Wellington Water

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

Moa Point Wastewater Treatment Plant

Annual Resource Consents Report 2021/2022

Your public water company

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Control Sheet

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0	Draft	25/07/2022	First version of report for review
1	Final	27/07/2022	Approved, Manager Wastewater Contracts

Executive Summary

This report has been prepared on behalf of the Wellington City Council (WCC) for compliance with the following resource consents:

WGN080003 [31505]

This discharge permit allows WCC to continuously discharge up to 260,000 cubic meters per day of secondary treated and disinfected wastewater from the Moa Point Wastewater Treatment Plant into the coastal marine area via an existing submarine outfall. The coastal marine area is designated between map references NZMS 260: R27; 2660742.5982398 and NZMS 260: R27; 2660710.5982311.

WGN080003 [35047]

This coastal permit allows WCC to occasionally discharge up to 4500 litres per second of mixed disinfected secondary treated and milli-screened wastewater to the coastal marine area via an existing submarine outfall during and/or immediately after heavy rainfall, when the quantity of wastewater arriving at the Moa Point Wastewater Treatment Plant exceeds 3000 litres per second. The coastal marine area is designated between map references NZMS 260: R27; 2660742.5982398 and NZMS 260: R27; 2660710.5982311.

WGN080003 [26182]

This coastal permit allows WCC to occupy the foreshore and seabed of the coastal marine area with an existing submarine outfall pipeline. The coastal marine area is designated between map references NZMS 260: R27; 2660742.5982398 and NZMS 260: R27; 2660710.5982311.

WGN080003 [26183]

This discharge permit allows WCC to continuously discharge contaminants (including odour) to air from the Moa Point Wastewater Treatment Plan ventilation system. The Moa Point WWTP is located at map reference NZMS 260: R27; 2661614.5984078.

The report will cover the period from 1 July 2021 to 30 June 2022.

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Resource Consent

WGN080003 [31505]

Effluent discharge from the Moa Point WWTP is governed by the resource consent under the Greater Wellington Regional Council consent file number WGN8003 [31505]. In general, the consent allows the continuous discharge of up to 260,000 cubic metres per day of secondary treated and disinfected wastewater from Moa Point Wastewater Treatment Plant into coastal marine area via an existing submarine outfall.

The following outlines the conditions of this resource consent required for this report.

WGN980003 [35047]

In addition to the above resource consent, the discharge from the Moa Point WWTP is governed by another resource consent under the Greater Wellington Regional Council consent file number WGN8003 [35047]. In general, the consent allows the discharge up to 4500 litres per second of mixed disinfected secondary treated and milli-screened wastewater to the coastal marine area via an existing submarine outfall during and/or immediately after heavy rainfall, when the quantity of wastewater arriving at the Moa Point Wastewater Treatment Plant exceeds 3000 litres per second.

The following will also outline the conditions of this resource consent required for this report.

WGN980003 [26182]

The outfall pipeline from the Moa Point WWTP is governed by the resource consent under the Greater Wellington Regional Council consent file number WGN8003 [26182]. In general, the WCC is allowed to occupy the foreshore and seabed of the coastal marine area with an existing submarine outfall pipeline.

The following will also outline the conditions of this resource consent required for this report.

WGN980003 [26183]

Emissions from the Moa Point WWTP are governed by the resource consent under the Greater Wellington Regional Council consent file number WGN8003 [26183]. In general, the WCC is allowed to continuously discharge contaminants (including odour) to air from Moa Point Wastewater Treatment Plan ventilation system.

The following will also outline the conditions of this resource consent required for this report.

WGN080003 [31505]

Condition (5)

The permit holder shall continue to engage with the Moa Point Community Liaison Group (CLG) established and maintained under the Wellington City Council destination. A summary of each meeting that includes, but is not limited to, issues discussed, actions agreed upon and any follow-up on agreed actions from previous meetings shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council within 10 working days of each CLG meeting.

A CLG meeting was held on 9th September 2022. The minutes of the meeting was sent to the group.

Condition (6)

The permit holder shall continuously monitor and record the flow rate and volume of treated wastewater entering the submarine outfall pipeline, to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council. A summary of the records listing the daily discharge volumes and average and maximum flow rates shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council at quarterly intervals, in accordance with condition 19 of this permit.

Although the data requested in Condition (6) is not a requirement for the annual report, the total daily effluent volume is shown.

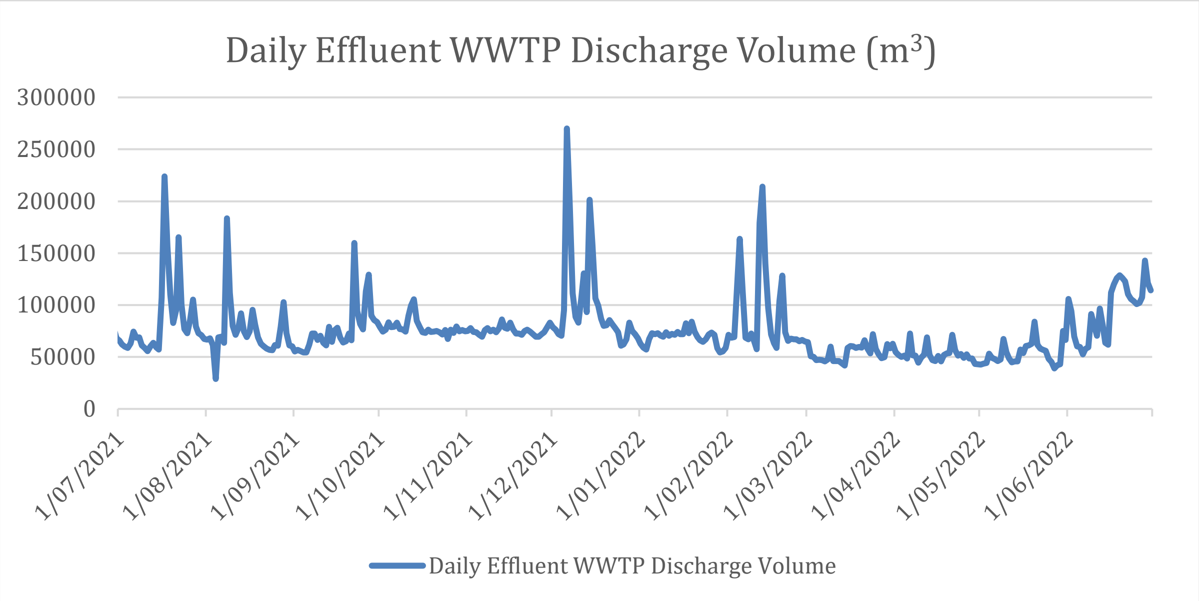


Figure 1: Moa Point WWTP Effluent Discharge Volume

Condition (10)

The wastewater discharged from the Moa Point Wastewater Treatment Plant to the coastal waters shall comply with the following effluent quality criteria:

(a) $cBOD_5$

The geometric mean of 90 consecutive daily sampling results shall not exceed 20g/m^3 and no more than 10% of 90 consecutive sample results shall exceed 45g/m^3.

(b) Suspended solids

The geometric mean of 90 consecutive daily sampling results shall not exceed 30g/m^3 and no more than 10% of 90 consecutive sample results shall exceed 68g/m^3.

(c) Faecal Coliforms

The geometric mean of 90 consecutive daily sampling results shall not exceed 200 colony forming units per 100mL and no more than 10% of 90 consecutive sample results shall exceed 950 colony forming units per 100mL.

Compliance with the effluent quality criteria shall be determined from the results of wastewater monitoring undertaken in accordance with conditions (9)(a) and (9) (b) of this permit, with running geometric mean and ninetieth percentile calculated following each sampling event using the preceding 90 consecutive sample results.

Section (a)

Below is a summary of the geometric mean and ninetieth percentile for the Carbonaceous Biological Oxygen Demand.

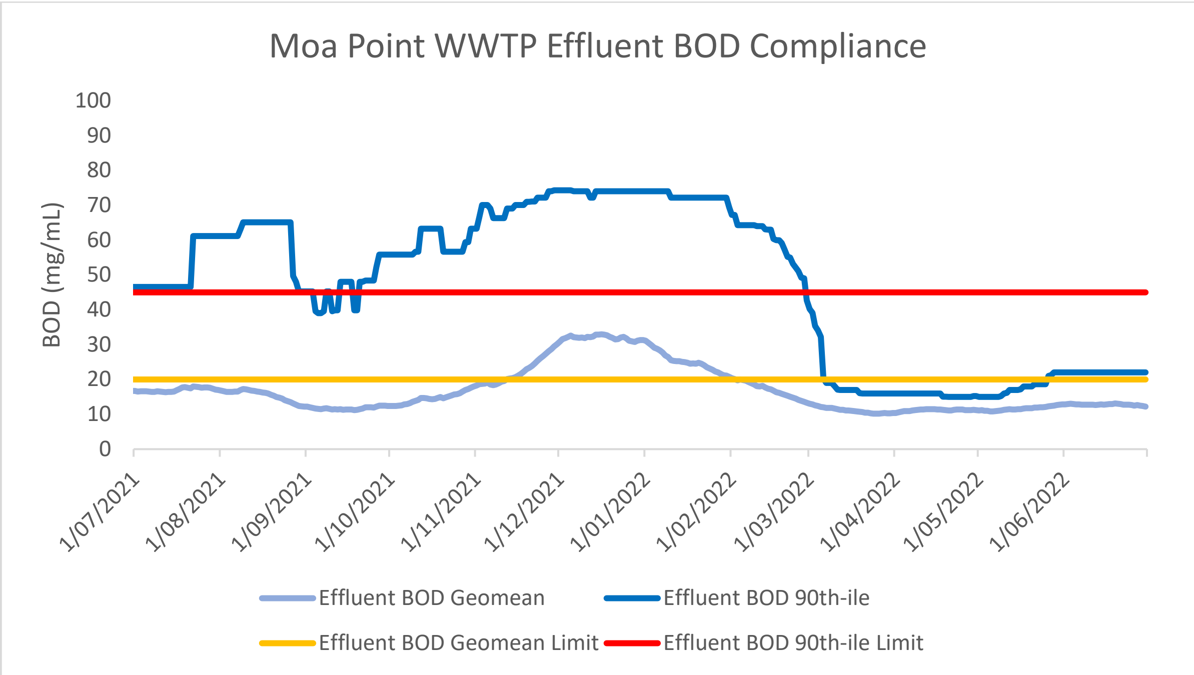


Figure 2: Effluent Carbonaceous Biological Oxygen Demand Results Geometric Mean and 90th Percentile

A graphical representation of the daily effluent results can be found in Appendix i: Daily Effluent Results. The daily values can be found in quarterly reports and certificates of laboratory analysis can be provided upon request.

Section (b)

Below is a summary of the geometric mean and ninetieth percentile for the Suspended Solids.

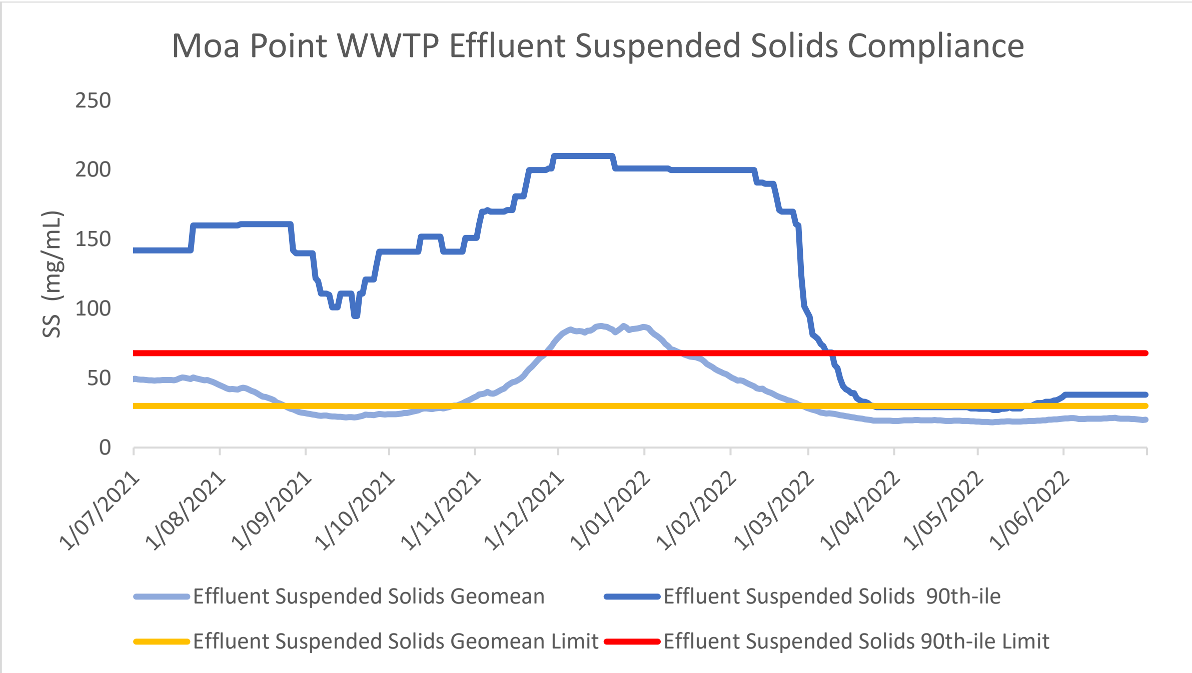


Figure 3: Effluent Suspended Solids Results Geometric Mean and 90th Percentile

A graphical representation of the daily effluent results can be found in Appendix i: Daily Effluent Results. The daily values can be found in quarterly reports and certificates of laboratory analysis can be provided upon request.

Section (c)

Below is a summary of the geometric mean and ninetieth percentile for the Faecal Coliforms.

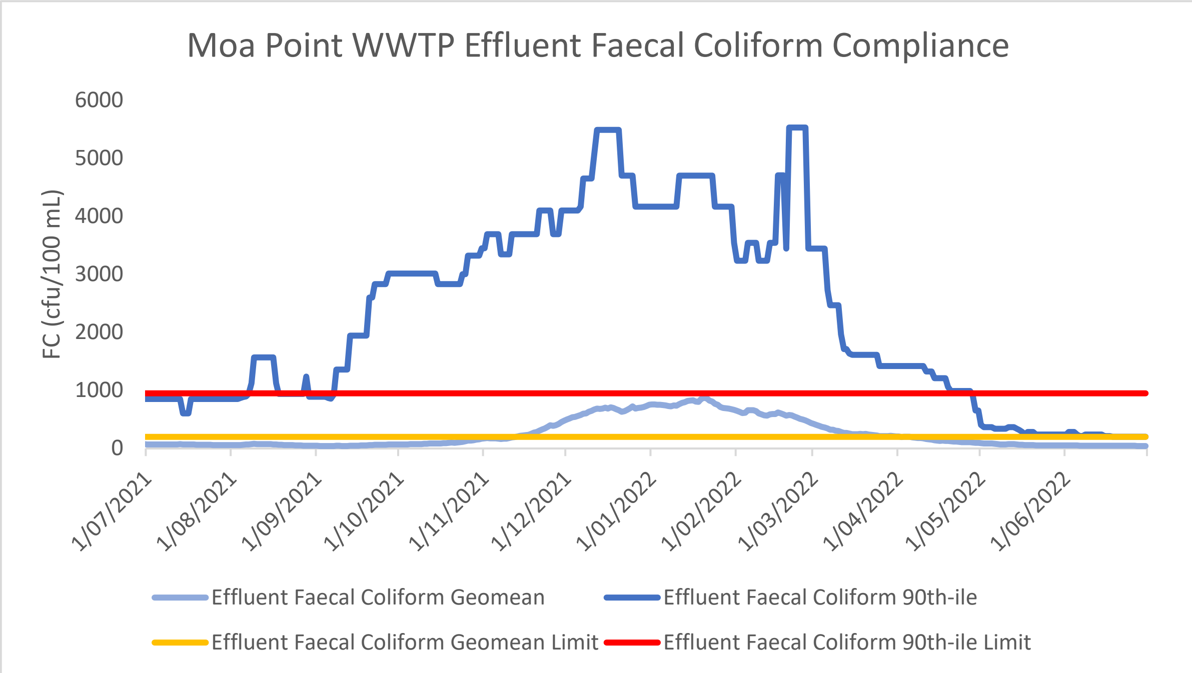


Figure 4: Effluent Faecal Coliform Geometric Mean, and 90th Percentile

A graphical representation of the daily effluent results can be found in Appendix i: Daily Effluent Results. The daily values can be found in quarterly reports and certificates of laboratory analysis can be provided upon request.

Condition (11)

The permit holder shall at least once every three months obtain a sample of the treated wastewater discharged from the treatment plant to the outfall. This sample shall be analyzed for and not exceed the following:

Total arsenic	0.26g/m³
Total cadmium	0.08 g/m³
Total chromium	0.48 g/m³
Total copper	0.14 g/m³
Total lead	0.48 g/m³
Total mercury	0.01 g/m³
Total nickel	0.77 g/m³
Total zinc	1.65 g/m³
Phenol	0.80 g/m³
Cyanide as CN	0.10 g/m³

The sample shall also be analysed for: pH Ammoniacal Nitrogen Oil and Grease

Below is a summary of the analytical results for the quarterly effluent samples.

Compound	Units	Limit	29 July 2021	18 October 2021	27 January 2022	6 April 2022
Total arsenic	g/m^3	0.26	0.001	0.00086	0.00	0.00
Total cadmium	g/m^3	0.08	0.00025	5E-05	0.00	0.00
Total chromium	g/m^3	0.48	0.0025	0.00067	0.00	0.00
Total copper	g/m^3	0.14	0.0036	0.0088	0.01	0.00
Total lead	g/m^3	0.48	0.0005	0.00058	0.00	0.00
Total mercury	g/m^3	0.01	0.00025	5E-05	0.00	0.00
Total nickel	g/m^3	0.77	0.0012	0.0013	0.00	0.00
Total zinc	g/m^3	1.65	0.016	0.04	0.04	0.04
Phenol	g/m^3	0.8	0.002	0.02	0.00	0.00
Cyanide as CN	g/m^3	0.1	0.005	0.005	0.00	0.00
pH	N/A	N/A	7	7	7.00	6.70
Ammoniacal Nitrogen	g/m^3	N/A	7.94	12.90	10.00	5.12
Oil and Grease	g/m^3	N/A	7	14	8.00	8.40

Table 1: Quarterly Effluent Sample Results

The analytical data sheet results can be viewed in the Moa Point WWTP quarterly reports. All analytical results for the quarterly effluent samples are well below the limits set in the resource consent. This is because of the lack of heavy industry in Wellington City.

All data for the 2021/2022 reporting year is compliant.

Condition (13)

The permit holder shall notify the Manager, Environmental Regulation, Wellington Regional Council immediately in the event that a running geometric mean and/or ninetieth percentile effluent quality value or other value calculated following each wastewater quality sampling event exceeds the criteria stipulated in conditions 10 and 11 of this permit for more than three consecutive sampling events. Such a notification shall include the likely reason for exceedance, and measures to be undertaken by the permit holder to remedy the situation. The permit holder shall also immediately notify the Medical Officer of Health of any such event.

The plant was not able to consistently meet the consent requirements for effluent quality for this reporting period due to BOD, faecal coliforms and suspended solids non-compliances. The exceedances can be majorly attributed to asset failures. A please explain letter was received on the 3rd of March 2022, and a response was forwarded to the regional council on the 8th April.

Condition (20)

The permit holder shall provide to the Manager, Environmental Regulation, Wellington Regional Council an Annual Assessment and Analysis Report for the period 1 July to 30 June by 31 July each year summarising compliance with the conditions of this permit. This report shall include, but not be limited to the following:

a) A summary of all monitoring undertaken in accordance with the conditions of this permit and a critical analysis of the information in terms of compliance and adverse environmental effects;
b) A comparison of data with previously collected data in order to identify any emerging trends;
c) Comments on compliance with the conditions of this permit;
d) Any reasons for non-compliance or difficulties in achieving compliance with the conditions of this permit;
e) Any measures that have been undertaken to improve the environmental performance of the wastewater treatment and disposal system;
f) A copy of any complaints recorded (in accordance with condition 18 of this permit) during the year;
g) Any other issues considered to be important;

A copy of the repot shall be provided to Community Liaison Group, Te Atiawa, Te Runanganui O Taranaki Whanui kit e Upoko o te Ika a Maui, Ngati Toa Rangatira and the Wellington Tenths Trust, if requested.

Section (a)

Table 2 summarises all the treatment plant data monitored from July 2021 to June 2022. The median, minimum and maximum values are tabulated for each parameter.

Parameter	Units	Geomean Limit	N	Minimum	Median	90th Percentile	Maximum
WWTP Effluent Discharge	m^3	260,000	365	28840	70740	106113	270060
Daily Effluent BOD	g/m^3	20	365	2	13	55	310
Daily Effluent Suspended Solids	g/m^3	30	365	2	24	146	580
Daily Effluent Faecal Coliform	cfu/100mL	200	365	2	119	2530.11558	322012

Table 2: Summary of Monitoring Results

An assessment of environmental effects of the effluent non-compliances had been submitted to the regional council. A copy of this report can be found on Appendix ii.

Section (b)

A comparison of data was made between 2021/2022 reporting period and the previous four (4) years. The following section summarizes that comparison.

WWTP Effluent Discharge Volume:

WWTP effluent discharge volume is used to establish a trend. The effluent volumes have been plotted for the last 5 years. The discharge flow increases during winter season and decreases in summer.

