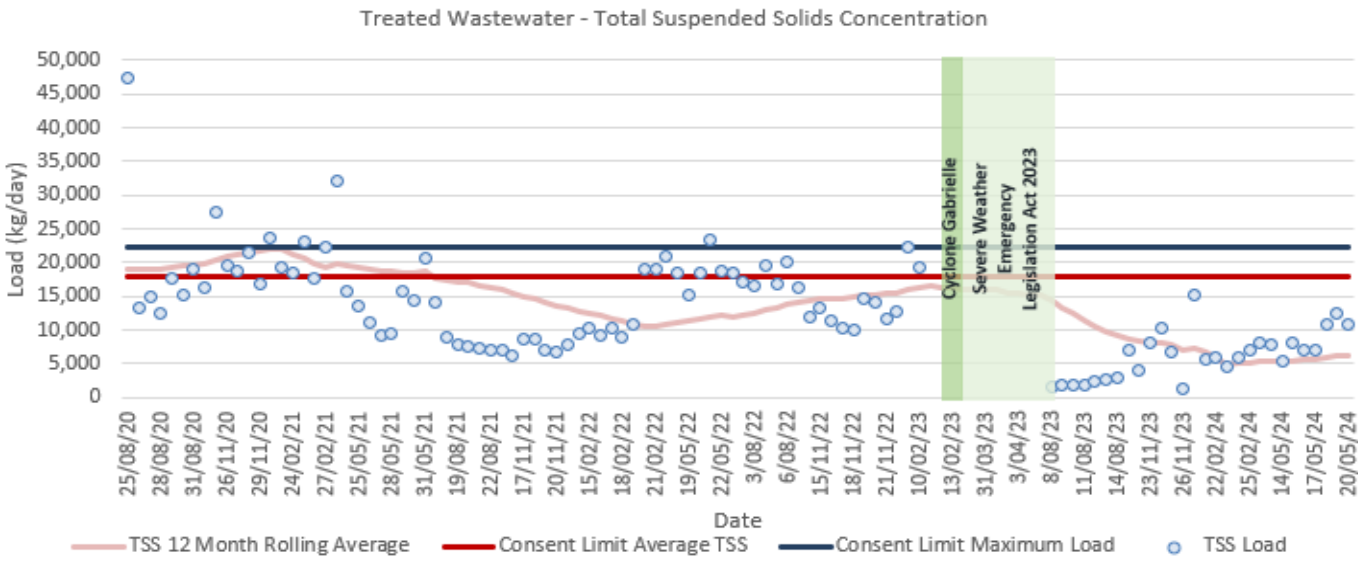
	BLUE MUSSEL	GREEN MICROALGAE	WEDGE SHELL
Sep-20			
Dec-20			
Mar-21			
Jun-21			
Aug-21			
Nov-21			
Feb-22			
May-22			
Aug-22			
Nov-22			
Feb-23			
Jun-23			
Aug-23			
Nov-23			
Feb-24			
May-24			

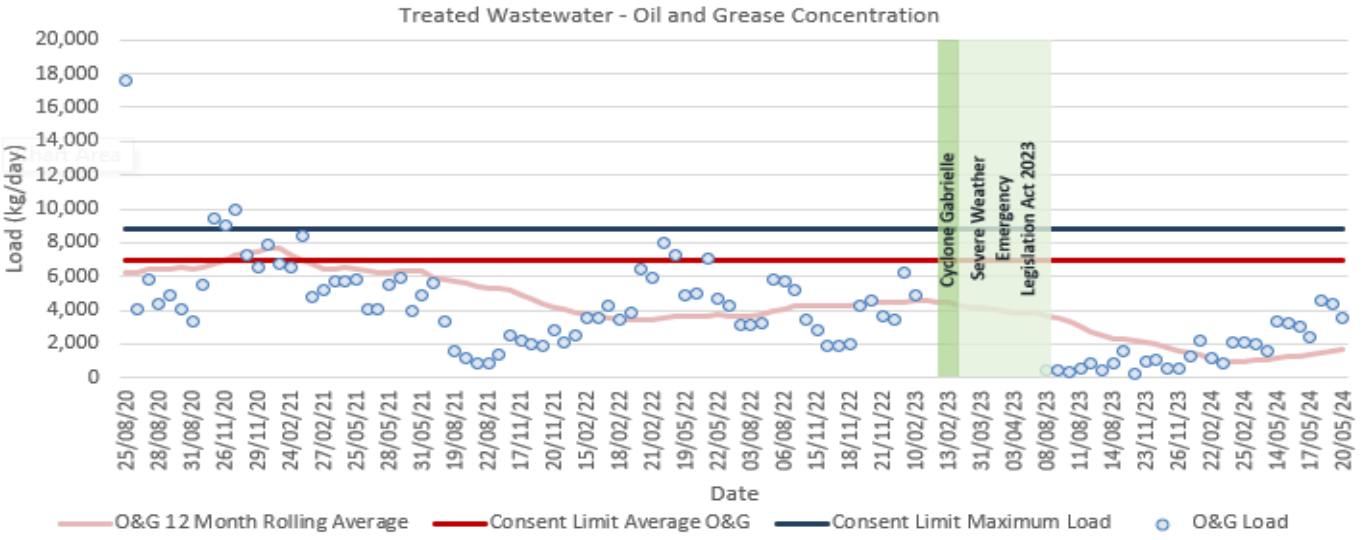
Total suspended solids, biochemical oxygen demand, and oil and grease loads in treated wastewater

Treated wastewater consistently complied with the consent limits for total suspended solids, biochemical oxygen demand and oil and grease since May 2022. The load limits were exceeded 12 times prior to that. Since 2020 there has been a downward trend in total suspended solids, biochemical oxygen demand, and oil and grease loads in the treated wastewater. NCC adopted the Trade Waste and Wastewater Bylaw in 2022 and is implementing it in stages.

The total suspended solids, biochemical oxygen demand, and oil and grease load is measured in the treated wastewater over seven days each quarter. Between 2020 and 2022, the maximum load limit for total suspended solids was exceeded six times. In 2020, the maximum load limit for oil and grease was exceeded four times and the limit for biochemical oxygen demand was exceeded twice. Since 2020, there has been a decline in the rolling 12-month average load and the treated wastewater consistently complied with the consent limits since May 2022.

Loads were significantly lower after Cyclone Gabrielle, possibly due to businesses not operating at full capacity. There was a gradual increase in loads over the past year, but they remained lower than pre-cyclone.


Treated Wastewater - Total Suspended Solids Concentration
Load (kg/day)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Cyclone Gabrielle
Severe Weather
Emergency
Legislation Act 2023
25/08/20
28/08/20
31/08/20
26/11/20
29/11/20
24/02/21
27/02/21
25/05/21
28/05/21
31/05/21
19/08/21
22/08/21
17/11/21
20/11/21
15/02/22
18/02/22
21/02/22
19/05/22
22/05/22
3/08/22
6/08/22
15/11/22
18/11/22
21/11/22
10/02/23
13/02/23
31/03/23
3/04/23
8/08/23
11/08/23
14/08/23
23/11/23
26/11/23
22/02/24
25/02/24
14/05/24
17/05/24
20/05/24
Date
TSS 12 Month Rolling Average
Consent Limit Average TSS
Consent Limit Maximum Load
TSS Load