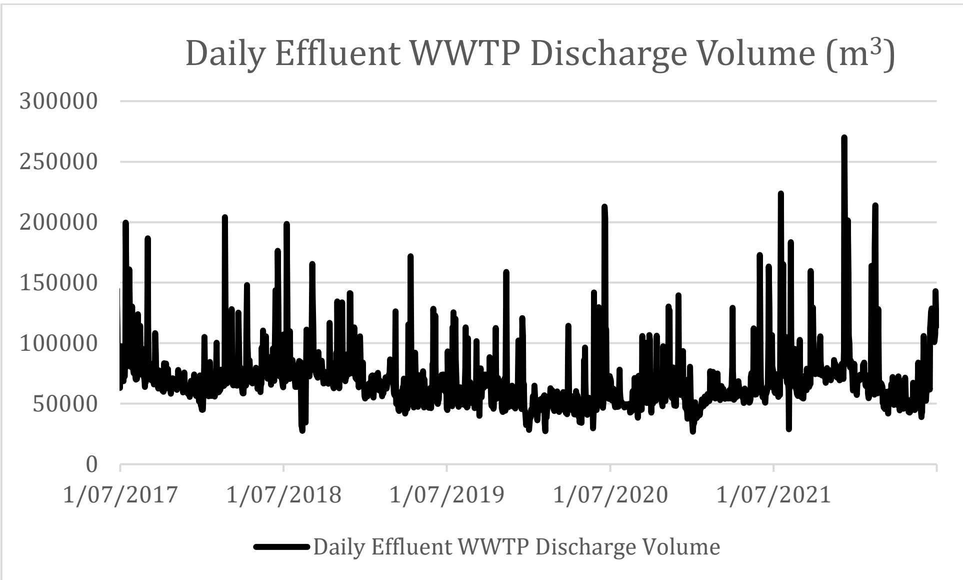


Figure 5: WWTP Effluent Discharge Volume

WWTP Effluent BOD$_5$:

To establish a trend, all daily effluent BOD in the last five years have been used.

There were exceedances in the effluent BOD results in the past two financial years which can be majorly attributed to a series of asset failures in the treatment plant. The daily results are now returning to be below consent limits since the end of FY2021/2022.

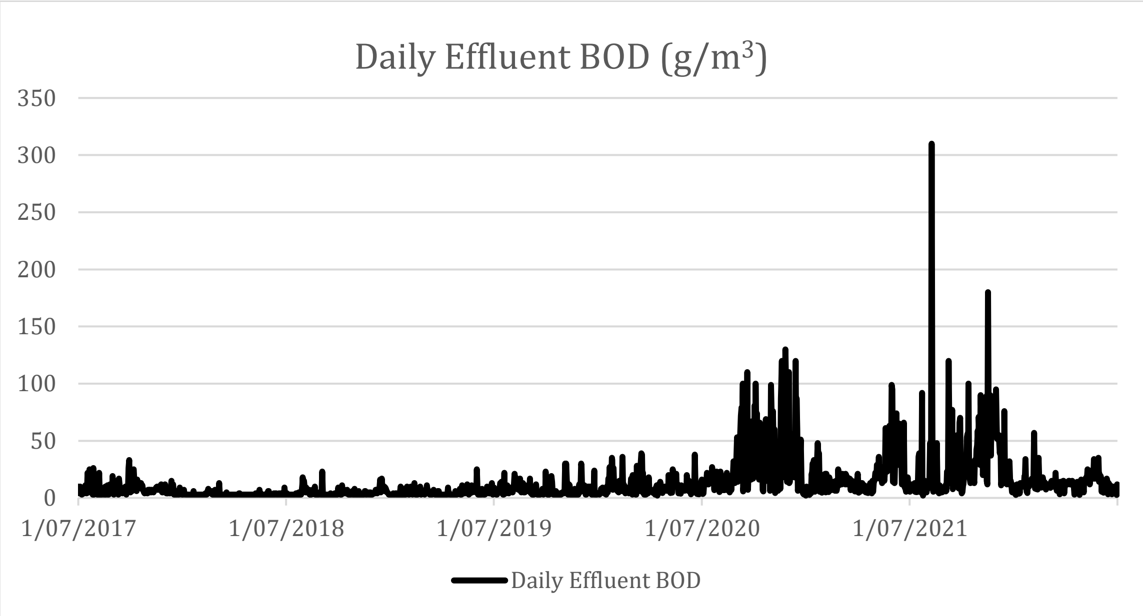


Figure 6: Daily Effluent BOD Results

WWTP effluent suspended solids:

To establish a trend, all daily effluent suspended solids in the last five years have been used.

There were exceedances in the effluent suspended solids results in the past two financial years which can be majorly attributed to a series of asset failures in the treatment plant. The daily results are now returning to be below consent limits since the end of FY2021/2022.

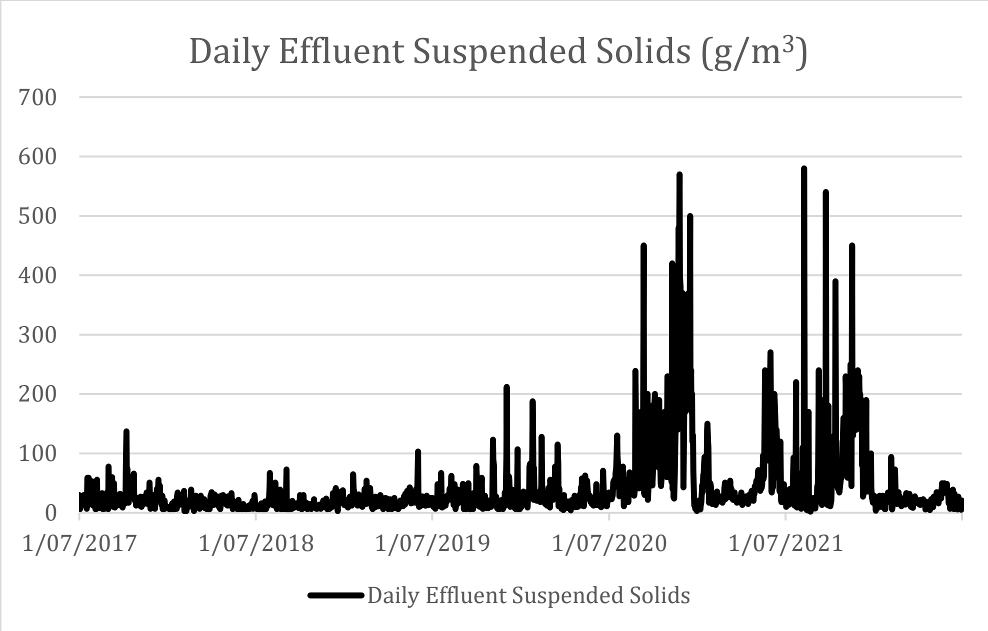


Figure 7: Daily Effluent Suspended Solids Results

WWTP effluent faecal coliform:

To establish a trend, all daily effluent faecal coliform in the last five years have been used.

There were exceedances in the effluent faecal coliform results in the past two financial years which can be majorly attributed to a series of asset failures at the treatment plant. The daily results are now returning to be below consent limits since the end of FY2021/2022.

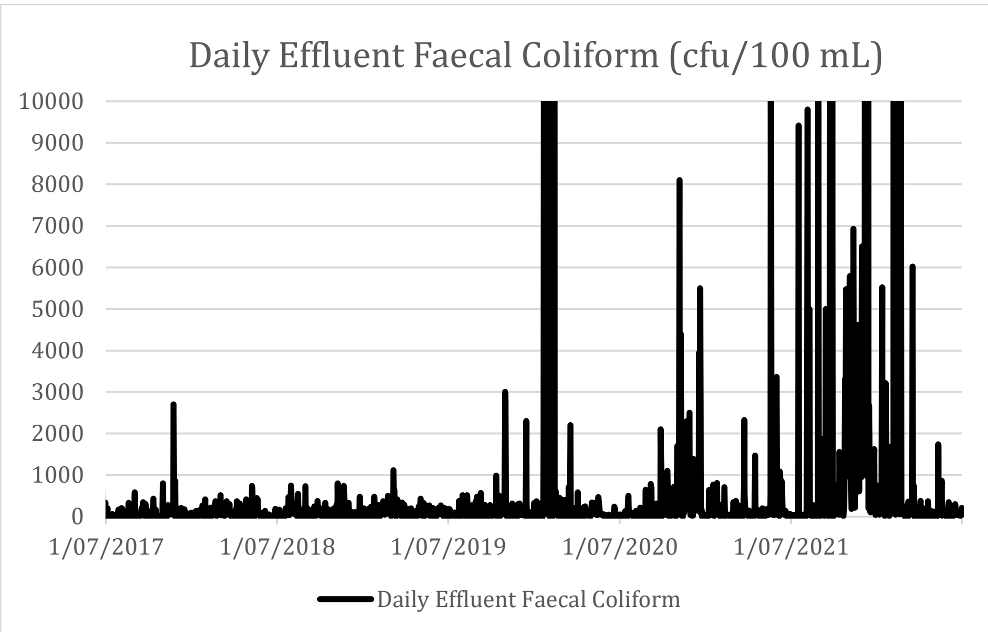


Figure 8: Daily Effluent Faecal Coliform Results

The following is a comparison of the analytical results for the quarterly effluent sample:

Parameters	Units	Limits	July - September					October - December					January - March					April - June				
			2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022
Total arsenic	g/m^3	0.26	0.002	0.002	0.002	0.0009	0.001	0.002	0.002	0.002	0.0013	0.00086	0.002	0.002	<0.002	0.001	0.00	0.010	0.002	<0.001	0.001	0.00
Total cadmium	g/m^3	0.08	0.001	0.001	0.001	0.0001	0.00025	0.001	0.001	0.001	0.0003	5E-05	0.001	0.001	<0.001	0.0001	0.00	0.001	0.001	<0.001	0.0003	0.00
Total chromium	g/m^3	0.48	0.001	0.001	0.001	0.0009	0.0025	0.001	0.001	0.001	0.0025	0.00067	0.001	0.001	0.001	0.0012	0.00	0.002	0.003	<0.001	0.0025	0.00
Total copper	g/m^3	0.14	0.015	0.010	0.004	0.0037	0.0036	0.017	0.013	0.004	0.026	0.0088	0.003	0.010	0.015	0.0220	0.01	0.006	0.020	0.0037	0.0091	0.00
Total lead	g/m^3	0.48	0.001	0.001	0.001	0.0004	0.0005	0.001	0.001	0.001	0.002	0.00058	0.001	0.001	0.001	0.0016	0.00	0.001	0.001	<0.001	0.0006	0.00
Total mercury	g/m^3	0.01	0.0005	0.0005	0.0005	0.0001	0.00025	0.0005	0.0005	0.0005	0.0003	5E-05	0.0005	0.0005	0.0005	0.0001	0.00	0.0005	0.0005	<0.001	0.0003	0.00
Total nickel	g/m^3	0.77	0.001	0.001	0.001	0.0011	0.0012	0.001	0.001	0.001	0.0015	0.0013	0.001	0.001	0.002	0.0012	0.00	0.002	0.001	0.0011	0.0014	0.00
Total zinc	g/m^3	1.65	0.045	0.025	0.017	0.039	0.0160	0.041	0.032	0.017	0.049	0.034	0.029	0.032	0.044	0.0490	0.04	0.046	0.038	0.039	0.0340	0.04
Phenol	g/m^3	0.80	0.02	0.05	0.05	0.002	0.002	0.05	0.05	0.05	0.0020	0.02	0.25	0.05	0.05	0.0020	0.00	0.10	0.05	0.002	0.0020	0.00
Cyanide as CN	g/m^3	0.10	0.010	0.010	0.010	0.005	0.005	0.014	0.014	0.010	0.0050	0.005	0.010	0.022	0.063	0.0050	0.00	0.061	0.021	0.005	0.0050	0.00
pH	N/A	N/A	6.8	6.9	7.2	7	6.8	6.9	6.9	7.4	7	6.900	6.9	6.7	6.8	7	6.8	6.8	7.0	6.7	7	6.9
Ammoniacal Nitrogen	g/m^3	N/A	14.2	7.7	24.4	5	7.94	9.1	13.9	26.5	6	12.9	N/A	5.2	5.5	8	7.94	5.0	7.3	4.8	4	12.9
Oil and Grease	g/m^3	N/A	5	5	4	10	7	5	5	4	11	13.8	11	4	11	5	7	4	19	9.8	5	13.8

Table 3: Analytical Results for Quarterly Effluent Sample

Section (c)
The plant was not able to consistently meet its effluent quality compliance requirements. Regional council issued an infringement notice in July 2021 and an abatement notice in October 2021 due to effluent non-compliances.

Section (d)
The non-compliances were majorly due to asset failures. Regional council has been given an explanation regarding these non-compliances.

Section (e)
Asset failures were rectified as soon as it was confirmed that it was causing non-compliance to the treatment plant. There were delays on the repair due to disruption brought by COVID19.

Section (f)
No complaints were recorded for the 2021/2022 reporting period.

Section (g)
There were no other issues that arose relating to the resource consent for the 2021/2022 reporting year.

WGN080003 [35047]

Condition (8)

The permit holder shall monitor and record the flow rate, total volume and duration of any bypass discharge from the Moa Point Wastewater Treatment Plant to the long outfall, and calculate and record a dilution ratio (secondary treated: screened effluent) for each bypass event based on average rates of flow during that event. The results of this monitoring shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council, within 10 working days of the bypass discharge occurring.

The following is a summary of the bypass events from the Moa Point WWTP for the 2021/2022 reporting period.

Date	Duration	Average Discharge Flow Rate	Total Volume of Bypass	Total Volume Treated Effluent During Overflow	Dilution Ratio	Consented	Cause
dd/mm/yyyy	hrs/mins	L/s	m^3	m^3	--	Y/N	--
17-Jul-21	15 hr 22 m	531	24,774	171,145	7:1	Y	Wet Weather
6-Dec-21	30 hr 30 m	303	20,528	341,289	17:1	Y	
15-Dec-21	02 hr 05 min	127	222	21,130	95:1	Y	
5-Feb-22	35 hr 58 m	200	14,361	255,139	18:1	Y	
12-Feb-22	28 hr 56 m	652	52,828	264,480	5:1	Y	Wet Weather
12-Feb-22	05 hr 00m	N/A	323	N/A	N/A	N	Wet Weather-> discharge at Short Outfall
20-Feb-22	00 hr 41m	N/A	97	N/A	N/A	N	Wet Weather &IPS pump fault-> discharge at Short Outfall
20-Feb-22	04 hr 54 m	246	1,863	46,724	25:1	Y	Wet Weather
20-May-22	01 hr 24m	484	2,672	9,964	4:1	N	Wet Weather + Clarifier 3 offline
1-Jun-22	25 hr 22 m	639	49,110	111,930	2:1	N	Wet Weather + Clarifier 3 offline
9-Jun-22	02 hr 52 m	846	8,475	13,905	2:1	N	Wet Weather + Clarifier 3 offline
10-Jun-22	46 hr 22 m	485	65,410	157,336	2:1	N	Wet Weather + Clarifier 3 offline

Table 4: Bypass Events from 2021/2022 Reporting Period

Condition (10)

During a bypass discharge (if during normal working hours) and on days one, two and three after the discharge, the permit holder shall take **a grab sample** of coastal water at each of the following locations, providing safe access is available: • Dorrie Leslie Park at boat ramp • Hue Te Taka Peninsula; • Tarakena Bay Beach at boat ramp • Tarakena Bay Beach, Western side • Hue te Taka Peninsula, Western side; • Moa Point Road, opposite number 49 • Lyall Bay Beach, Eastern side • Dorrie Leslie Park, South side of boat ramp • Dorrie Leslie Park, West of boat ramp • Peninsula at Queens Drive and The Esplanade • Houghton Bay, Western side • Marine Centre, Island Bay, Eastern side • Island Bay, Western side Each sample shall be analysed for faecal coliforms and enterococci. The permit holder shall identify and record the location of the sampling points (including map references) and supply this information to the Manager, Environmental Regulation, Wellington Regional Council, within three months of the commencement of this permit. The details of the monitoring programme, as outlined in the Overflow Contingency Plan (required under condition 12 of this permit), shall be to the satisfaction of the Manager, Environmental Regulation, Wellington Regional Council. *Note: These sample locations have been selected to act as audit sites to determine if the results obtained from the modelling undertaken in regards to public health risks from bypass discharges are substantiated by sample results.*

The resource consent WGN080003 [35047], Condition 10 was amended on 13 December 2017 to add another ten (10) shoreline monitoring sites. These additional shoreline monitoring sites are located near storm water discharges which may affect the monitoring results.

The following map displays the (13) sites for shoreline sampling:

Figure 1: Moa Point WWTP Shoreline Sampling Sites

The following is a summary of the shoreline samples taken for the bypass event(s) listed in Condition.

Date	49 Moa Point Road		Dorrie Leslie Park at Boat Ramp		Dorrie Leslie Park - South End		Dorrie Leslie Park - Western End		Houghton Bay - Western Side		Hue te Taka Peninsula		Hue te Taka Peninsula West		Island Bay Marine Centre Eastside		Island Bay Westside		Lyall Bay Beach Eastern Side		Peninsula at Queens Drive		Tarakena Bay Beach at Boat Ramp		Tarakena Bay Western Side	
	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci	Faecal Coliform	Enterococci
	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL	cfu/ 100mL
17/07/2021	4	2	46	29	800	260	5.5	24	3000	11000	420	62	120	33	2800	11000	2700	16000	2	1.8	1000	280	54	40	1.8	1.8
18/07/2021	14	31	350	150	40	48	2000	520	22	7.3	32	22	66	16	30	33	30	25	210	50	180	70	110	13	42	44
19/07/2021	20	9	14	31	80	120	78	7.3	20	16	14	16	74	120	96	100	420	1600	18	11	38	33	42	36	18	15
6/12/2021	92	660	100	560	580	800	36	29	80	440	46	110	52	120	960	1000	820	2000	500	390	960	1800	460	440	84	640
7/12/2021	1100	3300	58	180	780	3500	78	62	960	2200	1000	3600	900	3500	860	2700	300	580	380	540	88	150	520	780	1300	3500
8/12/2021	27	33	18	24	5.5	5.5	78	140	7.3	7.3	1.8	1.8	1.8	1.8	11	11	15	15	3.6	3.6	5.5	5.5	1.8	1.8	1.8	1.8
15/12/2021	7.3	6	1.8	3.6	13	27	1.8	1.8	1.8	7.3	100	100	27	24	3.6	5.5	96	92	9.1	7.3	420	150	25	18	20	18
16/12/2021	9.1	4	29	20	72	94	3.6	16	9.1	5	11	10	20	8	3.6	10	94	82	330	92	18	2	22	10	7.3	22
17/12/2021	1.8	16	3.6	1.8	33	11	20	5	1.8	1.8	1.8	13	1.8	13	33	9.1	62	38	16	3.6	1.8	3.6	15	1.8	5.5	9.1
5/02/2022	260	680	39	21	230	94	7.3	7.3	250	1300	110	1000	64	1000	1100	1300	300	610	230	320	330	670	170	82	100	880
6/02/2022	160	54	12	20	18	27	300	320	10	36	130	36	27	27	400	590	14	16	27	30	400	570	160	54	18	12
7/02/2022	13	18	54	44	74	52	4	36	88	84	7.3	70	15	82	780	230	7.3	7.3	76	74	16	3.6	80	72	11	9.1
8/02/2022	14	2	46	28	20	26	20	22	6	2	300	22	340	18	150	62	58	250	180	62	22	12	48	210	12	6
9/02/2022	10	2	8	6	6	2	4	2	4	2	4	2	2	10	2	2	4	2	8	2	14	16	6	2	6	4
13/02/2022	270	920	3600	6600	12000	6800	10	10	9300	37000	4200	8500	160	220	11000	8800	13000	7700	150	150	9500	35000	270	800	140	98
14/02/2022	230	170	130	84	370	180	170	110	320	230	170	130	200	160	440	660	3900	1100	500	480	200	200	140	58	200	120
15/02/2022	82	60	52	66	86	27	83	56	400	260	18	11	25	11	88	76	150	130	96	82	150	110	520	440	80	24
16/02/2022	13	2	40	40	58	38	46	52	440	58	13	9.1	1.8	5.5	130	24	170	22	310	56	460	44	46	38	200	38
20/02/2022	64	40	350	3.3	70	41	33	52	96	30	150	52	380	82	82	36	26	43	20	11	1100	120	110	64	330	55
21/02/2022	33	27	18	1.8	52	38	82	38	38	20	130	20	42	64	44	46	11	33	40	33	16	24	96	22	110	36
22/02/2022	110	9	110	15	5.5	25	5.5	1.8	11	15	25	9.1	13	3.6	9.1	31	1000	290	40	90	9.1	9.1	13	15	18	15
9/06/2022	50	100	580	1300	66	72	92	18	120	130	78	84	80	60	500	860	5000	9000	120	120	480	1200	94	110	40	84
10/06/2022	72	64	58	110	25	42	52	82	18	50	84	84	35	360	440	420	1400	1500	460	1000	600	660	72	210	48	420
11/06/2022	1.8	2	230	740	170	250	64	94	66	120	1.8	1.8	50	100	640	140	240	720	280	480	24	11	13	29	1.8	1.8
12/06/2022	1.8	9	24	16	3.6	9.1	500	280	1.8	3.6	1.8	1.8	1.8	1.8	640	140	1.8	1.8	1.8	20	1.8	1.8	1.8	7.3	1.8	1.8
13/06/2022	31	22	27	35	42	38	640	140	16	29	7.3	5.5	3.6	3.6	33	20	50	24	25	35	25	27	58	110	24	80
14/06/2022	8	4	20	16	6	10	42	42	16	6	26	34	20	34	50	66	850	2800	26	26	74	48	16	2	32	34

Table 5: Additional Moa Point Shoreline Sample Results

Condition (13)

The annual report required by condition 19 of this permit shall detail what steps have been taken in the reporting year and what steps are proposed to be undertaken in the future to reduce infiltration and stormwater ingress into the Wellington City sewerage network. This information shall include, but not be limited to, the following information: a) Details on the adoption of a policy to identify, and to repair or replace, defective private sewer drains in the Wellington City catchment. If such a policy is adopted, detail on its implementation made within the previous year b) Details of additional works that have been undertaken and what these works are expected to achieve c) An indication of when any on-going works will be completed d) Details of any investigations undertaken with regard to inflow and infiltration in the Wellington City catchment e) Details of any works or investigations planned for the next financial year

An inflow and infiltration report can be found in appendix vi.

Condition (16)

The permit holder shall provide suitable wastewater sample locations for monitoring the quality of:

a) The bypass flows; and
b) Secondary treated wastewater (i.e. both wastewater streams prior to mixing) during bypass discharges.

The permit holder shall obtain grab samples of both wastewater streams within the first two hours of a bypass discharge occurring during normal working hours or as soon as practicable for those events occurring outside normal working hours. These Samples shall be analysed for:

- cBOD5
- suspended solids
- faecal coliform
- pH
- ammoniacal nitrogen
- oil and grease

And on at least one bypass event each year these samples shall also be analysed for the following indicator contaminants:

- Total cadmium
- Total chromium
- Total copper
- Total lead
- Total nickel
- Total zinc

The wastewater quality results, together with the results of wastewater flow monitoring shall be used to calculate, by mass balance, the quality of the wastewater discharge after both wastewater streams have mixed. The mass balance calculation for a contaminant (a) is:

$C_{mixed}(a) – (C_{tr}(a)*Q_{tr} – C_{by}(a)*Q_{by})/Q_{mixed}$

Where: **C** is contaminant concentration
Q is the flow rate (litres/sec)
tr subscript relates to parameter of the secondary treated wastewater stream
by subscript relates to parameter of the bypassed wastewater stream
mixed subscript relates to the parameter of the mixed secondary treated and bypassed waste streams.

The calculated mixed wastewater discharge quality results shall be reported to the Manager, Environmental Regulation, Wellington Regional Council, within 10 working days of the overflow event occurring.

There were six (6) consented and six (6) non-consented bypass events occurred during this reporting period.

Condition (17)

The permit holder shall obtain grab samples of bypass flows and secondary treated wastewater during discharges (i.e. at the locations required by conditions 16) within the first two hours of a bypass discharge occurring during normal working hours until 7 bypass events have been sampled. The permit holder will use best endeavours to obtain these samples in the first 5 years of the permit. These samples shall be analysed for: • Total cadmium • Total chromium • Total copper • Total lead • Total nickel • Total zinc • Total arsenic • Total phenol • Volatile organic compounds • Semi-volatile organic compounds • Organochlorine pesticides The wastewater quality results, together with the results of wastewater flow monitoring shall be used to calculate, by mass balance, the quality of the wastewater discharge after both wastewater streams have mixed. The Calculated mixed wastewater monitoring results shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council, as soon as they are available.

Condition 17 is no longer enforced since seven (7) bypass events have been sampled and the five (5) year date has passed. Therefore, no reporting for this condition is required.

Condition (19)

The permit holder shall provide to the Manager, Environmental Regulation, Wellington Regional Council an Annual Assessment and Analysis Report for the period 1 July to 30 June by 31 July each year summarising compliance with the conditions of this permit. This report shall include, but not be limited to the following: a) A summary of all monitoring undertaken in accordance with the conditions of this permit and a critical analysis of the information in terms of compliance and adverse environmental effects; b) A comparison of data with previously collected data in order to identify any emerging trends; c) Comments on compliance with the conditions of this permit; d) Any reasons for non-compliance or difficulties in achieving compliance with the conditions of this permit; e) Any measures that have been undertaken to improve the environmental performance of the wastewater treatment and disposal system; f) A copy of any complaints recorded (in accordance with condition 18 of this permit) during the year; g) Any other issues considered to be important;

Section (a)

Several parameters are used to monitor the Moa Point WWTP in the event that the influent flow rate exceeds 3000L/s and there is a bypass through the long outfall. A summary of all the monitoring data can be found in preceding parts of this consent report. In the last quarter of this reporting period, the full treatment capacity of the plant had been reduced from 3,000 L/s to 2,200 L/s due to clarifier 3 being offline.

It can be noted that elevated microbial concentrations are recorded in some sites for the first 24-hours after the discharge. These elevated results can be caused by several factors such as discharges from treatment plant, storm water and wastewater network during wet weather events. Site-specific microbial results tend to return to safe levels after 24 hours of the cessation of discharge.

Section (b)

Because the discharges from the WWTP are highly dependent on a wet weather event, it is difficult to compare the data from year to year. Instead of comparing the actual data, a comparison of the averages of the data from the 2021/2022 reporting period will be made to the previous five (5) years. The following section summarises that comparison.

Below is a comparison of the annual average of the monitoring parameters:

Parameter	Units	WWTP Bypass Discharges Annual Averages				
		2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
Average WWTP Bypass Flow Rate	L/s	201.5	160.5	167	223	396
WWTP Bypass Total Volume	m^3	8,310	3,522	5,827	2,150	20,099
Dilution Ratio	--	16:1	35:1	19:1	20:1	37:1
Ammoniacal Nitrogen	g/m^3	9.5	6.5	11.05	7	8.45
Carbonaceous Biological Oxygen Demand	g/m^3	21.5	28.25	98.83	66	82.7
Faecal Coliforms of Bypass	cfu/100mL	3,427,500	948,250	1,811,667	153,432	3,408,000
Oil and Grease	g/m^3	21	6.75	30.33	9	10.6
pH of Bypass	--	6.95	7.125	6.27	7	7.07
Suspended Solids	g/m^3	57.5	72.75	183.5	134	171.6
Total cadmium	g/m^3	0.001	0.001	0.00	0.0002	0.0001
Total chromium	g/m^3	0.0035	0.002	0.01	0.003	0.0057
Total copper	g/m^3	0.026	0.027	0.04	0.044	0.039
Total lead	g/m^3	0.003	0.003	0.01	0.005	0.012
Total nickel	g/m^3	0.0015	0.0015	0.01	0.002	0.003
Total zinc	g/m^3	0.0725	0.145	1.22	0.078	0.13

Table 6: Discharge Parameters Comparison

The average bypass volume for FY2021/2022 has increase versus the previous financial years. The annual averages for the monitoring parameters are similar over the 5-year period.

Section (c)

There were six unconsented discharges for this reporting period.

Section (d)

An explanation on the two incidents of short outfall discharges has been given to regional council. The four other unconsented discharges were due to a reduction in treatment capacity.

Section (e)

Wellington Water and Veolia are fast tracking the repair of the clarifier 3 to return the plant into its normal capacity.

Section (f)

The have been no complaints recorded for the 2021/2022 reporting period.

Section (g)

There has been no other issues regarding the consent for this reporting period.

WGN 080003 [26812]

Condition (3)

The permit holder shall undertake an annual physical assessment of the condition of the outfall pipeline. This assessment shall include, but not be limited, the following: a) An assessment of the structural condition of the pipeline b) An inspection of the diffuser ports c) An assessment of the erosion or scour around exposed sections of the pipeline and d) Recommend any maintenance that is required The results of the assessment shall be submitted to the manager, Environmental Regulation, Wellington Regional Council not later than three months after the assessment has been undertaken.

The assessment of the structural condition of the pipeline was conducted in February 2022. A report of the assessment can be found in Appendix iii: Outfall Pipeline Inspection Report.

WGN 080003 [26813]

Condition (7)

The permit holder shall monitor air quality in the vicinity of the plant to confirm the absence of faecal coliforms and salmonella originating from the plant. Sampling is to be carried out at least once every six months. The sampling method and locations are to be agreed with the Manager, Environmental Regulation, Wellington Regional Council within three months of the granting of this permit. Tests are to be carried out at a minimum of three sites downwind and three sites upwind of the plant, with at least one in the vicinity of Air New Zealand kitchens and one at a level of Kekerenga Street. The other sites are to be located outside of/and within 100 metres of the site boundary. The results shall be provided annually in the annual report required under condition 14 of this permit, or on request.

Ambient Microbe Monitoring was performed at the Moa Point WWTP. The following table is a summary of the air quality monitoring in the vicinity of the WWTP:

Full reports can be found in the Moa Point WWTP quarterly reports.

	Faecal Coliforms		Salmonella	
Date	**23/08/21**	**21/02/2022**	**23/08/21**	**21/02/2022**
Site 1	Absent	Absent	Absent	Absent
Site 2	Absent	Absent	Absent	Absent
Site 3	Absent	Absent	Absent	Absent
Site 4	Absent	Absent	Absent	Absent
Site 5	Absent	Absent	Absent	Absent
Site 6	Absent	Absent	Absent	Absent

Table 7:Semi-Annual Air Quality Monitoring

Condition (8)

Hydrogen Sulphide (H_2S) and other reduced Sulphur compounds shall be monitored in the deodorized gas discharge. Monitoring shall be undertaken in the stack leading from the chemical scrubber system on a monthly basis.

The results shall be provided annually in the annual report required under condition 14 of this permit, or on request.

The monthly results from the Hydrogen Sulphide (H_2S) and Total Reduced Sulphur (TRS) are summarised in the in the following table:

Month	WWTP	
	H_2S	TRS
	ppm	ppm
Jul-21	0.004	0.002
Aug-21	0.00017578	0.002
Sep-21	0.00018	0.002
Oct-21	0.001120865	0.002
Nov-21	0.002175821	0.002
Dec-21	0.000175811	0.037
Jan-22	0.000175745	0.002
Feb-22	0.000197734	0.002
Mar-22	0.001120879	0.002
Apr-22	0.000175824	0.002
May-22	0.000175765	0.002
Jun-22	0.000153842	0.002
Limits	**0.01**	**0.05**

Table 8: Monthly H_2S and TRS Concentrations

The full reports can be found in the quarterly reports for the 2021/2022 reporting period. All results are within the resource consent limits.

Condition (9)

The discharge to air from the chemical scrubber system shall contain no more than 0.01ppm hydrogen sulphide (H_2S) and no more than 0.05ppm total reduced Sulphur compounds (including H_2S).

These limits have been included in the summary under WGN080003[26813] Condition (8).

Condition (10)

The permit holder shall undertake smoke testing of the Moa Point wastewater treatment plant and ventilation system. The smoke tests are to be carried out on an annual basis between the months of August and November. The results of the smoke test shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council within one month of the testing being carried out by the permit holder. A copy of the analysed results shall also be provided to Community Liaison Group, if requested.

A smoke test was performed on the WWTP on 3rd November 2022. The smoke test report can be found in Appendix iv: Smoke Test Report.

Condition (14)

The permit holder shall provide to the Manager, Environmental Regulation, Wellington Regional Council an annual monitoring report for the period 1 July to 30 June, by 31 July each year summarising compliance with the conditions of this permit. A copy of the report shall be provided to Community Liaison Group, if requested. This report shall include, but not be limited to the following: a) A summary of all monitoring undertaken in accordance with the conditions of this permit and a critical analysis of the information in terms of compliance and adverse environmental effects b) A comparison of data with previously collected data in order to identify any emerging trends c) Comments on compliance with the conditions of this permit d) Any reasons for non-compliance or difficulties in achieving compliance with the conditions of this permit e) Any measures that have been undertaken, to improve the environmental performance of the wastewater treatment and disposal system f) A copy of any complaints recorded (in accordance with condition 13 of this permit) during the year g) Outcomes from the implementation of the Odour Management Plan h) Any other issues considered important by the permit holder.

Section (a)

A summary of all the monitoring data can be found in preceding parts of this consent report.

Section (b)

A comparison of data from the 2021/2022 reporting period was made to the previous four (4) years. The following section summarises that comparison.

The following tables are a comparison of the results from the air quality monitoring:

Location	Faecal Coliforms									
	Q1 - 2017	Q1 - 2018	Q1 - 2019	Q1 - 2021	Q1 - 2022	Q2 - 2017	Q2 - 2018	Q2 - 2019	Q2 - 2020	Q2 - 2021
Site 1	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 2	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 3	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 4	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 5	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 6	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

Table 9: Comparison of Faecal Coliforms in Air

Location	Salmonella									
	Q1 - 2017	Q1 - 2018	Q1 - 2019	Q1 - 2021	Q1 - 2022	Q2 - 2017	Q2 - 2018	Q2 - 2019	Q2 - 2020	Q2 - 2021
Site 1	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 2	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 3	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 4	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 5	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Site 6	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent

Table 10: Comparison of Salmonella in Air

The following is a comparison of the monthly Hydrogen Sulphide and total reduced Sulphur results:

Month		Moa Point WWTP										
	H_2S (ppm)						TRS (ppm)					
	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022
July	0.00159	0.00602	0.00013	0.00013	0.001	0.004	0.002	0.006	0.011	0.002	0.002	0.002
August	0.0015	0.0004	0.00915	0.00013	0.003	0.00018	0.002	0.004	0.002	0.002	0.002	0.002
September	0.00262	0.00091	0.0047	0.00013	0.001	0.00018	0.002	0.022	0.004	0.002	0.002	0.002
October	0.00045	0.00157	0.00422	0.0001	0.003	0.0011	0.018	0.011	0.004	0.009	0.002	0.002
November	0.00031	0.0033	0.00327	0.0057	0.003	0.0022	0.002	0.035	0.007	0.002	0.002	0.002
December	0.004	0.02333	0.00499	0.0015	0.003	0.00018	0.0049	0.043	0.011	0.002	0.002	0.037
January	0.00441	0.01005	0.00464	0.0001	0.000154	0.00018	0.002	0.045	0.007	0.002	0.002	0.002
February	0.00064	0.01754	0.00453	0.003	0.000198	0.00020	0.012	0.017	0.013	0.003	0.002	0.002
March	0.0068	0.02367	0.00073	0.002	0.000176	0.0011	0.039	0.011	0.002	0.002	0.002	0.002
April	0.00056	0.01374	0.00017	0.00011	0.002	0.00018	0.003	0.019	0.002	0.002	0.002	0.002
May	0.00054	0.00102	0.00219	0.0001	0.01	0.00018	0.021	0.004	0.004	0.002	0.002	0.002
June	0.00074	0.00028	0.00013	0.001	0.001	0.00015	0.021	0.004	0.002	0.002	0.002	0.002
Limit	0.01						0.05					

Table 1: Monthly Moa Point WWTP H_2S and TRS Comparison

The H_2S and TRC results were comparable over the 5 year period.

Section (c)
As noted in WGN080003[26813] Condition (14) Section (a) all monitoring parameters are compliant to the resource consent.

Section (d)
As noted in WGN080003[26813] Condition (14) Section (a) all monitoring parameters are compliant to the resource consent. There were no difficulties in achieving compliance with the conditions of this permit.

Section (e)
The Moa Point WWTP has been performing well below the limits set in the resource consent. No significant measures have been undertaken to improve the environmental performance of the wastewater treatment and disposal system.

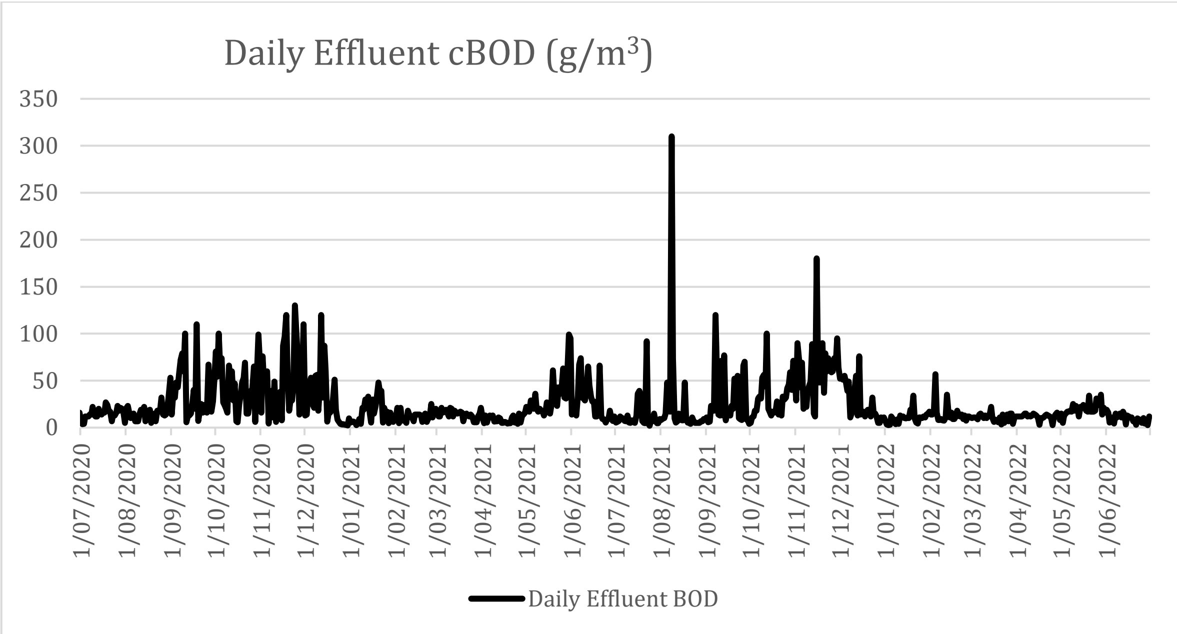
Section (f)
There was only one complaint received regarding this resource consent in February 2022. The complainant referred to a bad smell that was preventing them from opening their window, but no issues were detected at the plant other than clarifier 3 being offline, and no unusual odours were detected either. The matter was reported to Wellington Water and GWRC (see appendix V)

Section (g)
The outcomes for the implementation of the Odour Management Plan are good.

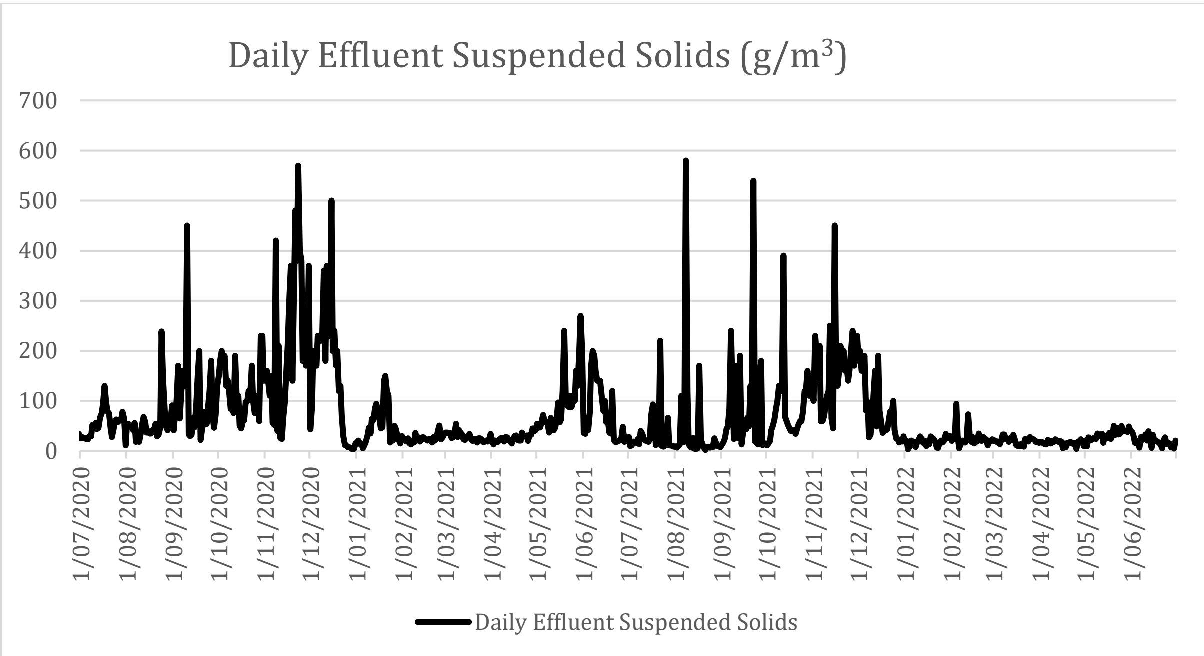
Section (h)
There were no other issues that arose relating to the resource consent for the 2021/2022 reporting year.