Treated Wastewater - Oil and Grease Concentration
Load (kg/day)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Cyclone Gabrielle
Severe Weather
Emergency
Legislation Act 2023
25/08/20
28/08/20
31/08/20
26/11/20
29/11/20
24/02/21
27/02/21
25/05/21
28/05/21
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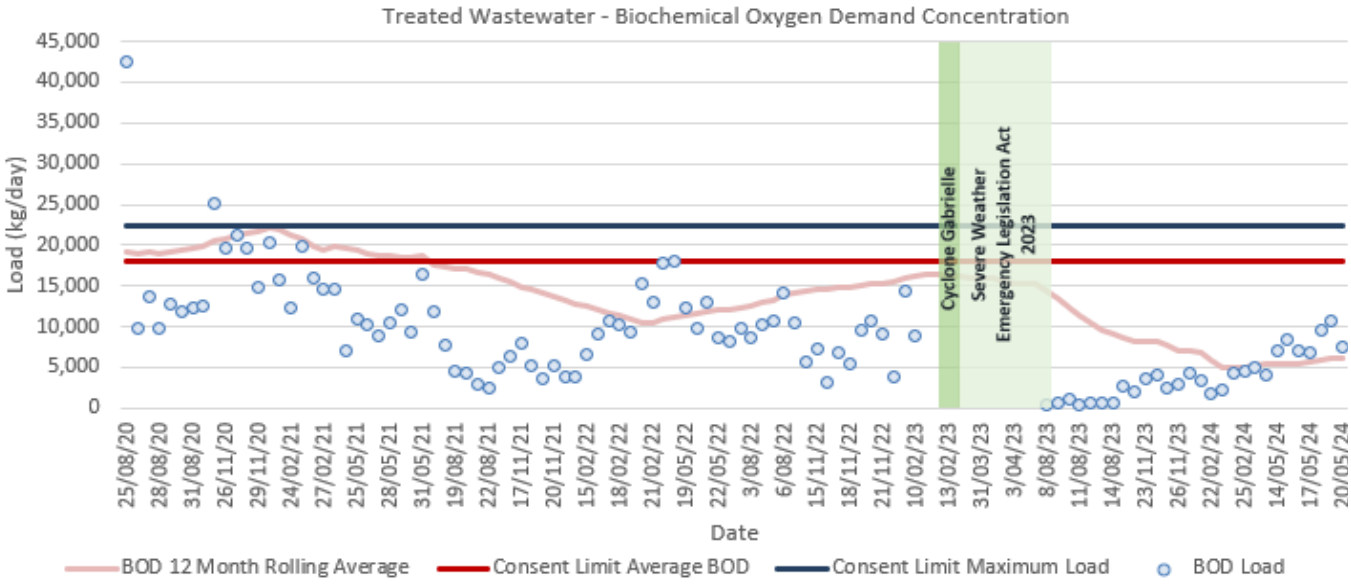
03/04/23
08/08/23
11/08/23
14/08/23
23/11/23
26/11/23
22/02/24
25/02/24
14/05/24
17/05/24
20/05/24
Date
O&G 12 Month Rolling Average
Consent Limit Average O&G
Consent Limit Maximum Load
O&G Load


Treated Wastewater - Biochemical Oxygen Demand Concentration
Load (kg/day)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Cyclone Gabrielle
Severe Weather
Emergency Legislation Act
2023
25/08/20
28/08/20
31/08/20
26/11/20
29/11/20
24/02/21
27/02/21
25/05/21
28/05/21
31/05/21
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10/02/23
13/02/23
31/03/23
3/04/23
8/08/23
11/08/23
14/08/23
23/11/23
26/11/23
22/02/24
25/02/24
14/05/24
17/05/24
20/05/24
Date
BOD 12 Month Rolling Average
Consent Limit Average BOD
Consent Limit Maximum Load
BOD Load

Sediment Testing

Sediment quality near the outfall was consistently within the guideline values. Biodiversity south of the outfall was lower than in other areas near the outfall, and this has declined over time, suggesting some negative impacts from the discharge.

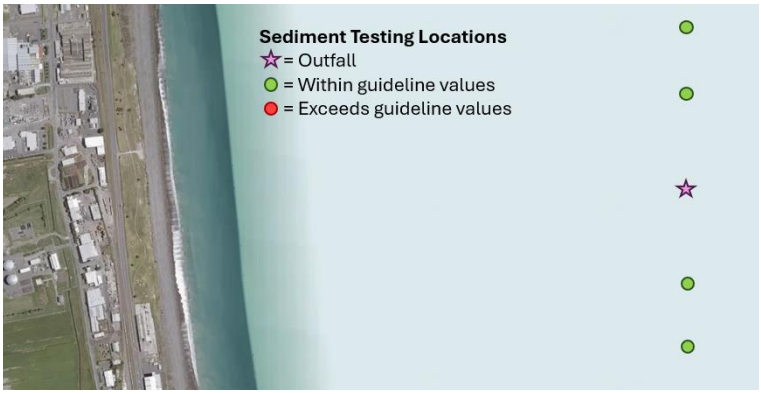

Figure 8: Sediment Testing

Twice a year seabed sediment samples are collected 300 m and 500 m north and south of the outfall diffuser. The samples are analysed for arsenic, cadmium, chromium, copper, mercury, nickel, lead, selenium and zinc. As metals accumulate in sediment, this provides a good measure of the effect of the discharge over time. The results are summarised in Figure 8. All results were within the guideline values for sediment quality (ANZECC & ARMCANZ, 2000).

A seabed ecology and sediment quality survey undertaken in 2021 showed sites south of the outfall had slightly higher organic matter in the sediment and this was reflected in the types of organisms present. Biodiversity south of the outfall was lower than in other areas near the outfall, and this had declined over time, suggesting some negative impacts from the discharge.

Cyclone Gabrielle resulted in significant volumes of silt being deposited into the marine environment from the rivers. This has caused a shift in benthic communities and the effects of the silt will likely be seen for some time.