Appendix i:

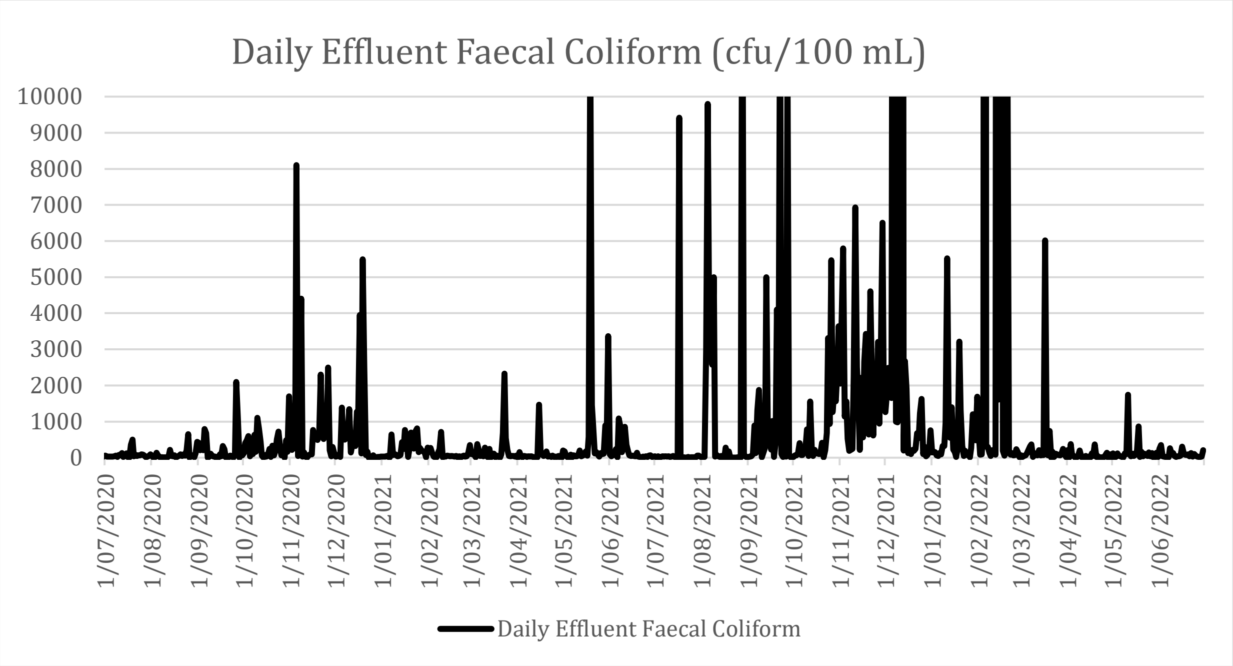
Daily Effluent Carbonaceous Biological Oxygen Demand Results



Daily Effluent Suspended Solids Results



Daily Effluent Faecal Coliforms Results



Appendix ii:
Moa Point WWTP Assessment of environmental effects of non-compliant wastewater discharges during 2020 & 2021

Moa Point WWTP

Assessment of environmental effects of non-compliant wastewater discharges during 2020 & 2021

PREPARED FOR Wellington Water | March 2022

We design with community in mind

Stantec

Revision schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)		
			Prepared by	**Reviewed by**	**Approved by**
0	4/3/2022	Draft report V1	D. Cameron	B. Mulling	
1	8/3/2022	Final Report	D. Cameron	B. Mulling	I. Rautenbach

This document entitled "Moa Point WWTP – Potential effects of non-compliant wastewater discharges during 2020 and 2021" was prepared by Stantec New Zealand ("Stantec") for the account of Wellington Water (the "Client"). The material in it reflects Stantec's professional judgment in light of the scope, the Client's brief (if any) and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published. In preparing the document, Stantec may have relied on information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. No liability is accepted by Stantec or any employee or sub-consultant of Stantec with respect to its use by a third party.

Quality statement

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1 Introduction

The Moa Point Wastewater Treatment Plant (WWTP) operates under three discharge permits which authorise:

- A continuous discharge of treated wastewater into the Coastal Marine Area (CMA) via an existing submarine outfall.
- An occasional discharge of mixed disinfected secondary treated and milli-screened wastewater to the CMA via an existing submarine outfall.
- A continuous discharge of contaminants to air (including odour) from the WWTP air ventilation system.

A monitoring and technology review, as required by a consent condition of the three discharge permits, was submitted to Greater Wellington Regional Council (GWRC) in 2018 on the 9th year of the 25-year consent duration. The review concluded that, overall, the WWTP has had an exemplary record of compliance with existing consent conditions since 2009 (Stantec, 2018).

Unfortunately, since the middle of 2020, the WWTP discharge has moved into a period of non-compliance with condition 10 of the continuous discharge permit which specifies treated wastewater quality standards for $cBOD_5$, suspended solids and faecal coliform bacteria.

Condition 10 states that:

"*The wastewater discharged from the Moa Point Wastewater Treatment Plant to the coastal waters shall comply with the following effluent quality criteria:*

a) $cBOD_5$. The geometric mean of 90 consecutive daily sampling results shall not exceed 20 g/m^3 and no more than 10% of 90 consecutive samples shall exceed 45 g/m^3.

b) Suspended solids. The geometric mean of 90 consecutive daily sampling results shall not exceed 30 g/m^3 and no more than 10% of 90 consecutive samples shall exceed 68 g/m^3.

c) Faecal coliforms. The geometric mean of 90 consecutive daily sampling results shall not exceed 200 colony forming units per 100ml and no more than 10% of 90 consecutive samples shall exceed 950 colony forming units per 100ml.

Compliance with the effluent quality criteria shall be determined from the results of wastewater monitoring undertaken in accordance with conditions (9)(a) and (9)(b) of this permit, with a running geometric mean and ninetieth percentile calculated following each sampling event using the preceding 90 consecutive samples."

Conditions 11 and 14 also specify effluent quality and effects standards and are relevant to this assessment.

Condition 11 states that:

"The permit holder shall at least once every three months obtain a sample of the treated wastewater discharged from the treatment plant to the outfall. This sample shall be analysed for and not exceed the following:

Total arsenic	*0.26 g/m^3*
Total cadmium	*0.08 g/m^3*
Total chromium	*0.48 g/m^3*
Total copper	*0.14 g/m^3*
Total lead	*0.48 g/m^3*
Total mercury	*0.01 g/m^3*
Total nickel	*0.77 g/m^3*
Total zinc	*1.65 g/m^3*
Phenol	*0.80 g/m^3*
Cyanide as CD	*0.10 g/m^3*

This sample shall also be analysed for pH, Ammoniacal nitrogen and Oil & Grease"

Condition 14 states that:

"The discharge shall not result in any of the following effects beyond a 100m radius of the discharge point (described in condition 3 of this permit):

a) The production of any conspicuous oil or grease films, scums or foams or floatable or suspended materials
b) Any conspicuous change in colour or visual clarity
c) Any emission of objectionable odour, or
d) Any significant effects on aquatic life"

The purpose of this report is to review the results of monitoring required by the resource consent, and other relevant information, and to assess the potential adverse effects of non-compliant discharges that occurred during 2020 and 2021. This assessment is focused on the ***effects*** of the discharges. A consideration of the ***causes*** of the non-compliance has been addressed elsewhere.

2 Dilution and dispersion

Final treated wastewater is discharged via an ocean outfall and diffuser located south of Lyall Bay. The outfall terminates in a multiport diffuser at the offshore end of a buried pipe running 1,800 m in a southwest direction from the shoreline at Moa Point. Wastewater is discharged from 18 risers spaced at 5m intervals along the 90 m diffuser Figure 2-1. The risers project 1.4 m above the seabed. Each riser has two discharge ports, one of which is blocked off on some of the risers so as to maintain optimal discharge jet velocity. The diffuser is in 21 to 23 m depth of water.

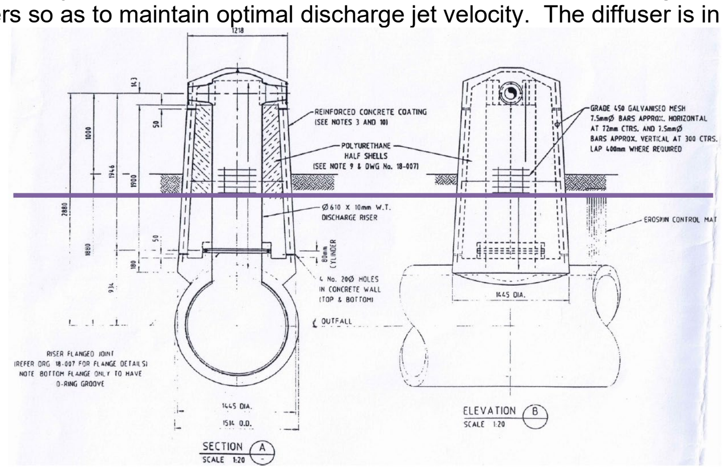

Figure 2-1 Details of diffuser risers (blue line is typical seafloor level)

A dye study and CORMIX hydrodynamic mixing model conducted by Cawthron Institute in 2003, updated in 2007, characterised the initial dilutions achieved for average and peak discharge flow rates (MWH, 2007). At the current average daily flow rate of approximately 800 L/s, a minimum initial dilution of 120-fold is predicted.

3 Recent performance of the WWTP

3.1 Wastewater flow rate

Condition 2 of the continuous discharge consent states that: "*The rate of discharge shall not exceed 260,000 cubic metres per day (m^3/day)*". Figure 3-1 shows a single data point above that limit (red line) on 6 December 2021 when the flow volume was 270,060 m^3. This occurred during a period of sustained heavy rainfall and is the only exceedance on record. Perhaps more importantly, the box plots show that wastewater flows have not increased over the last 20 years despite significant population growth in the wastewater catchment over that period.

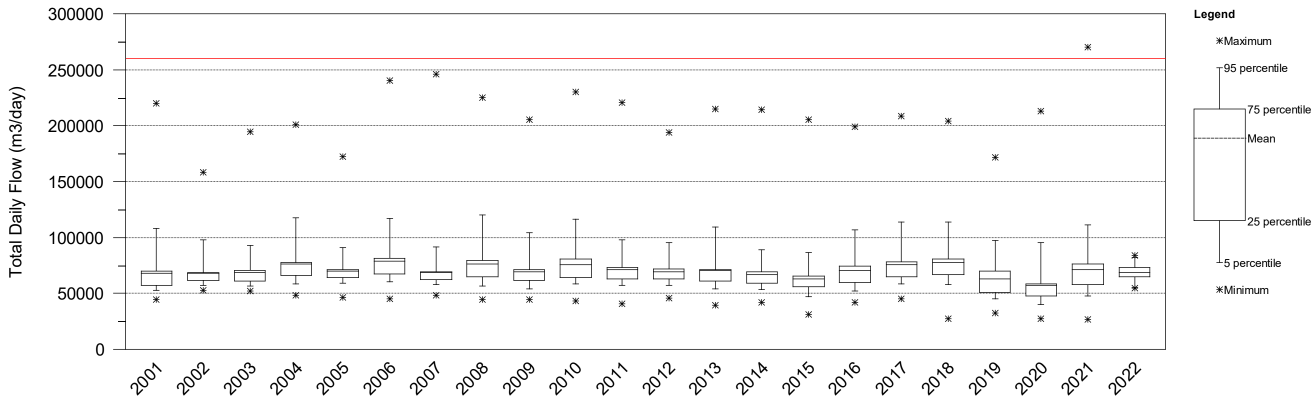

Figure 3-1: Total daily effluent flow rate from Moa Point WWTP (maximum permitted flow indicated by red line)

3.2 Assessment against condition 10

3.2.1 $cBOD_5$

Figure 3-2 summarises the daily monitoring results for $cBOD_5$ showing fairly consistent results for years 2001 until 2019, and a marked increase for years 2020 and 2021. Figure 3-3 focuses in on the 2020 to 2022 period, showing persistent exceedance of the geometric mean and 90th percentile consent limits. Table 3-1 shows that median and upper percentile values increased sharply over that period with a maximum $cBOD_5$ concentration of 310 mg/L.

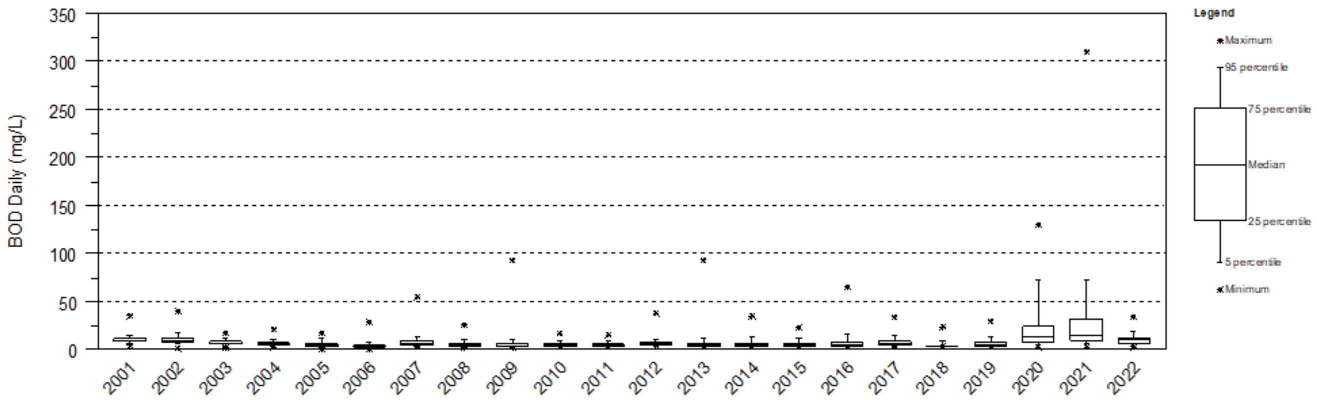

Figure 3-2: Summary of daily treated wastewater $cBOD_5$ (mg/L) by year

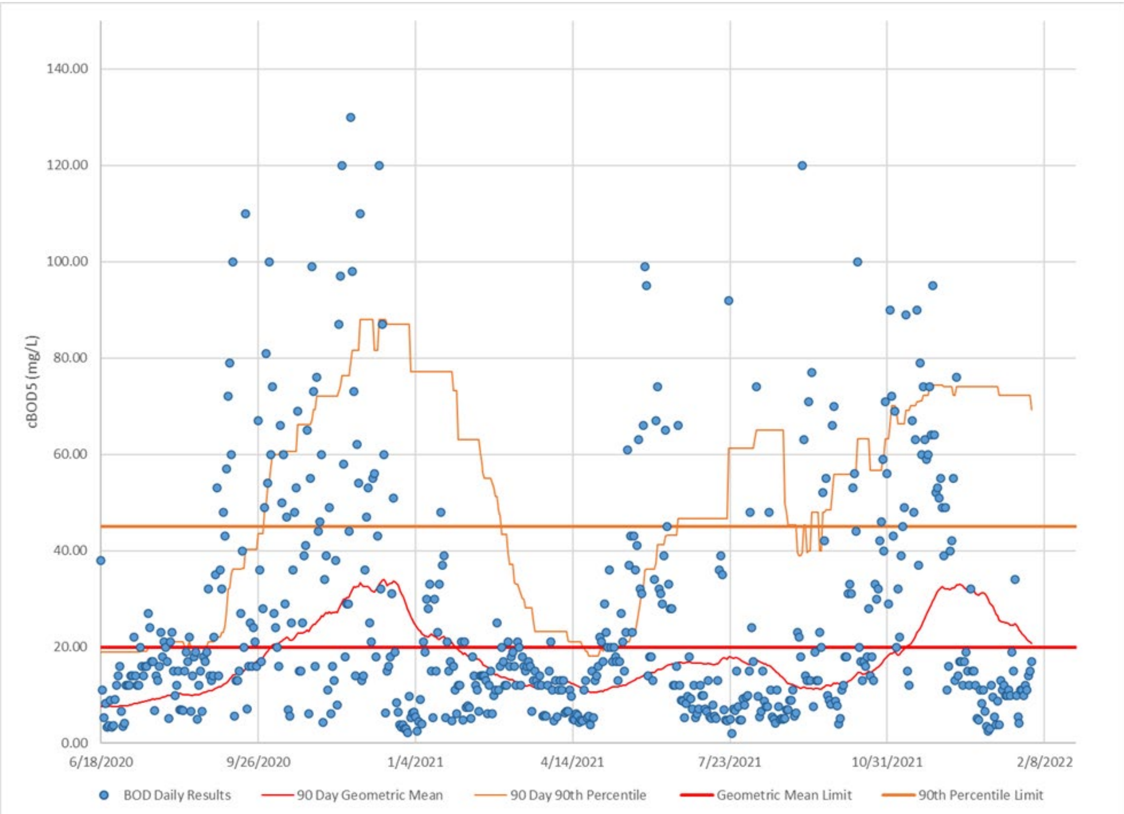

Figure 3-3: Daily treated wastewater $cBOD_5$ (mg/L), 90-day geometric means and 90-day 90th percentiles

Table 3-1: Daily treated wastewater $cBOD_5$ (mg/L) summary statistics for years 2018 to 2021

Year	Sample size	Minimum	Median	95-percentile	maximum	s.d.
2018	365	<3.0	3	9	23	2.35
2019	365	<3.0	4	13	30	4.44
2020	366	2.2	13	72	130	22.84
2021	365	2.1	15	72	310	27.56

3.2.2 TSS

Figure 3-4 summarises the daily monitoring results for Total Suspended Solids (TSS) showing relatively consistent results for years 2001 to 2019, and a marked increase for years 2020 and 2021. Figure 3-5 shows extensive exceedance of the geometric mean and 90th percentile consent limits during 2020 and 2021. Median and upper percentile TSS values increased sharply over this period with maximum concentrations at nearly 600 mg/L (Table 3-2).

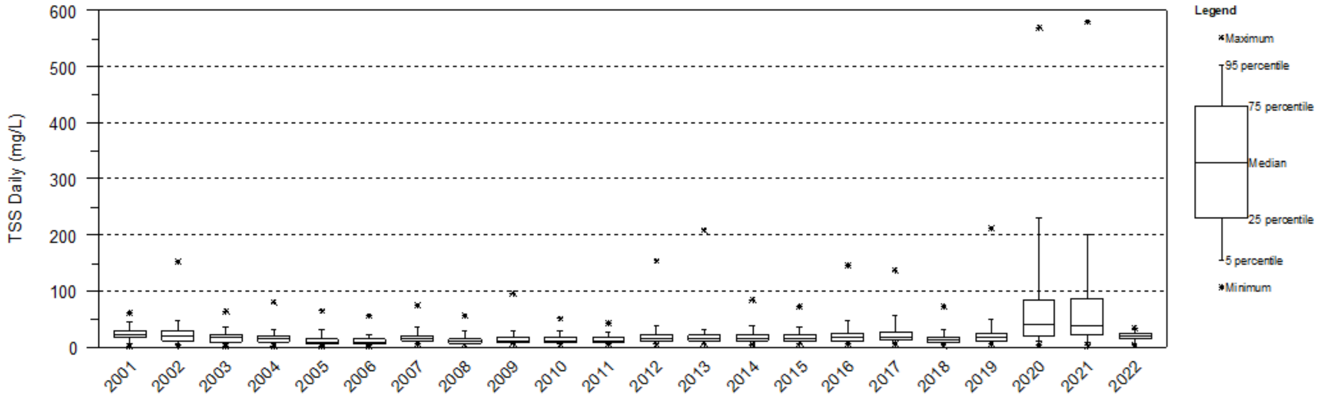

Figure 3-4: Summary of daily TSS (mg/L) monitoring results by year

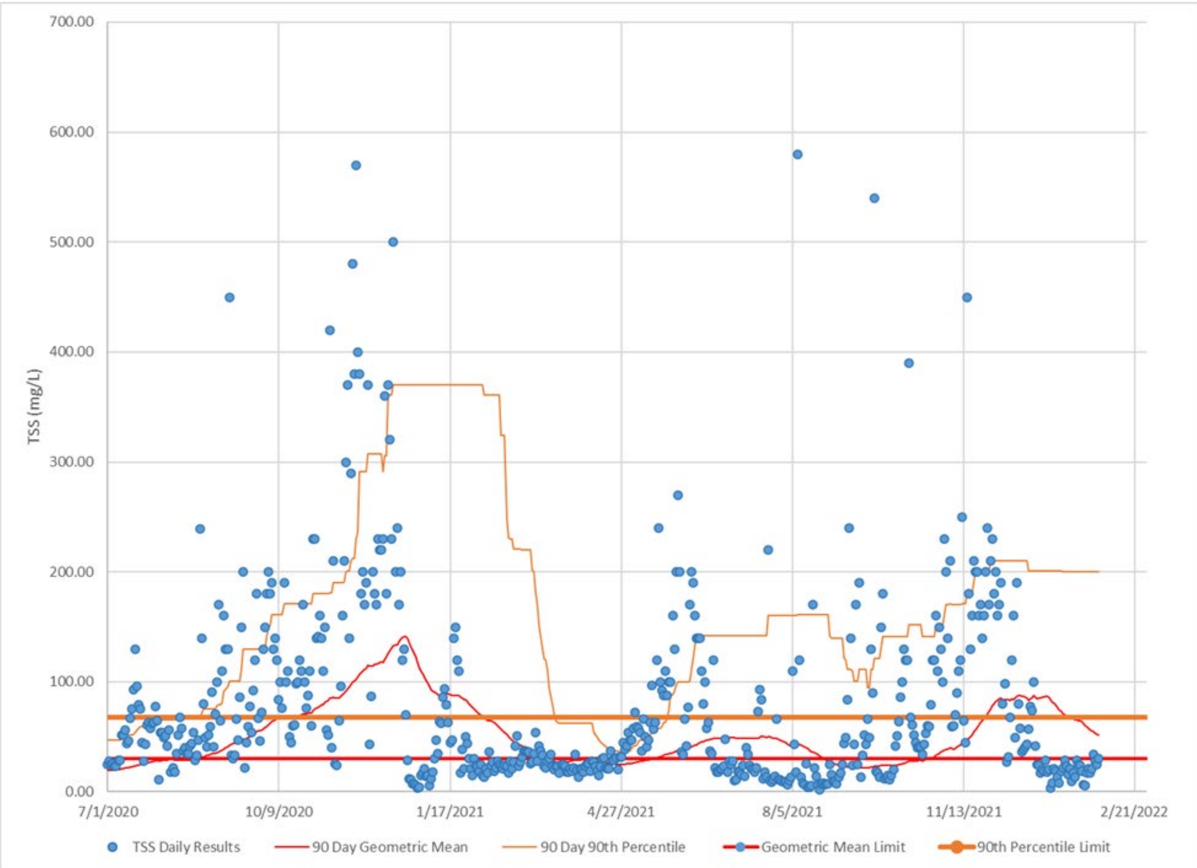

Figure 3-5: Daily treated wastewater TSS (mg/L), 90-day geometric mean and 90-day 90th percentile

Table 3-2: Daily treated wastewater TSS (mg/L) summary statistics for years 2018 to 2021

Year	Sample size	Minimum	Median	95-percentile	Maximum	s.d.
2018	365	3.0	13	32.3	73	9.22
2019	365	6.0	17	48.3	212	18.23
2020	366	3.2	39	230	570	88.62
2021	365	2.0	37	200	580	73.75

3.2.3 Faecal coliform bacteria

Figure 3-6 summarises the daily monitoring results for faecal coliforms by year showing a progressive increase in upper percentile values during 2019, 2020, 2021 and 2022. Figure 3-7 shows significant exceedance of the geometric mean and 90th percentile consent limits, especially from late 2021. Median and upper percentile values increased sharply over that period with maximum faecal coliform concentrations close to 60,000 cfu/100 ml (Table 3-3).

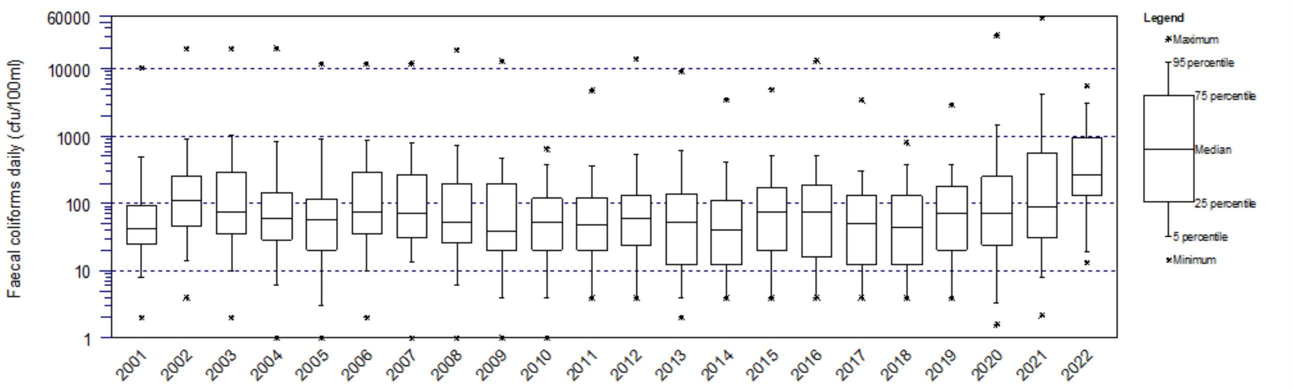

Figure 3-6: Summary of daily treated wastewater faecal coliform concentration per 100ml on a log scale, by year

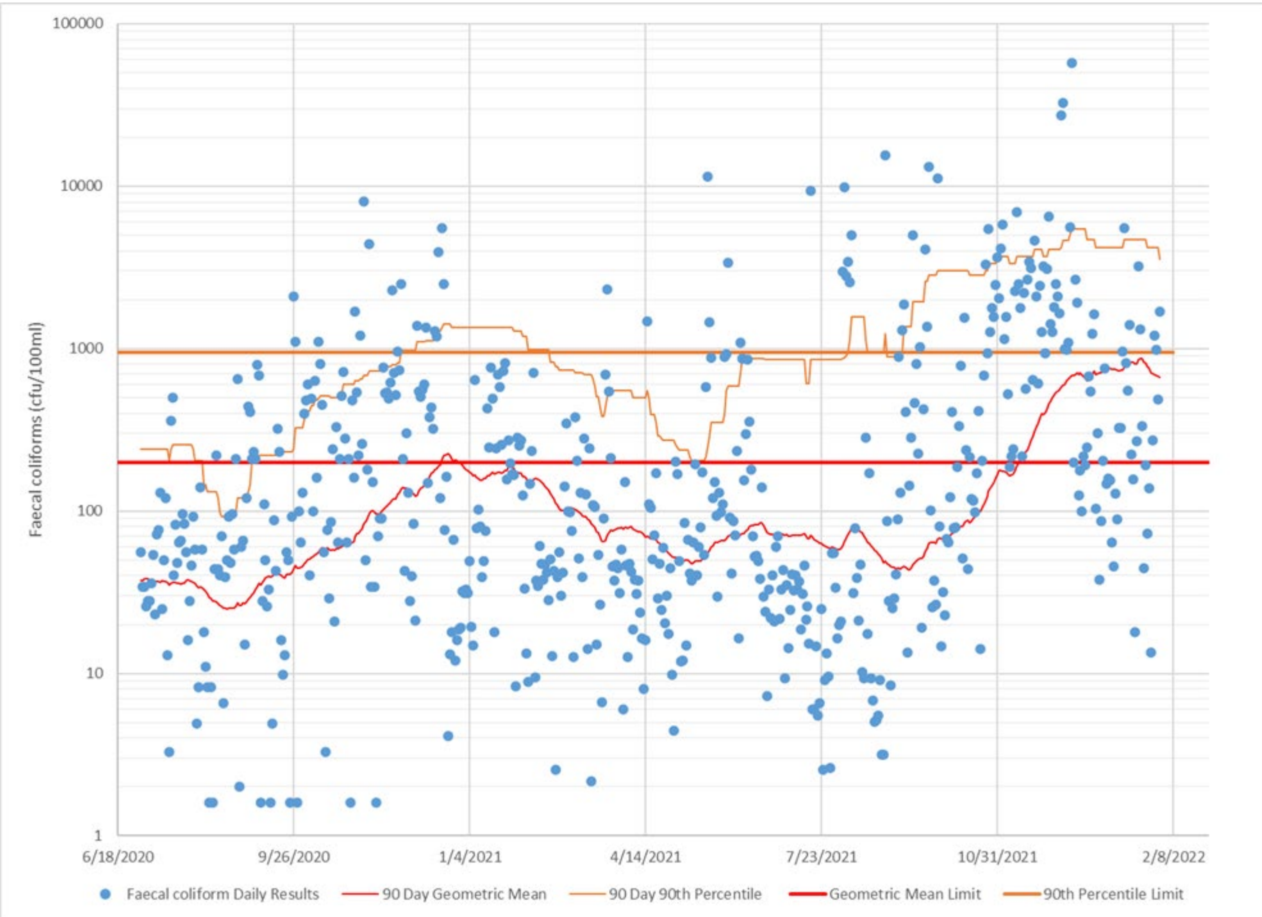

Figure 3-7: Summary of daily treated wastewater faecal coliform results (cfu/100ml) on a log scale

Table 3-3: Daily treated wastewater faecal coliform (cfu/100ml) summary statistics for years 2018 to 2021

Year	Sample size	Minimum	Median	95-percentile	maximum	s.d.
2018	365	<4.0	44	370	800	135
2019	365	<4.0	69	373	3,000	269
2020	366	1.6	69	1,449	32,000	2,807
2021	365	2.1	90	4,102	57,297	4,088

3.3 Assessment against condition 11

Table 3-4 summarises the results of quarterly monitoring during 2020 and 2021 for the contaminants listed in condition 11. It also includes the maximum concentrations permitted by condition 11, and the ANZG (2018) 99% species protection level multiplied by the predicted 120-fold minimum initial dilution. The latter represents a robust trigger value for the protection of marine biota around the outfall. Neither the consent limits nor the ANZG (2018) based trigger values were exceeded in any of the quarterly samples collected during 2020 or 2021, indicating negligible receiving environment risk of toxicity in relation to the condition 11 contaminants.

Table 3-4: Summary statistics from quarterly final wastewater monitoring during 2020 and 2021

Variable	Units	Number of samples	Minimum	Mean	Maximum	Consent limit	ANZG (2018) 99%*120
Total arsenic	mg/L	8	<0.0010	<0.001	0.0013	0.2600	0.0960
Total cadmium	mg/L	8	<0.0001	0.0002	0.0003	0.0800	0.0840
Total chromium	mg/L	8	<0.0001	0.0021	0.0040	0.4800	0.0168
Total copper	mg/L	8	0.0036	0.0105	0.0260	0.1400	0.0360
Total lead	mg/L	8	<0.0004	0.0009	0.0020	0.4800	0.2640
Total mercury	mg/L	8	<0.0001	0.0002	0.0003	0.0100	0.0120
Total nickel	mg/L	8	0.0011	0.0015	0.0020	0.7700	0.8400
Total zinc	mg/L	8	0.0160	0.0368	0.0490	1.6500	0.3960
Phenol	mg/L	8	<0.0020	0.0045	0.0200	0.8000	32.400
Cyanide as CD	mg/L	8	<0.0050	<0.0050	<0.0050	0.1000	0.2400
Total nitrogen	mg/L	11	13.0	17.6	30.0	not specified	not specified
Ammoniacal N	mg/L	18	3.74	7.19	12.90	not specified	60
Oil & Grease	mg/L	8	5.00	8.25	13.80	not specified	not specified
pH	-	8	6.70	6.83	7.00	not specified	not specified

3.4 Assessment against condition 14

Condition 14 states that: "*The discharge shall not result in any of the following effects beyond a 100m radius of the discharge point (described in condition 3 of this permit):*

a) The production of any conspicuous oil or grease films, scums or foams or floatable or suspended materials;

b) Any conspicuous change in colour or visual clarity

c) Any emission of objectionable odour, or

d) Any significant effects on aquatic life"

3.4.1 Suspended solids, colour, clarity, oil, grease and odour

The effects of the Moa Point WWTP discharge on receiving water concentrations of total suspended solids can be determined by mass balance calculation. The predicted receiving water contaminant concentration (*Cx*) at any location *x* is given by equation 1:

$$Cx = \frac{(Co - Cb)}{TD} + Cb \qquad (1)$$

Where: *Co* = the wastewater concentration of the contaminant;
Cb = the background concentration in the ocean; and
TD = the total dilution.

Predicted TSS concentrations in surface waters above the diffuser resulting from median and 95-percentile wastewater concentrations during the 2018 and 2020 years are summarised in Table 3-5.

Table 3-5: Predicted suspended solids concentration after initial mixing (in surface waters above the diffuser)

Year	Statistic	Wastewater concentration (mg/L)	Background seawater concentration (mg/L)	Minimum dilution (x-fold)	Predicted concentration after initial dilution (mg/L)	Predicted increase (mg/L)
2018	Median	13	5	120	5.1	0.1
	95-percentile	33	5	120	5.2	0.2
	Maximum	73	5	120	5.6	0.6
2020	Median	39	5	120	5.3	0.3
	95-percentile	230	5	120	6.9	1.9
	Maximum	570	5	120	9.1	4.1

Table 3-5 indicates that the high treated wastewater quality achieved during 2018 would have caused a negligible and likely undetectable increase in suspended solids at the point where the discharge plume from the diffuser reaches the seawater surface (i.e., after initial mixing). The poorer quality treated wastewater produced during 2020 and 2021 might, in the worst case, have formed a visible plume in surface waters over the outfall diffuser when viewed from an elevated position, however for the majority of time the plume would have been barely visible.

The maximum wastewater concentration of oil & grease measured in the treated wastewater water (from Table 3-4) is estimated to have caused a worst-case oil and grease concentration of approximately 0.1 mg/L in surface water above the outfall diffuser, which would be barely discernible. Similarly, the discharge would not likely have produced any scum or foam or objectionable odour in surfaces waters near the diffuser.

In summary, because of the high level of dilution achieved by the multiport diffuser, the poor-quality wastewater discharged during 2020 and 2021 might have, in the worst case, caused a visible discharge plume in surface waters above the outfall diffuser, but the formation of a conspicuous oil film, scum, foam, colour or odour is unlikely.

3.4.2 Aquatic life

An ecology survey was conducted around the outfall diffuser by Cawthron marine ecologists on 7 May 2018 (Morrisey, 2018). The ecological survey was conducted in parallel with the annual pipeline condition survey conducted during April and May 2018 by Undersea Construction Ltd (2018). In combination the 2018 survey reports described the condition of the pipeline, the surrounding seabed, and the marine ecology prior to the start of non-compliant discharges, i.e., during a period of normal operation. The Cawthron divers observed that all risers were covered in diverse and apparently healthy fouling assemblages, including sponges, anemones, colonial and solitary ascidians, hydroids, barnacles and red, green and brown algae (Plate 1). Free living organisms included kina, cushion stars, seven armed stars and various gastropods including the large duck's bill limpet and the warty sea slug were also common. The only fish seen during the dives were species of triplefins (family Trypterygiidae). The assemblages were similar to those previously described in an earlier survey by Barter, *et al.*, (2006).

The seabed around the risers consisted of gravels, pebbles and cobbles (up to 30 cm diameter) and small patches of smaller gravel or coarse sand (Plate 2). Disturbance of the sediments by divers showed that there was a small amount of fine, easily suspended material within the matrix of gravel and pebble. Structurally, the bed featured large ripples created by wave action and possibly tidal currents. The lower parts of some risers were not fouled, and this may be the result of abrasion by coarse sediments moved by water currents.

Plate 1: View of a diffuser riser and fouling assemblage, May 2018

Plate 2: Seabed deposits of cobbles, gravel and sands forming undulating peak and depressions around the diffuser position, May 2018

The annual pipeline inspection repeated in February 2021 providing a photographic record of the condition of the pipeline, diffusers, and surrounding seabed during and after a sustained period of sub-optimal discharge quality (Undersea Construction Ltd, 2021). Plates 3 and 4 show the shoreward end of the pipe approximately 30m and 60m from shore. The authors observed that the first 80m of the shoreward section is exposed but beyond that the pipeline is buried under the seabed, except for the risers on the diffuser section at the seaward end.

Plate 5 shows the fouling assemblage on a diffuser riser near the seaward end of the pipeline in February 2021 which appears to be similar to that recorded on a riser in May 2018 (it is not clear whether this is the same riser or an adjacent one), and Plate 6 shows the seabed surrounding a diffuser consisting of cobbles, gravel and sands, which is similar to that recorded in May 2018.

The existence of large ripples in the seabed indicates relatively strong seawater currents capable of transporting sediments away from the diffuser rather than allowing the disposition and accumulation of fine sediment on the seabed. In this type of dispersive receiving environment, the risks associated with an increased contaminant load in the WWTP discharge, such as eutrophication and toxicity, are very much reduced because fine sediment and associated contaminants are not able to accumulate on the seabed.

It is noted that the 2021 pipeline and seabed annual inspection was focused on the physical condition of the pipeline and diffuser and did not include an assessment of the marine ecology. For that reason, the information included in the 2021 report is not sufficient to determine whether ecological changes have occurred compared with the 2018 baseline. Nevertheless, the photographs below suggest that if ecological changes have occurred since 2018 they are likely to be relatively minor.

Plate 3: View of the pipeline 30m from shore, Feb 2021

Plate 4: View of the pipeline 60m from shore, Feb 2021

Plate 5: View of a diffuser riser and fouling assemblage, Feb 2021

Plate 6: Seabed deposits of cobbles, gravel and sands around the diffuser position, Feb 2021.

3.5 Risk to Public Health

Table 3-3 shows that the 95th percentile faecal coliform concentration of the treated wastewater discharge increased by an order of magnitude from 370 cfu/100ml in 2018 to 4,102 cfu/100ml in 2021. Clearly, there is potential for the poorer quality discharge to cause increased faecal indicator bacteria concentrations in coastal waters near the outfall.

Predicted faecal coliform concentrations in surface waters after initial dilution during the 2018 and 2021 years are summarised in Table 3-6.

Table 3-6: Predicted faecal coliform concentration after initial mixing (in surface waters above the diffuser)

Year	Statistic	Wastewater concentration (cfu/100ml)	Background seawater concentration (cfu/100ml)	Minimum dilution (x-fold)	Predicted concentration after initial dilution (cfu/100ml)	Increase (cfu/100ml)
2018	Median	44	2	120	2.4	0.4
	95-percentile	370	2	120	5.1	3.1
	Maximum	800	2	120	8.7	6.7
2021	Median	90	2	120	2.7	0.7
	95-percentile	4,102	2	120	36.2	34.2
	Maximum	57,297	2	120	480	478

The high-quality wastewater achieved during 2018 is predicted to have caused a negligible increase in receiving water concentrations of faecal coliform bacteria, which would have been barely measurable beyond the 100m mixing zone. The poorer discharge quality in 2020 and 2021 is predicted to have had minimal impact on surface water quality most of the time but might occasionally (for 5% of the time) have caused a receiving water increase of 30 to 40 faecal coliforms per 100 ml, and a rare worst-case increase of between 450 and 500 per 100ml after initial mixing.

As the discharge plume is carried away from the mixing zone by wind or tide induced currents, faecal indicator bacteria concentrations within the plume are reduced by the combined processes of dilution, dispersion and die-off, resulting in lower faecal coliform concentrations as the distance from the point of discharge increases.

GWRC and Wellington City Council collect weekly water samples at popular bathing beaches during the bathing season from 1 November to 31 March. All samples are tested for enterococci which is the faecal indicator bacteria most suitable for use in marine waters[1]. The enterococci monitoring results for Breaker Bay, Lyall Bay and Princess Bay from the summers of 2018/19, 2019/20 and 2020/21 are summarised in Table 3-7.

Table 3-7: Summary statistics for enterococci (cfu/100ml) monitoring results at bathing beaches closest to the ocean outfall diffuser (data obtained from WWL)

Site	Distance from outfall diffuser (m)	2018/2019			2019/2020			2020/2021			PNRP
		n samples	95%ile	% >500	n samples	95%ile	% >500	n samples	95%ile	% >500	95%ile
Breaker Bay	4,400	16	70	0	17	19	0	15	22	0	≤500
Lyall Bay @ Tirangi	2,600	38	500	5.2	35	720	5.7	29	961	6.9	
Lyall Bay @ Queens Drive	2,500	34	95	0	15	147	0	11	218	0	
Lyall Bay @ Onepu	2,400	17	63	0	17	69	0	16	173	0	
Princess Bay	1,900	30	92	0	17	8	0	15	64	0	

The Princes Bay monitoring site is the closest to the WWTP outfall diffuser, located 1,900 m to the west. The three Lyall Bay sites are located 2,400 to 2,600 m north of the outfall diffuser, while the Breaker Bay site is located 4,400 m to the east (Figure 3-8). At Princess Bay the highest enterococci concentration recorded during this period was 430 cfu/100ml on 2 December 2018. The annual 95th percentile values for the 2018/19, 2019/20 and 2019/20 years are 92, 8 and 64

[1] Enterococci is different from faecal coliforms which have been used to monitor the treated wastewater and comparisons between enterococci and faecal coliform data sets must be conducted with care.

cfu/100ml, respectively, easily achieving the PNRP Objective of ≤500. GWRC gives Princess Bay a ‘long term suitability for swimming grade’ of ‘Good’.

At Breaker Bay the highest enterococci concentration recorded was 84 cfu/100ml on 7 January 2021. The annual 95th percentile values for the 2018/19, 2019/20 and 2019/20 years are 70, 19 and 22 cfu/100ml, respectively, easily achieving the PNRP Objective. GWRC gives Breaker Bay a ‘long term suitability for swimming grade’ of ‘Good’.

There is no indication from the monitoring data that the poor-quality Moa Point WWTP discharge during 2020 and 2021 has adversely affected the microbiological water quality at either Princess Bay or Breaker Bay.

The Lyall Bay monitoring site at Tirangi Road had the poorest water quality of all sites listed in Table 3-7. The highest enterococci concentration recorded at the Tirangi Road sites was 2,000 cfu/100ml on 14 July 2021 (this site is monitored throughout the year, not just during the bathing season). Water quality was poorer during 2019/20 and 2020/21 when the Tirangi Road site did not achieve the PNRP Objective of ≤500 enterococci per 100ml. The poor bathing beach quality coincides with poor quality of the Moa Point WWTP discharge, however, as this pattern was not observed at the Princess Bay site, which is closer to the outfall diffuser, it is most likely driven by a local wastewater network problem in Lyall Bay.

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Figure 3-8: Location of bathing beach routine water quality monitoring sites (green dots) and indicative location of Moa Point outfall (blue line)

In summary, the predicted influence of a poorer quality WWTP discharge in 2020 and 2021 based on mass balance calculations, in combination with the results of routine faecal indicator bacteria monitoring at bathing beaches at Princess Bay, Lyall Bay and Breaker Bay, indicate a negligible increase in illness risk for those engaged in full contact recreation activities at those locations.