Dissolved oxygen, temperature and pH near the outfall

Seawater quality near the outfall was consistently within the consent limits for pH, temperature and dissolved oxygen.

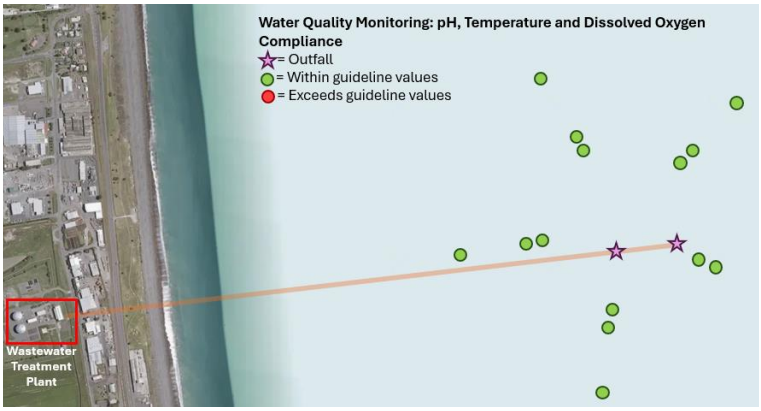

Figure 9: Water Quality Monitoring: pH, temperature, dissolved oxygen

Every three months, samples are taken at a 250 m, 300 m and 500 m radius from the outfall diffuser. The results are summarised in Figure 9. Turbidity, pH, dissolved oxygen and temperature are measured and must comply with the following:

- pH must remain between 6.5-8.5 within 300 m from the outfall.
- Dissolved oxygen must be above 80% saturation.
- The temperature cannot change by more than 3 degrees Celsius.

Biological Trickling Filter Performance

The performance of the biological trickling filter was fairly consistent in reducing biochemical oxygen demand and oil and grease. Its performance was more variable for reducing total suspended solids, with an increase in suspended solids through the biological trickling filter in November 2022. This may have been an anomaly as the bi-weekly data taken at the same time showed a reduction by 32%.

The performance of the biological trickling filter is measured every three months. It is measured by taking a 24-hour flow proportional sample of wastewater before and after the biological trickling filters. The average percentage reduction is shown in Figure 10.

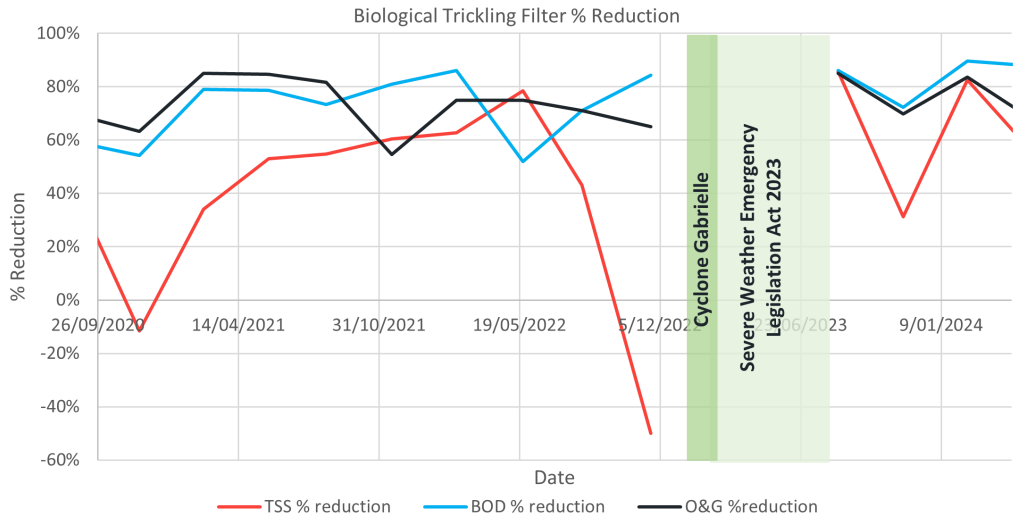

Figure 10: Biological Trickling Filter Performance

Outfall Pipe and Diffuser Condition

The outfall pipe and its diffusers were maintained by regularly sending out a dive team to inspect and clean them. The dive reports indicated that diffuser ports 36-45 were often blocked and not flowing. Some of the diffuser pipe was often buried under the seabed and full of sediment. The diffusers were then cleaned out to allow flow through them.

After Cyclone Gabrielle, a dive team was sent to inspect the outfall to check that it continued to operate properly despite the lack of treatment.

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