4 Conclusion

The operators of the Moa Point WWTP encountered technical challenges during 2020 and 2021 which resulted in a reduced quality of treated wastewater discharged to the CMA, especially in respect of suspended solids, $cBOD_5$, and faecal indicator bacteria. This assessment of the effects of the 2020 and 2021 discharges, based on a review of monitoring data and other readily available information, has reached the following conclusions:

- Increased loads of suspended solids discharged during 2020 and 2021 might, in the worst case, have formed a visible plume in surface waters over the outfall diffuser when viewed from an elevated position, however for the majority of time the plume would have been barely visible.
- The oil & grease content of the discharge remained relatively low and would have been barely discernible in surface waters above the outfall diffuser. The discharge in not likely have produced any scum or foam or objectionable odour in surfaces waters near the diffuser.
- The loads of total metals and total ammonia nitrogen discharged during 2020 and 2021 would not have exceeded marine DGV's in receiving waters after initial mixing.
- The information available from annual pipeline condition survey reports, including photographs of the diffuser risers and the surrounding seabed, suggests that if ecological changes have occurred since 2018, they are likely to be relatively minor.
- Increased microbiological loads discharged during 2020 and 2021 caused a negligible increase in illness risk for those engaged in full contact recreation activities at Princess Bay, Lyall Bay and Breaker Bay, compared with 2018.
- The long ocean outfall and multiport diffuser have played a critical role in mitigating the adverse effects of poorer quality wastewater by separating the point of discharge from sensitive receptors and by ensuring a high level of initial dilution.

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Appendix iii: Outfall Pipeline Inspection Report

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VEOLIA WATER SERVICES NZ LIMITED
– MOA POINT WASTEWATER OCEAN OUTFALL PIPELINE & SEABED ANNUAL INSPECTION

March 2022

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Document No.:	**UCL – 2022.03 – WWTP Outfall Pipeline – IR001**
	Prepared for: Veolia Water Services NZ Ltd., Moa Point WWTP, Wellington.

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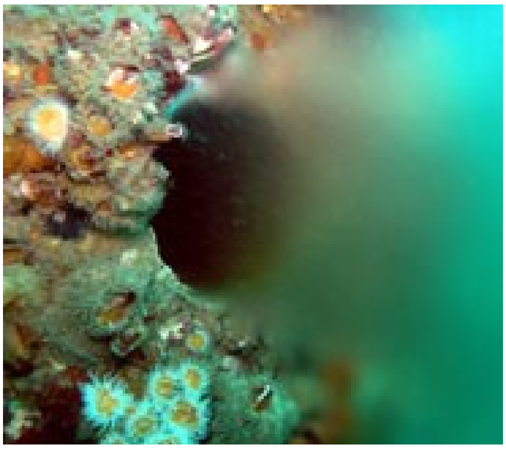

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Preface

Pipeline installations and their life cycle management represent major planning and engineering efforts; especially those subjected to harsh environmental conditions such as Wellington south coasts Moa Point Wastewater Ocean Pipeline Outfall. For Companies and or Government Authorities to obtain the maximum working life and return on their initial investment from assets in a marine environment it is important that they be maintained to an acceptable and safe working standard. To ensure the quality assurance of their asset it is necessary to complete infrastructure surveys, programmed maintenance, and subsequent to inspection findings; remedial works.

When pipeline installations and their ancillary sub-components come into service, it is hoped that they're free of all significant faults. This of course depends on the professional standards of the quality assurance of the numerous involved Parties in design, fabrication, construction, and installation.
To ensure a continuous working life for any marine asset, it is necessary to maintain an adequate inspection programme. Such a programme must be capable of detecting potential problems at an early stage. This allows the designers and engineers time to analyse the inspection information and suggest remedial action if required.

Experience has shown that the vast majority of all faults; damage / defects / deterioration found in marine structures and associated civil works have been done so visually. Visual information is of utmost importance both in programmed visual survey inspection, condition assessment, and diver general observation.
Throughout the progression of these survey inspections personnel observe and record data on numerous components in varying condition states.
The consequences of failure of what initially may only be a minor fault, especially sudden failure, can be catastrophic and very expensive, both in terms of repairs, lost business, and risks to health, safety and the environment.
Programmed survey inspections / condition assessment / asset audits are completed to ensure the continuing operational function and safe condition of the structure is maintained. Providing the Asset Owner, its Operators, and subsequently the users with an assurance of reliability and ensuring the integrity of the structure.

Condition assessment is an important step in the life cycle management process of Marine Structural Assets and their ancillary components.
One of UCL's major specialties of work and experience is in the inspections, condition assessment and reporting on numerous 'in-water' structures throughout New Zealand and Offshore. It is a facet of our work that we can derive immense satisfaction from; when being able to detect potential problems at an early stage, then work in partnership with Clients towards achieving common goals and economic solutions. Thus minimising risk and therefore maintaining the Clients valuable asset in safe and efficient working condition – "fit for purpose".

Asset Maintenance

“It needs to be recognised; to have an effective Asset Management System (AMS); you’re required to have an effective and efficient Asset Maintenance Programme (AMP)”.

Over the past few decades, the desire of extending the useful service life of marine structures has become of paramount significance. Where ageing structures are a serious problem faced by countries across the world; premature deterioration has also emerged as a major problem that results in reduced service lives of structures.
In the marine environment structural components are constantly subjected to multiple risk factors that result in deterioration over the course of their service lives.
Structural failure can be defined as the inability of a structure to serve its intended function with the desired levels of safety and serviceability.
Failure of a structure or sub-component of a structure may be attributed to a number of independent and interrelated factors.

Asset condition assessments combine the processes of periodic inspection and testing, and the assessment and interpretation of the resultant data to provide an indication of the current condition of a specific asset, as to the determination of the requirement for remedial action.
Asset condition assessments determine the physical state of an asset that may affect the performance of the asset and the ability of the asset to provide the required level of service.

The benefits of knowing the current condition of an asset are:

- The ability to plan and manage the delivery of the required level of service of the asset.
- Avoiding premature asset failure by providing the option of cost effective remediation.
- Providing an accurate estimate of future expenditure that is required.
- Determination and refinement of maintenance and rehabilitation strategies.

Asset maintenance to be undertaken over the balance of a marine structures service life is a major challenge to provide reliable and sustainable operation. Operating ageing structures efficiently and safely requires an asset maintenance cycle that includes; inspection diagnosis, evaluation and implementation of remediation processes.
It is a critical part of asset management to determine the remaining lifecycle of an asset and the capability of the asset to meet the designed performance and level of service requirements.
In today’s environment, the preventative maintenance of ageing structures is normally more cost beneficial compared to the cost of construction of new structures once original design lives have been exceeded. Asset Condition Assessment gathered information assists with the determination of the remaining service life of an asset, and the scheduling of remediation requirements that are required to reinstate the level of service that is provided by the asset to the desired standard.

Being unaware of the current condition of an asset may lead to the premature failure of the asset leaving limited options to the asset owner / operator; with replacement being the most expensive option. Unforeseen failure of an asset provides major consequences that constitute a risk to business operations or potential loss to the organisation. The benefits of knowing the current condition of an asset are; the ability to plan and manage the delivery of the required level of service of the asset, avoiding premature asset failure by providing the option of cost effective remediation, providing an accurate estimate of future expenditure that is required, and the determination and refinement of maintenance and rehabilitation strategies.

Assessment of damaged or deteriorated marine structures should only be made by qualified and experienced people specialising in this field of work; and the process should always include the aspects of the condition of the structure including all visible, non-visible and potential damage and defects, a review of the past, current and future service functions / requirements.

With most damaged or deteriorated marine structures, the owner / operator have a number of options which will effectively decide the appropriate remediation strategy that will meet the future service requirements of the structure. These options will include doing nothing, downgrading the capacity or functioning of the structure, preventing or reducing further damage without repair, improving, strengthening or refurbishing the structure, reconstructing all or part of the structure or demolishing the structure.

Proper remediation methodology begins with inspection and testing to identify the type and extent of defects and degradation mechanisms, and the overall condition and quality of the structure. Remediation projects are prone to increasing in volume and costs once work has commenced – investing in comprehensive and accurate Asset Condition Assessments before remediation begins has proven cost effective in the long term.

Often there is limited information on original design and concept drawings; with drawings and construction records often being partial and without update detail to cover "as built" changes.
An understanding of marine structures is critical in being able to provide comprehensive reporting on all aspects of the construction envelope. Prior to diagnosing the causes of defects or failure within a structure it is important to understand that defects result from several factors: design, construction practices, materials, the environment, and loading applied to the structure.

Baseline data along with periodic Asset Condition Assessments are intended to function as the foundation for asset maintenance strategies; in which components and sub-component of the structure are prioritised aligned with their degree of deterioration and loss of function.

General

All marine structure assets exposed to the marine environment are subjected to considerable deteriorating forces. Of course, the designers take this into account when designing the various components that are constructed to form marine structures; however local anomalies do occur and some detailed aspects of the problem are imperfectly understood.
All marine structures warrant careful monitoring on engineering grounds. This indicates a need for documentation for marine structures and the importance of these records should not be underestimated. The average working life of structures designed for marine environments is predicted to be between 35 – 50 years. During that life cycle, it would be reasonable to assume that defects of one type or another will occur. It makes good sense for both engineering and economic reasons for any such defects / damage / deterioration to be dealt with on a planned basis.

Veolia Water Services NZ Ltd. – Moa Point Wastewater Ocean Outfall Pipeline and Seabed

Annual Underwater Condition Survey Inspection

Overview

Report prepared for:
Edward Yong, Safety, Risk, & Compliance Officer /
& Stuart Pearce, Contract Manager
Moa Point WWTP
Veolia Water Services NZ Ltd. (Client)

Survey Inspection Investigations and Report completed by:
Wayne Angus, Civil Engineer / Construction Diver
Undersea Construction Ltd. (UCL) (Diving Contractor / Consultant)

The Moa Point Ocean Outfall Pipeline is approximately 1858m in length, from position 'A' at the roadside southern embankment inspection chamber, then traversing in a southerly direction through Lyall Bay to the pipelines southernmost diffuser (position 'F') at a water depth of 23 metres and a GPS position of 41° 21.119' S 174° 48.080' E.

Wellington City Council holds Resource Consent WGN080003 (26180) to discharge treated wastewater from the Moa Point Wastewater Treatment Plant into Lyall Bay via a 1.8km offshore outfall pipeline.

Following a brief discussion on the survey scope and objectives, staff from UCL completed underwater survey inspections of the Moa Point Wastewater Ocean Outfall Pipeline and seabed.

The emphasis of the survey investigations is to both monitor as per set 'Scope' criteria, observe and report on any defect / damage / deterioration that could affect the current operational working and future service life of the inspection components, the pipeline system as a whole, and to establish documented data that not only provides the Client with reporting on current condition status, but also comparisons with historic values.

Scope of Work

- Formulate a survey plan.

- Submit Worksafe NZ Notification of Work (Diving – Notifiable work).

- Task assessments, hazard analysis, and equipment preparation.

- Visual survey inspection of pipeline components:
  a) inshore exposed pipeline section; 3.0 – 8.0 metre water depth (positions ‘C – D’),
  b) buried pipeline route from diffuser # 18 (position ‘E’) on a heading back to position ‘D’,
  c) outfall diffuser section from southernmost diffuser # 1 (position ‘F’) to diffuser # 18 (position ‘E’).

- Dimensional measure of scour:
  a) at inshore exposed pipeline section (positions ‘C – D’). With reference to existing markers, set at 10 metre increments along the length of exposed pipe to establish repetitive monitoring at fixed positions. Update CAD drawing for 2022 reference and reporting purposes.
  b) at diffuser section.

- Cathodic Potential testing at diffuser test point and outlet nozzles.

- Photograph items of interest.

- Video diffusers in operation.

- Log all observations; defect / damage / deterioration etc., and general condition.

- Compile and submit a report of all inspection findings.

Positional Data

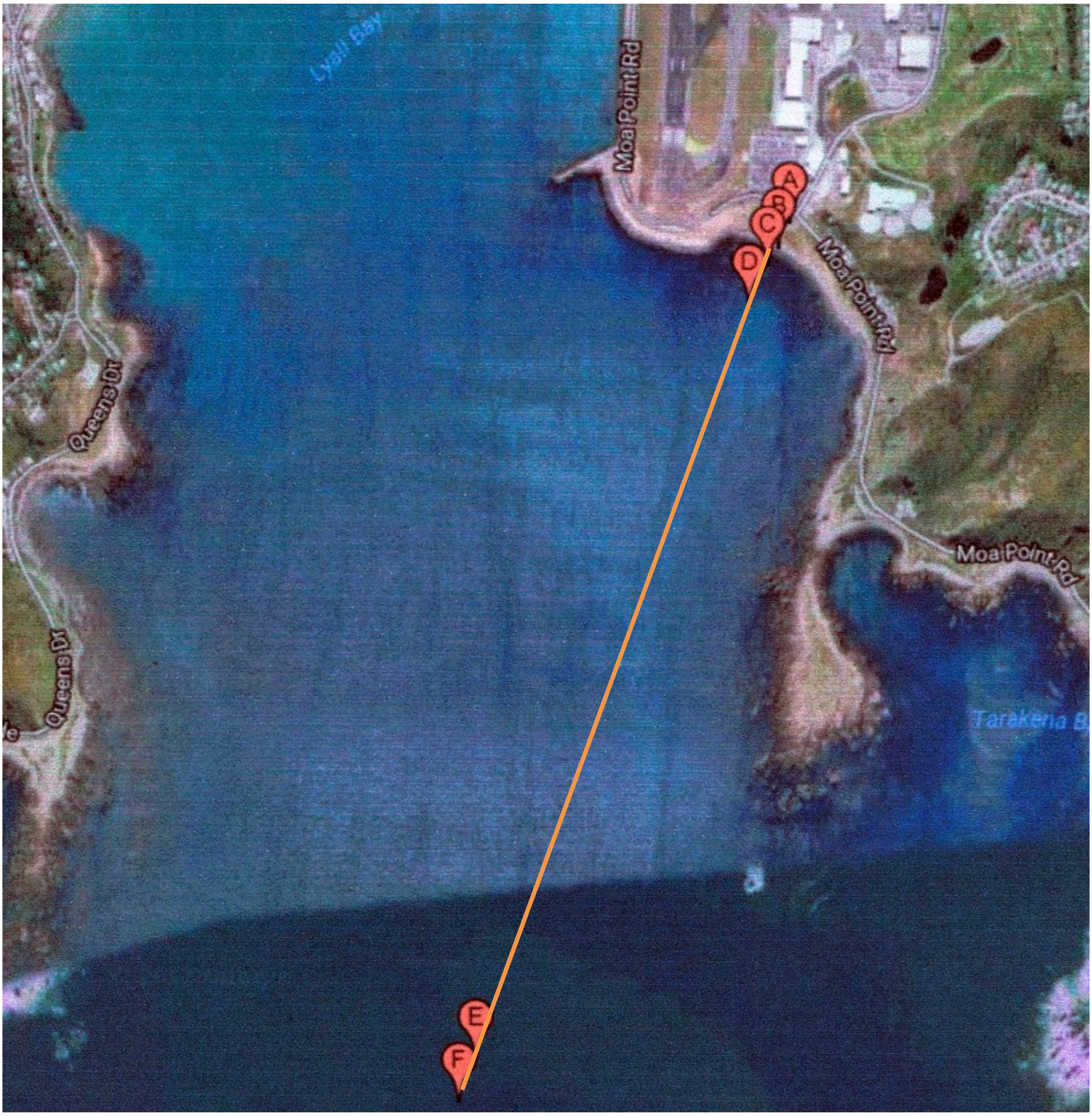

Figure 1: Pipeline route and key reference positions

Position 'A' - Onshore manhole access to buried pipeline

UTM			dd.ddddd°	dd° mm.mmm'	dd° mm' ss.s"
60G	316670 x – ea.	Lat:	-41.33630°N	41° 20.178'S	41° 20' 10.7"S
	5421594 y – no.	Long:	174.80903°E	174° 48.542'E	174° 48' 32.5"E

Position 'B' - Mean High Water (MHW)

UTM			dd.ddddd°	dd° mm.mmm'	dd° mm' ss.s"
60G	316652 x – ea.	Lat:	-41.33673°N	41° 20.204'S	41° 20' 12.2"S
	5421545 y – no.	Long:	174.80880°E	174° 48.528'E	174° 48' 31.7"E

Position ‘C’ - Exposed inshore pipeline section shoreward end

UTM		dd.ddddd°	dd° mm.mmm’	dd° mm’ ss.s”
60G	316630 x – ea.	Lat: -41.33707°N	41° 20.224’S	41° 20’ 13.5”S
	5421507 y – no.	Long: 174.80853°E	174° 48.512’E	174° 48’ 30.7”E

Position ‘D’ - Exposed inshore pipeline section seaward end

UTM		dd.ddddd°	dd° mm.mmm’	dd° mm’ ss.s”
60G	316598 x – ea.	Lat: -41.33772°N	41° 20.263’S	41° 20’ 15.8”S
	5421434 y – no.	Long: 174.80812°E	174° 48.487’E	174° 48’ 29.2”E

Position ‘E’ - Shoreward end of pipeline diffuser section

UTM		dd.ddddd°	dd° mm.mmm’	dd° mm’ ss.s”
60G	316100 x – ea.	Lat: -41.35121°N	41° 21.073’S	41° 21’ 44.0”S
	5419923 y – no.	Long: 174.80172°E	174° 48.103’E	174° 48’ 06.2”E

Position ‘F’ - Seaward end (southernmost) of pipeline diffuser section

UTM		dd.ddddd°	dd° mm.mmm’	dd° mm’ ss.s”
60G	316070 x – ea.	Lat: -41.35198°N	41° 21.119’S	41° 21’ 07.1”S
	5419836 y – no.	Long: 174.80133°E	174° 48.080’E	174° 48’ 04.8”E

Distance between points – (in metres)						
Reference	**A**	**B**	**C**	**D**	**E**	**F**
A	00.0	52.0	96.0	175.0	1765.0	1858.0
B	52.0	00.0	44.0	123.0	1713.0	1805.0
C	96.0	44.0	00.0	79.7	1670.0	1762.0
D	175.0	123.0	79.7	00.0	1591.0	1683.0
E	1765.0	1713.0	1670.0	1591.0	00.0	92.1
F	1858.0	1805.0	1762.0	1683.0	92.1	00.0

Table 1: Distances between key positions

Methodology / Procedure

Utilising both standard SCUBA and light-weight contaminated water equipment (Divator positive pressure masks), and using a breathing mixture of Nitrox 40 (40% O^2 / 60% N^2), divers inspected pipeline components as per the programmed Scope of Work: firstly the outfall diffuser section from southernmost diffuser # 1 (position ‘F’) to diffuser # 18 (position ‘E’), followed by the buried pipeline route from diffuser # 18 (position ‘E’) on a heading of 18° East of True North back to position ‘D’, then finally the inshore exposed pipeline section 3.0 – 8.0 metre water depth (positions ‘C – D’).
Divers completed the tasks as detailed within the scope of work: carrying out specific investigations, while also observing for any evidence of abnormal or aggressive wear, defect, damage, or deterioration, then logging all details accordingly.
Refer to relevant section of Report for further details.

Specialised Non Destructive Testing (NDT) equipment was used in the Cathodic Potential testing of the diffuser section of the pipeline.

The specialised CP equipment used to extrapolate data was:

BUCKLEYS Bathycorrometer, Serial No. BUC587.
Certificate of Calibration: S.41610, Det Norske Veritas (D.N.V.)

Figure 2: Bathycorrometer (Cathodic Potential Meter) in operation

As standard with the use of this type of equipment; prior to taking Cathodic Potential readings a calibration check is carried-out using a Zinc (Zn) test block; against the CP meters Silver / Silver Chloride (Ag/AgCl) electrode; the returned reading of 1.05V is considered very good.

Notes:

For ease of interpretation, this Report addresses and documents the pipeline inspection components in individual sections as follows:

- Inshore Exposed Pipeline Section and Seabed.
- Buried Pipeline Outfall Route and Seabed.
- Offshore Diffuser Section – General Survey.
- Diffuser section Cathodic Potential Survey.

UNDERSEA CONSTRUCTION LTD.

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P. O. BOX 31081,
LOWER HUTT 5040
NEW ZEALAND.

DAILY RECORD OF INSPECTION OR NDT

DATES OF DIVES:	05th & 12th 2022
INSPECTION PERSONNEL:	Scott McChesney, Jacques Angus, Rian Kriel, Wayne Angus
CLIENT:	Veolia Water Services NZ Ltd.
LOCATION:	Moa Point WWTP, Lyall Bay, Wellington
INSPECTION COMPONENT:	Wastewater Ocean Outfall Pipeline and Seabed – Annual Survey

TYPE OF DIVE:

SCUBA	SURFACE SUPPLY	MIXED GAS	OTHER
X		X	Divator + pressure mask

DIVE DETAILS: (multiple dives over the course of the 2 days)

	DIVE 1	DIVE 2	DIVE 3	DIVE 4	DIVE 5
MAXIMUM DEPTH OF DIVE	24.0m max.	24.0m max.	23.0m max.	8.0m max.	
BOTTOM TIME (minutes)	34 Diffusers	15 Diffusers	26 Pipeline route	47 Inshore section	

METHOD | **CHECK** | **PARTICULARS / EQUIPMENT**

CLEANING

TECHNIQUES:		

SAMPLING

TYPE:		

VISUAL INSPECTION

GENERAL SURVEY:	X	Visual condition assessment of inspection components
STILL PHOTOGRAPHY:	X	Photograph items of interest
VIDEO SURVEY:	X	Take video footage of diffusers in operation, & exposed inshore pipeline section

NDT

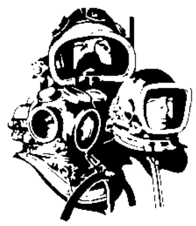
POTENTIAL MEASUREMENT:	X	Cathodic Potential readings
DIMENSIONAL SURVEY:	X	Obtain seabed scour measurements – around diffusers, & inshore pipeline section
REMEDIAL GRINDING:		
M.P.I.:		
ULTRASONIC:		
OTHER:		

ANY OTHER REMARKS: Refer to this Report for Inspection data results.

APPROVED

NAME OF SUPERVISOR: Wayne Angus
SIGNATURE: *W. T. Angus*
DATE: 05 & 12/03/ 2022

NAME OF CLIENT'S REP: Edward Yong
SIGNATURE:
DATE:



UNDERSEA VERIFICATION SURVEY

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Exposed Inshore Pipeline Section and Seabed

The exposed inshore pipeline section (position ‘C’) commences 44.0 metres below the MHWL at a depth of 3.0M, and extends approximately 80.0 metres to a depth of 7.0M.

Over the past year (between the 2021 to 2022 Inspections) the area has experienced an increased frequency where southerly swells have been the predominant sea conditions. Other than a few larger Southerly events, these conditions have tendered to remain slight to moderate: such conditions result in an increased volume of sand and fine gravel deposits been eroded from adjacent to the pipeline.
Visual observations indicate a slight depletion in bed (sand and fine gravel) deposit levels occurring around the exposed pipeline between the inspections period February 2021 to March 2022.

Due to the nature of this coastline; its exposure to severe southerly storms, its wave action and strong currents causing continual aggregate migration, and the shallow depth of burial of the inshore pipeline section; scour adjacent to the pipe will always remain an inevitable factor requiring monitoring.

In 2017 with the intention of gaining greater accuracy in the collection and reporting of scour data; UCL drove reference markers into the seabed at 10 metre intervals adjacent the 80 metre length of exposed pipeline section. These markers serve as fixed reference positions for the repetitive logging and comparison of annual data.

Although the exposed length of pipeline has increased slightly since commissioning; exposure progression has remained relatively slow; with exposure length only increasing minimally over the 2021 to 2022 inspection period. Over this same period scour adjacent to the pipeline has remained stable, with only increases of scour depth as measured at the several designated monitoring positions. This being largely due to the cyclic effect imposed from repetitive Southerly conditions on sand and light gravel deposit migration within the shallows.

Figure 3: Shoreward of the 00.0 metres monitoring mark, a further 03.0 metres of pipeline has been exposed

Exposed Pipeline Section Scour Depth Data									
Test point meterage	**Year**								**Comments**
	2019		**2020**		**2021**		**2022**		
	West (mm)	**East (mm)**	**West (mm)**	**East (mm)**	**West (mm)**	**East (mm)**	**West (mm)**	**East (mm)**	**Seafloor composition**
-03.0 metres							100	100	Formed rock reef with loose packed rock and gravels – in close proximity with pipeline
Position 'C' 00.0 metres	200	150	100	100	70	100	100	150	As above
10.0 metres	200	200	150	200	150	200	200	250	As above
20.0 metres	350	400	250	300	350	400	400	400	As above
30.0 metres	500	500	350	400	450	450	500	550	As above
40.0 metres	700	650	600	650	600	650	800	800	As above
50.0 metres	1000	1000	700	750	850	850	900	900	As above
60.0 metres	760	1100	600	600	850	900	850	850	Formed rock reef with gravel and sand deposits – rock reef structuring standing off 1 – 2 metres from pipeline
70.0 metres	500	750	400	450	400	450	500	500	As above
Position 'D' 80.0 metres	200	430	150	150	150	200	250	250	Sand and cobbles

Table 2: Scour measure record

Figure 4: -03.0 metres

Figure 5: 00.0 metres

Figure 6: 10.0 metres

Figure 7: 20.0 metres

Figure 8: 30.0 metres

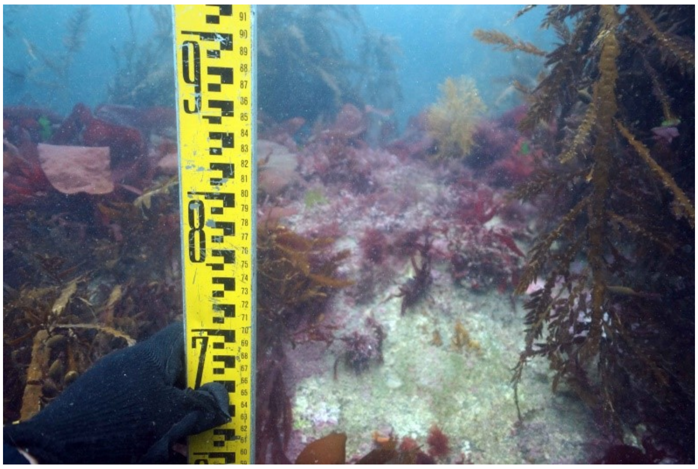


Figure 9: 40.0 metres

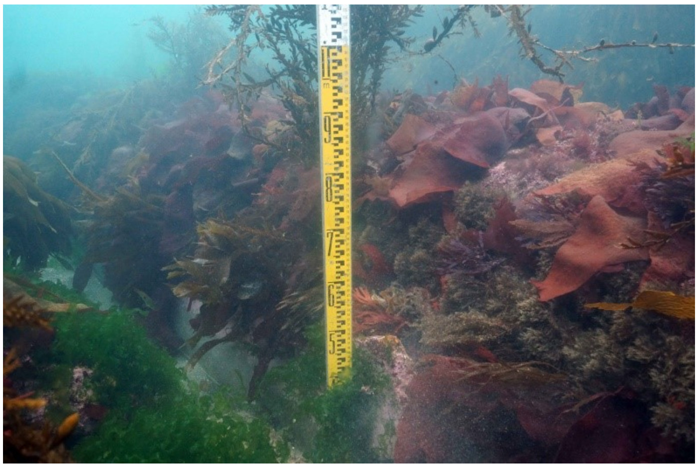


Figure 10: 50.0 metres

Figure 11: 60.0 metres

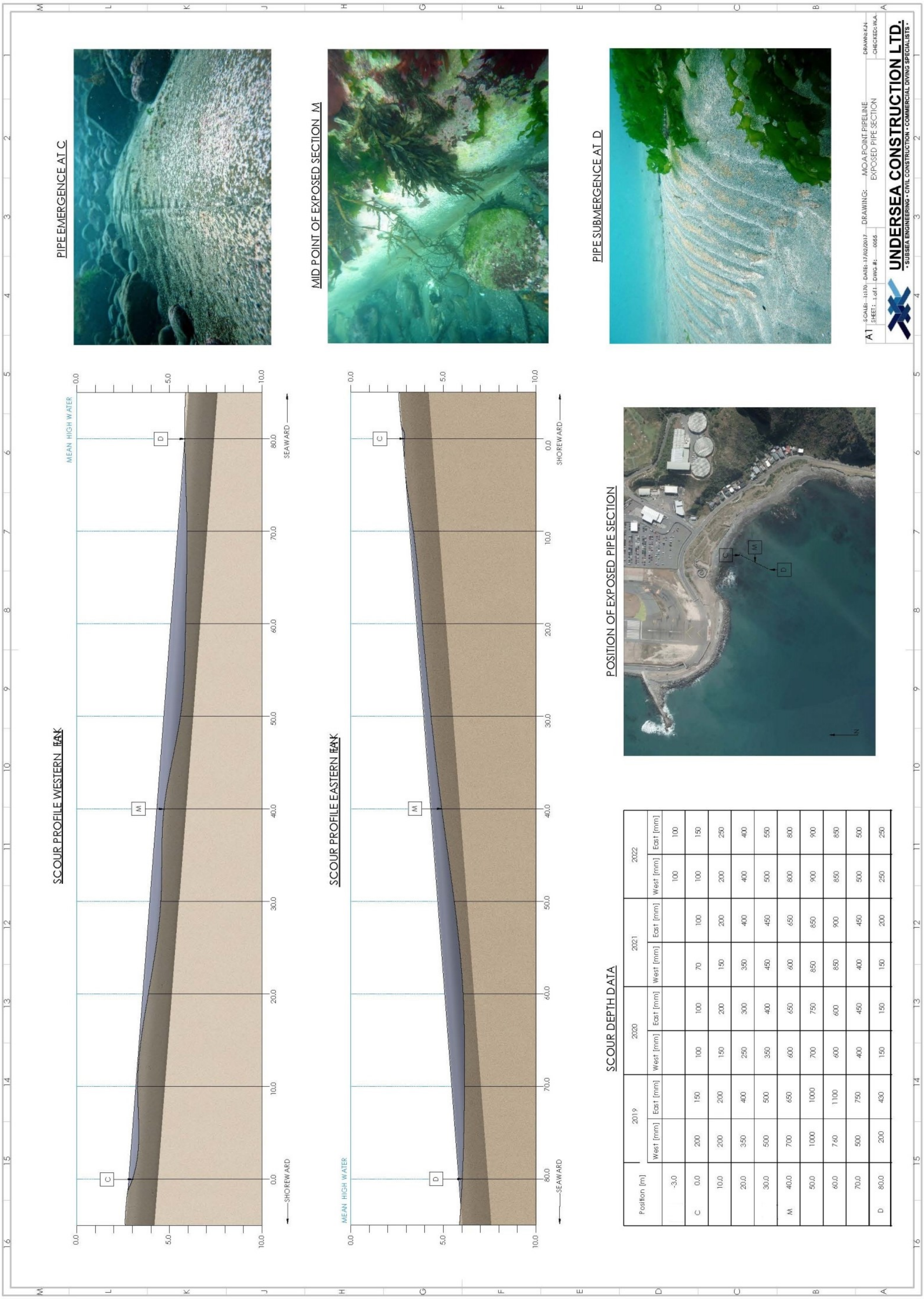
Figure 12: 70.0 metres

Figure 13: 80.0 metres

Notes:

The updated detail for the Inshore Pipeline Profile CAD drawing on Page 19 (Figure 14) can be viewed in A1 size CAD format, as provided in this Report's attachments.

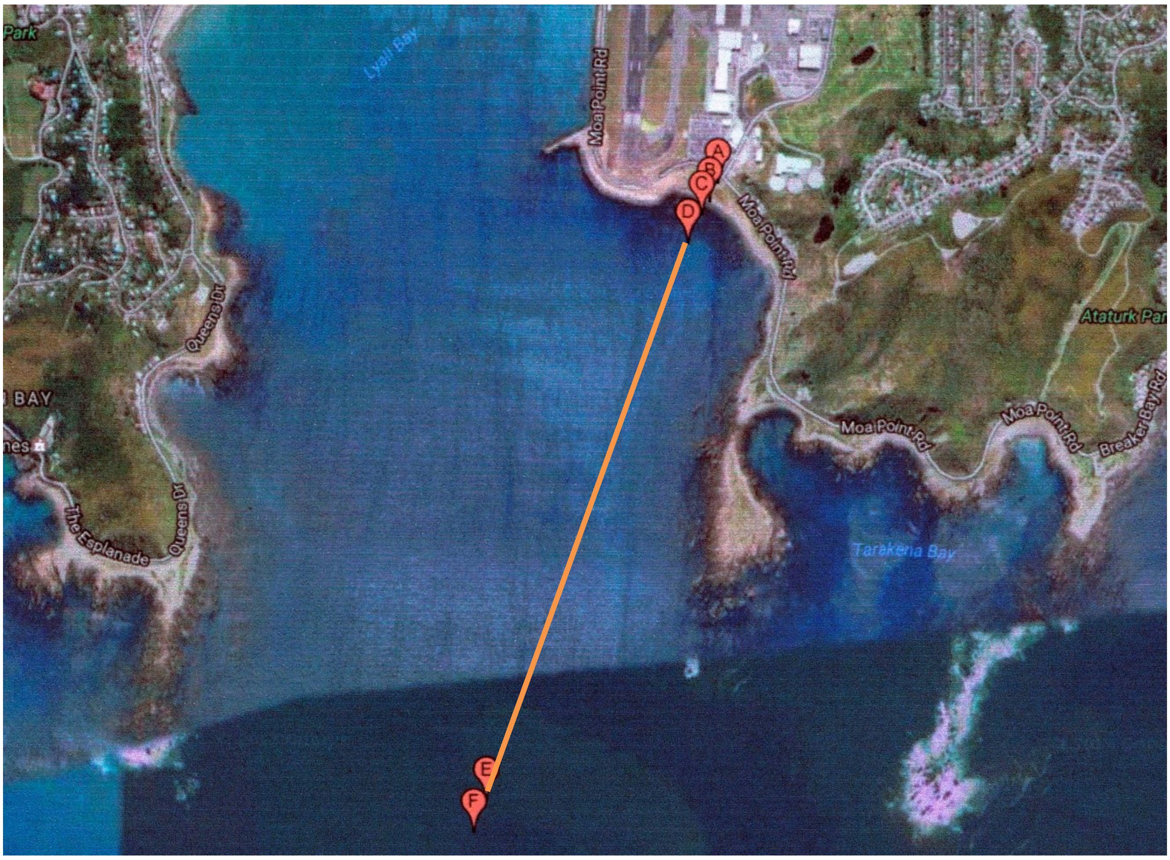
Video footage of the Exposed Inshore Pipeline Section can be viewed in the attached file: Exposed Inshore Pipeline Section – 2022.



Position [m]		2019		2020		2021		2022	
		West [mm]	East [mm]	West [mm]	East [mm]	West [mm]	East [mm]	West [mm]	East [mm]
	-3.0							100	100
C	0.0	200	150	100	100	70	100	100	150
	10.0	200	200	150	200	150	200	200	250
	20.0	350	400	250	300	350	400	400	400
	30.0	500	500	350	400	450	450	500	550
M	40.0	700	650	600	650	600	650	800	800
	50.0	1000	1000	700	750	850	850	900	900
	60.0	760	1100	600	600	850	900	850	850
	70.0	500	750	400	450	400	450	500	500
D	80.0	200	430	150	150	150	200	250	250

Figure 14: Inshore scour profile

Buried Pipeline Outfall Route and Seabed



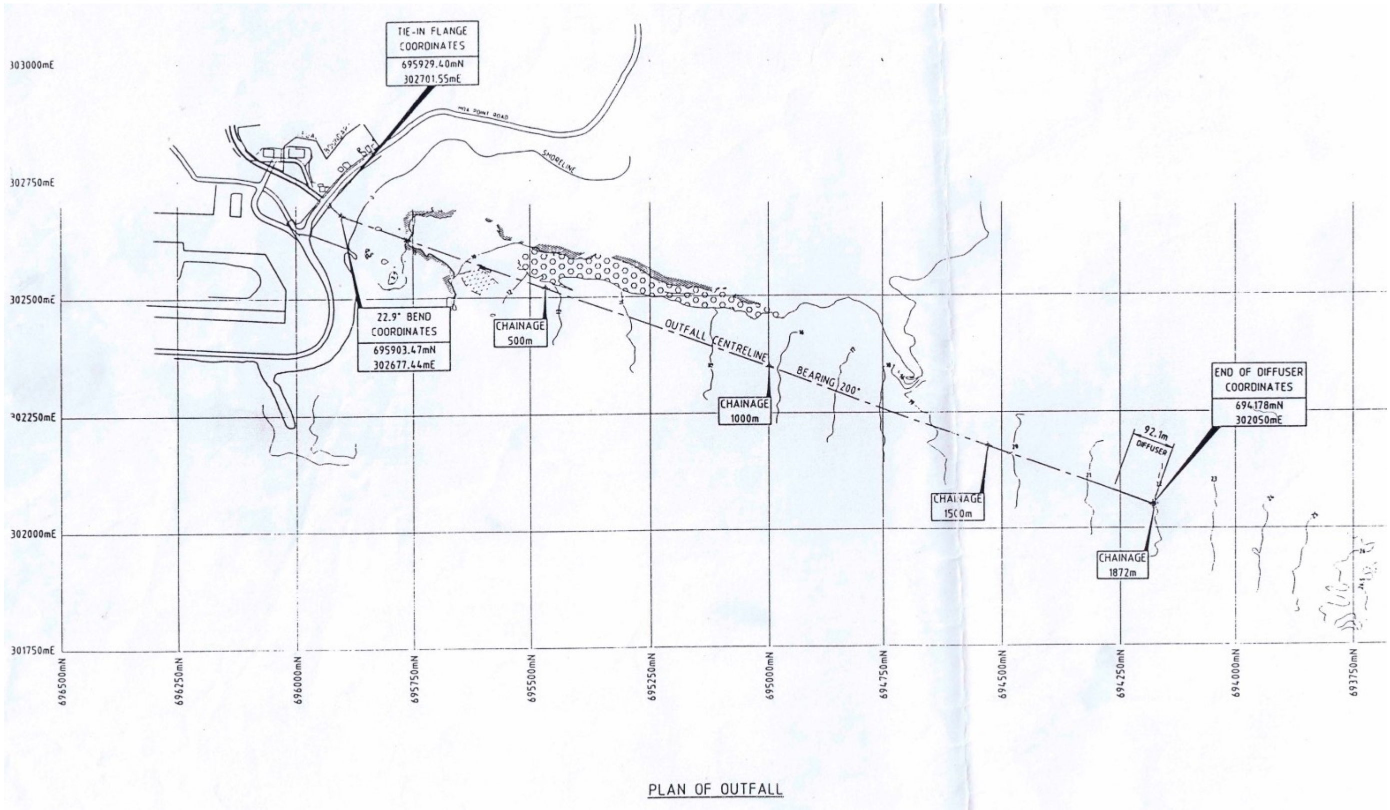


Figure 15: Pipeline route

Prior to underwater inspection of the buried pipeline outfall route and seabed UCL personnel dropped anchored marker buoys at positions ‘D & E’, and placed a survey tripod with prism set at position ‘B’ as a backsight alignment. From the survey vessel used for the pipeline inspection, a diver equipped with a manta-board tethered to the vessel was dropped in the water at position ‘E’ where he descended to the seabed and readied for the tow along the pipeline route. The vessel proceeded slowly on a heading of 18° East of True North towing the diver who also had his underwater computer compass aligned to the same heading.

Travelling just above the seabed along the pipeline route, the diver kept observation for any exposed pipeline sections, or evidence of fouling. The tow commencing at position ‘E’ (Diffuser # 18), and ceased approximately 50 metres from the shoreline at position ‘D’.

Visibility was poor; ranging from 0.5 to 1.5 metres.

The diver experienced no observations of exposed pipe, nor any evidence of fouling by foreign objects.

The offshore seabed, consisting of rocks, and coarse gravels and sand forms a profile of undulating peaks and depressions of +/- 300mm.

The inner route seabed, consisting of coarse sand and gravels forms a profile of undulating peaks and depressions of +/- 150mm.

Seafloor deposits of gravel and sand in the form of undulating, peaks and depressions are typical and commonplace in this type of coastal environment.

The result of the underwater tow inspection being; no areas for concern observed.

Figure 16: Typical seabed composition – offshore route – Position E

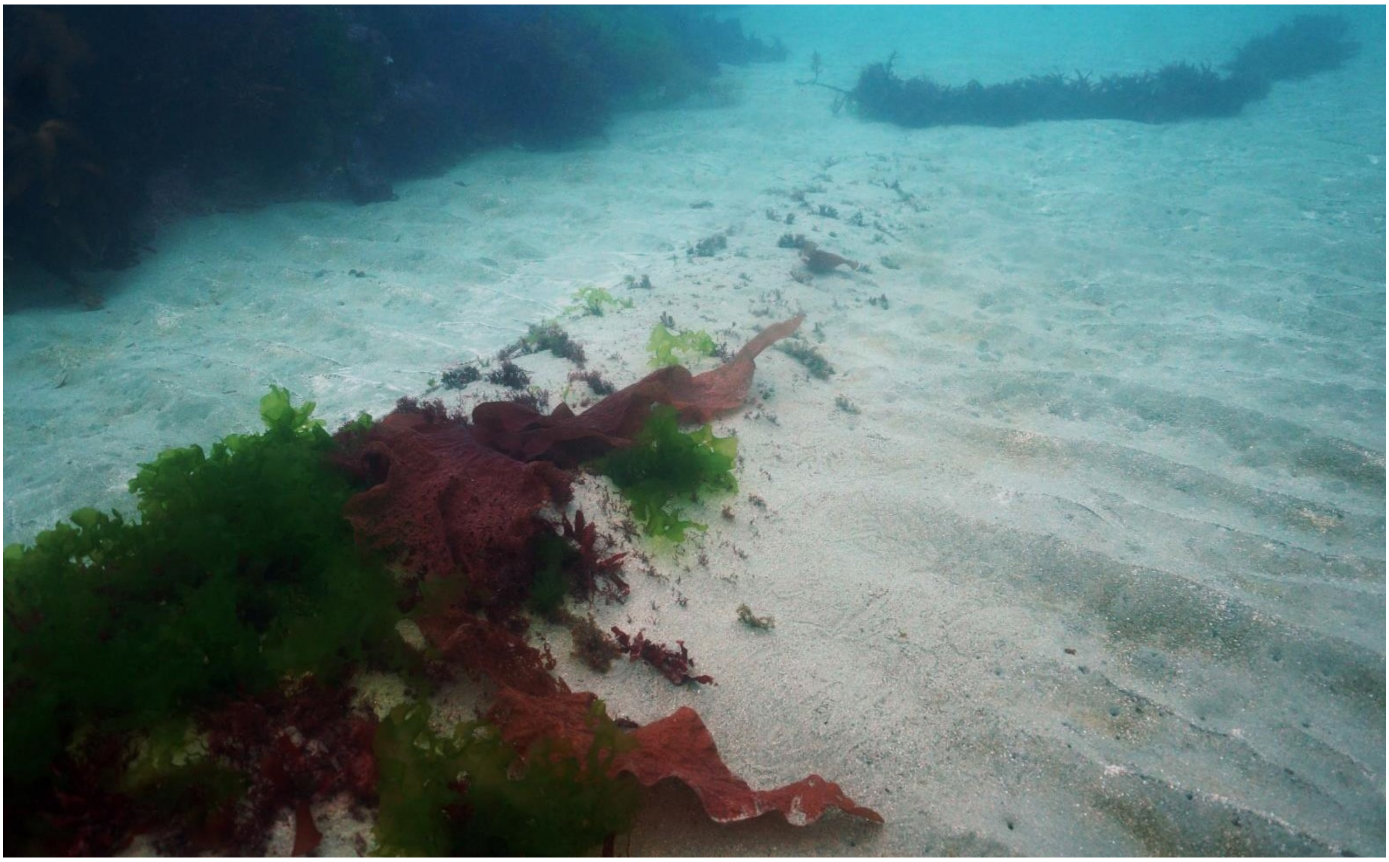
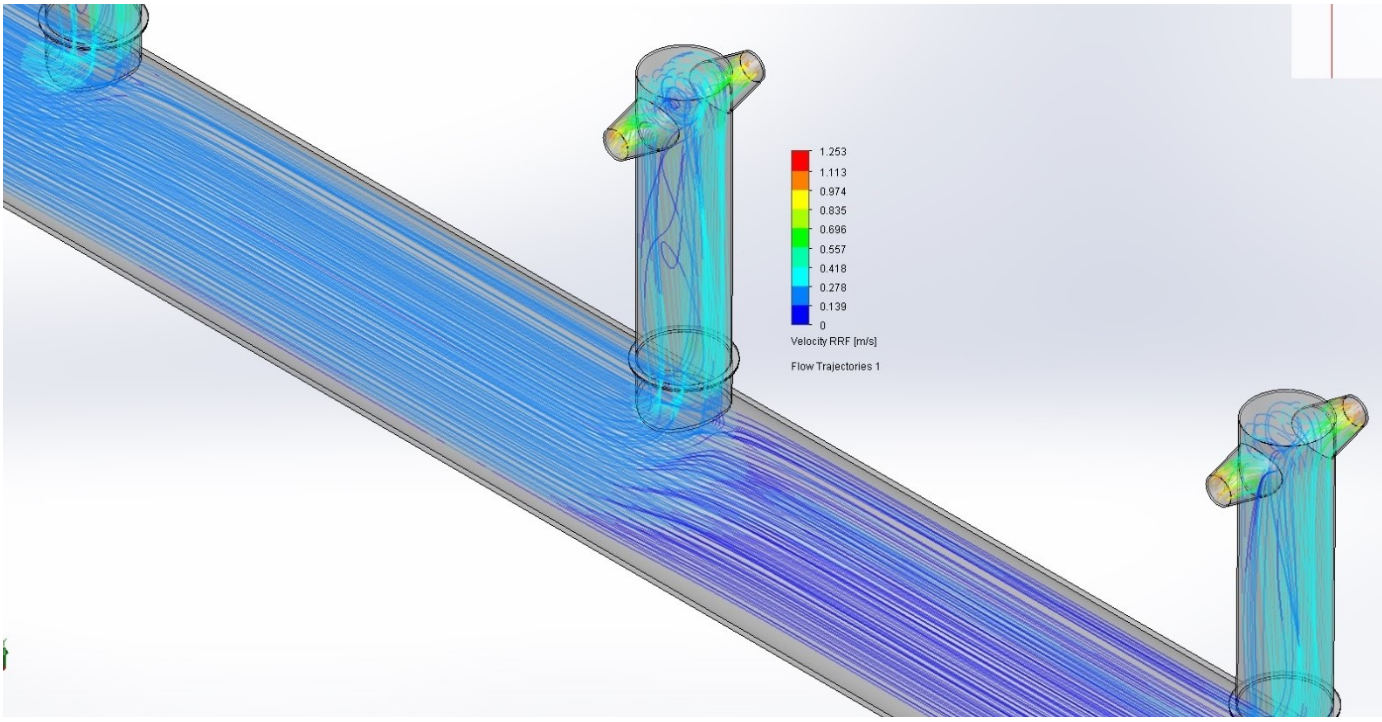


Figure 17: Typical seabed composition – offshore route – Position D

Offshore Diffuser Section – General Survey



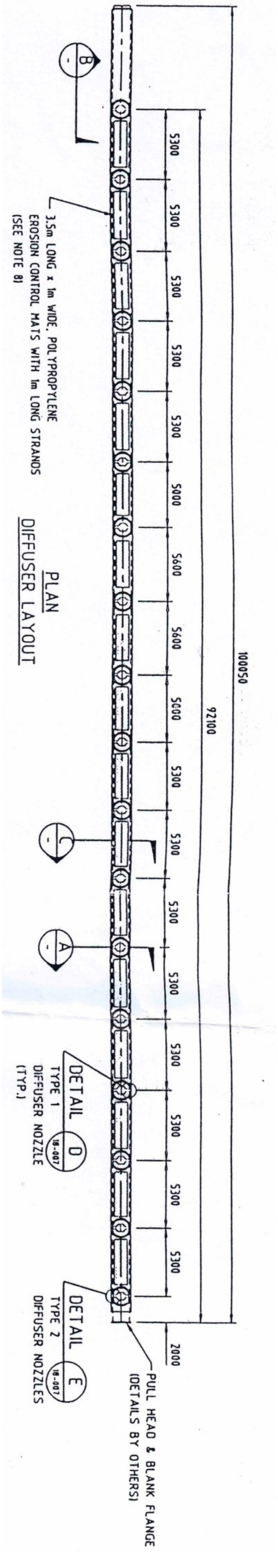


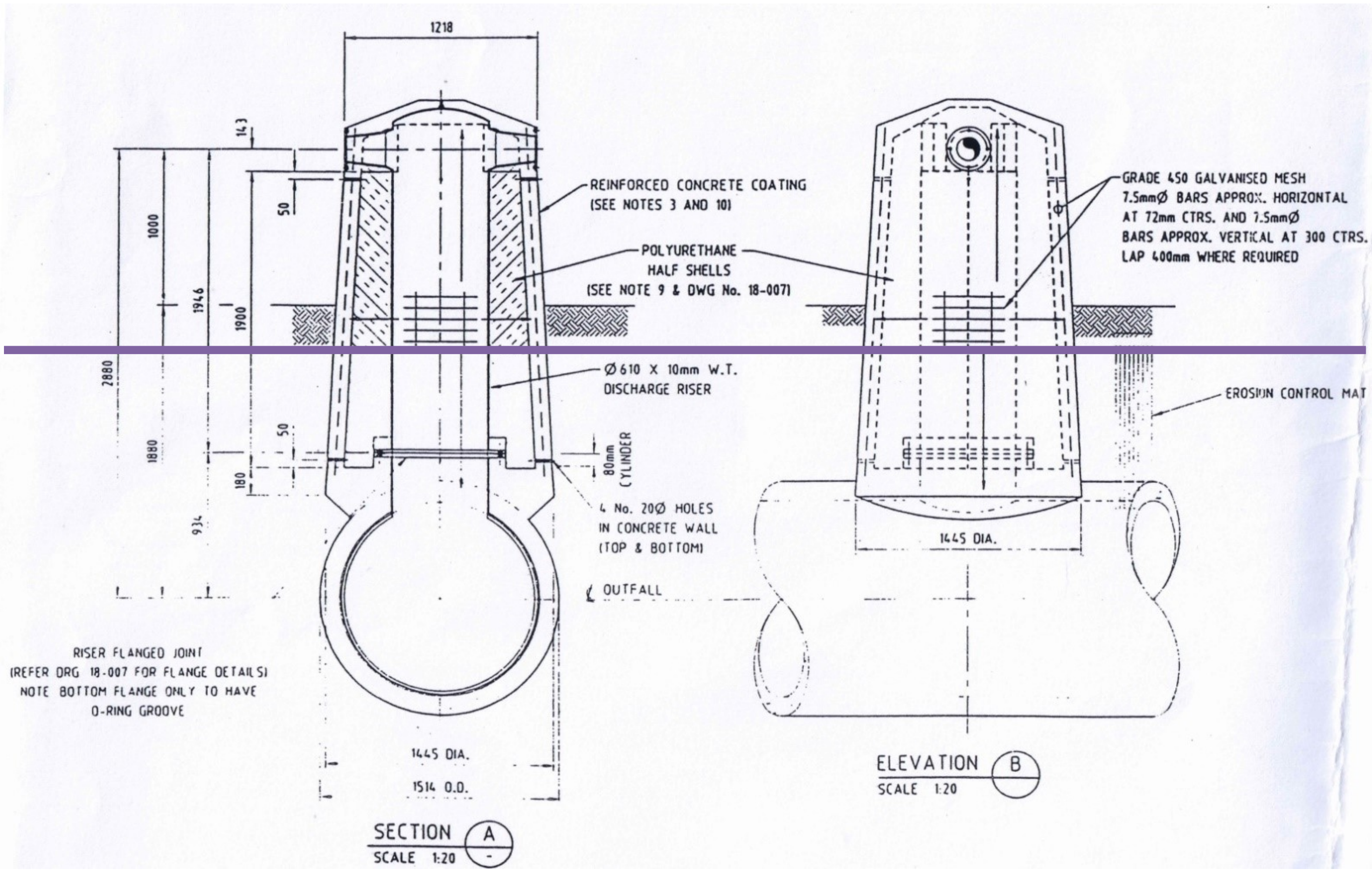
Figure 18: Diffuser layout

Divers inspected the general condition of diffusers, measuring scour depths around riser pipes, and checking for any evidence of fouling, damage, defect, or deterioration.

The inspection commenced at the seaward most diffuser, this being diffuser # 1 (position ‘F’), and finished at the shoreward diffuser, this being diffuser # 18 (position ‘E’).

Visual observations were completed around the diffusers that exhibited the greatest scour depths to ensure that none of the bed stabilisation mats were exposed. There were no sightings made, nor any exposed material observed from the erosion control mats.
With reference to the construction drawings it should be noted that at the current recorded scour depths some of the bed erosion stabilisation matting should be exposed; however none was observed.
Visibility during the offshore inspection was very poor; at no more than 2.0 metres.

All 18 diffusers had their exposed heights measured from seabed. All heights ranged between 1.350 to 1.600 metres.



Maximum current scour depth / seafloor level

Figure 19: Diffuser detail

No evidence was observed of any damage or deterioration to any of the 18 diffuser assemblies. Seafloor deposits of rocks, course gravels and sand form undulating, peaks and depressions typically of +/- 300mm in west – east (shoreline) orientation around the diffuser positions.

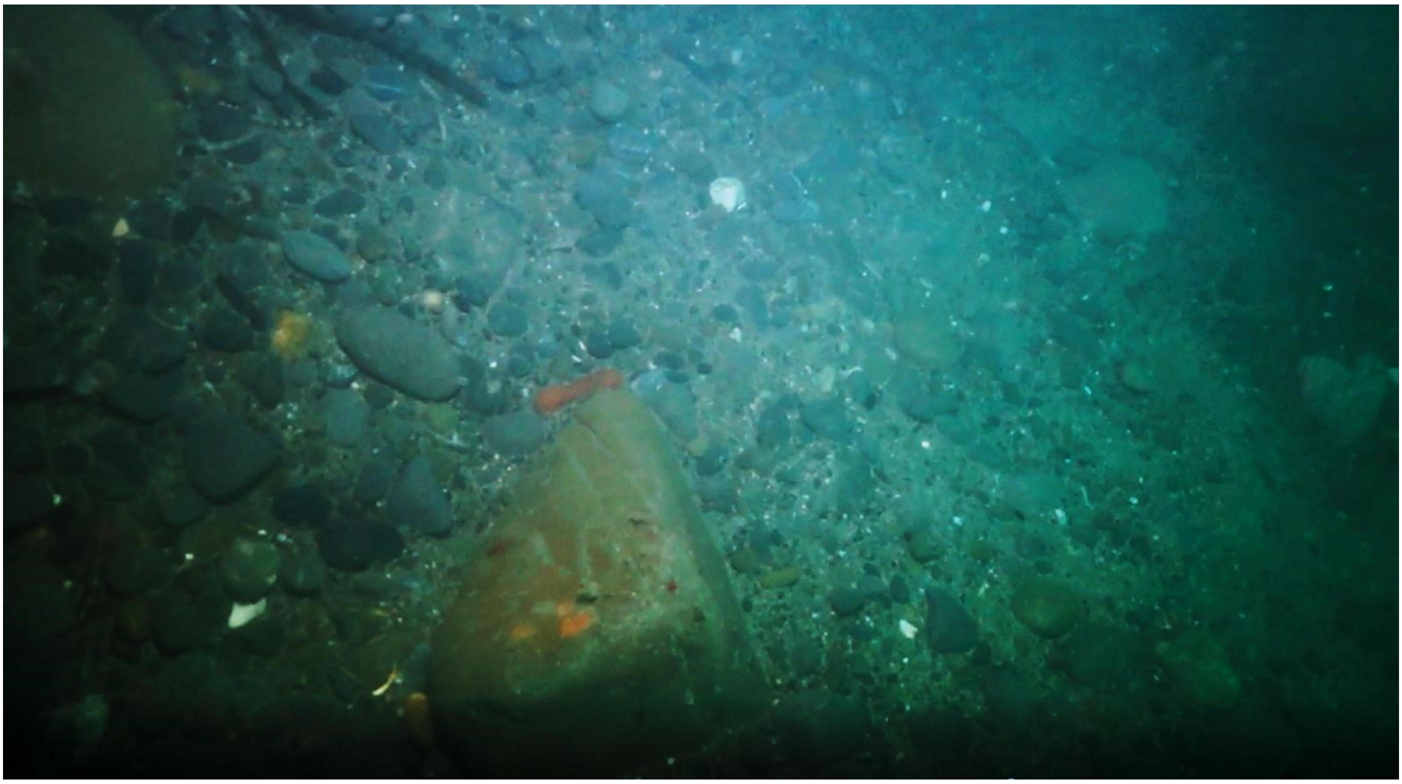
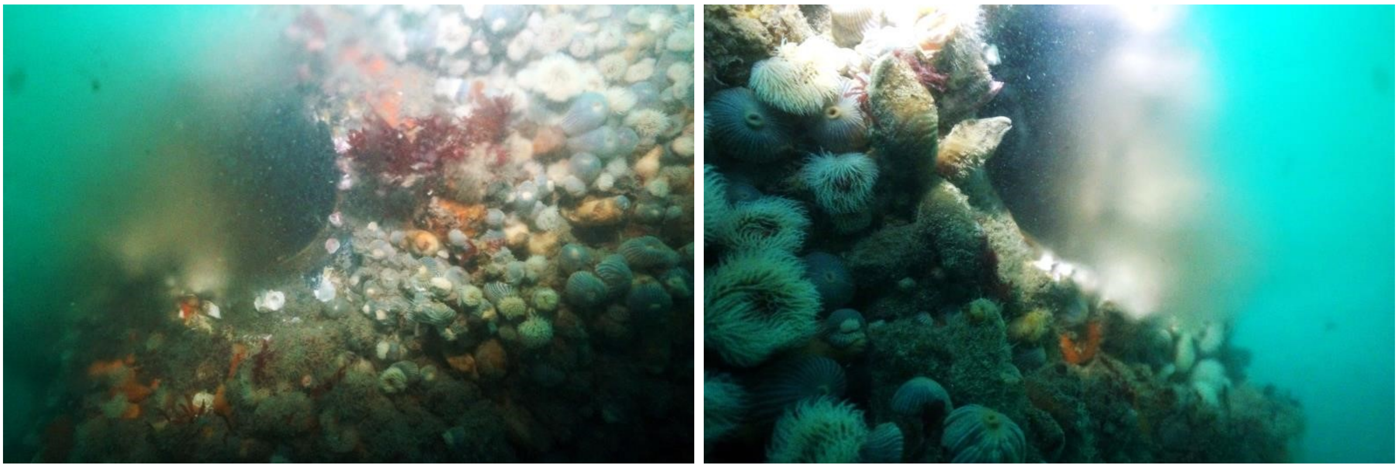


Figure 20: Typical scale of aggregate sizing observed around the Diffuser positions

Diffuser from seaward to shoreward	Diffuser Exposed Height out of Seabed		Open Ports	
	North face	South face	West	East
1	1.450 metre	1.550 metre	X	X
2	1.450 metre	1.500 metre	X	X
3	1.400 metre	1.500 metre	X	X
4	1.400 metre	1.500 metre	X	X
5	1.500 metre	1.500 metre	X	X
6	1.500 metre	1.500 metre	X	X
7	1.500 metre	1.500 metre	X	X
8	1.500 metre	1.600 metre	X	X
9	1.500 metre	1.600 metre		X
10	1.500 metre	1.600 metre	X	
11	1.500 metre	1.600 metre		X
12	1.500 metre	1.600 metre	X	
13	1.500 metre	1.600 metre		X
14	1.500 metre	1.500 metre	X	
15	1.450 metre	1.450 metre		X
16	1.500 metre	1.550 metre	X	
17	1.400 metre	1.450 metre		X
18	1.350 metre	1.450 metre	X	

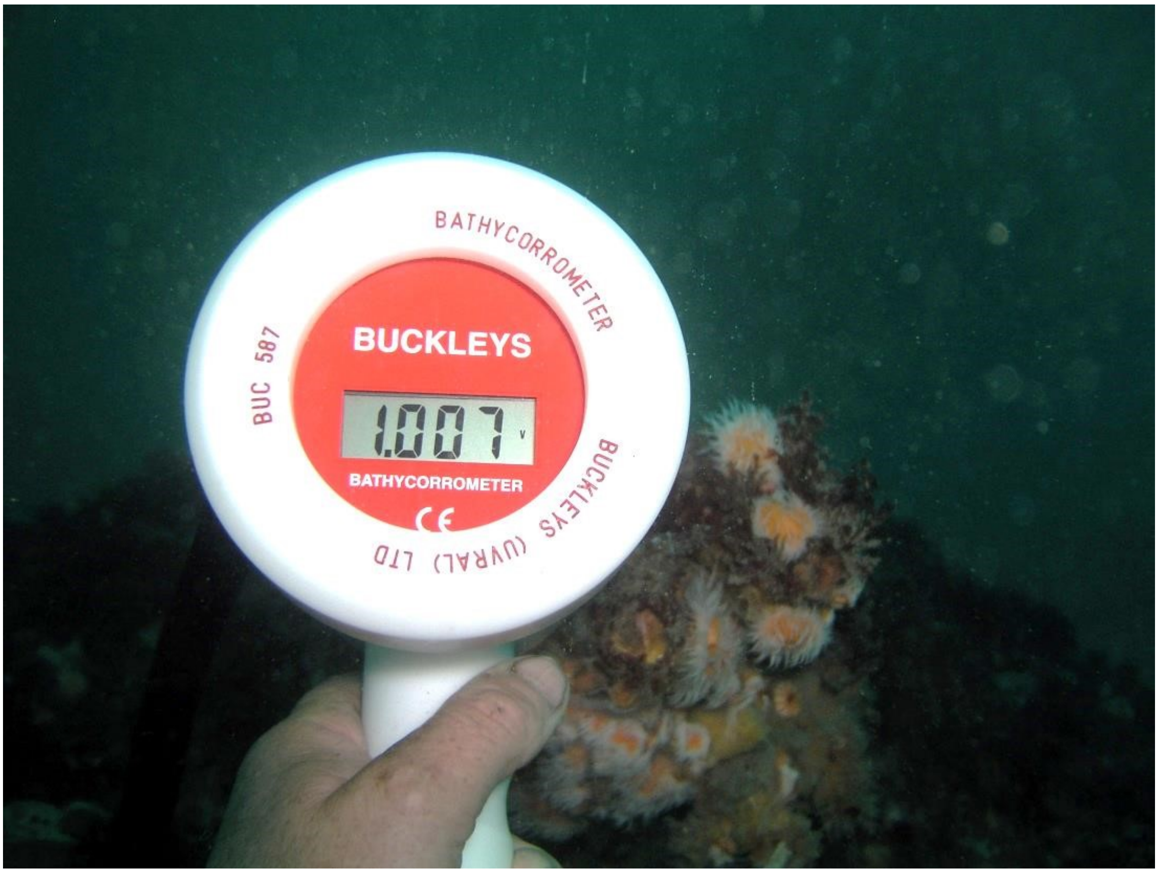
Table 3: Exposed heights of diffusers (seabed scour around diffuser positions)
X Open diffuser ports



Figures 21 & 22: Typical flow discharge flume from a diffuser nozzle

Note:
Video footage of a typical Diffuser in Operation can be viewed in the attached file:
Diffuser in Operation

Diffuser Section Cathodic Potential Survey



To protect a steel structure or installation in seawater, a more active metal than the steel is selected from the galvanic series and placed in contact with the steel below water level.
Current flows as a result of the electrochemical difference, from the active metal, through the seawater, to the steel. Thus the active metal becomes anodic and corrodes, whilst the steel becomes cathodic and is protected; so that in fact the active metal corrodes in order to protect the steel.

The Cathodic Protection System on the Moa Point Wastewater Ocean Outfall Pipeline consists of 26 Zinc Alloy Sacrificial Anodes on the outfall pipeline, and 18 Zinc Alloy Sacrificial Anodes installed on the diffuser risers. The Cathodic Protection System has a minimum design life of 30 years.

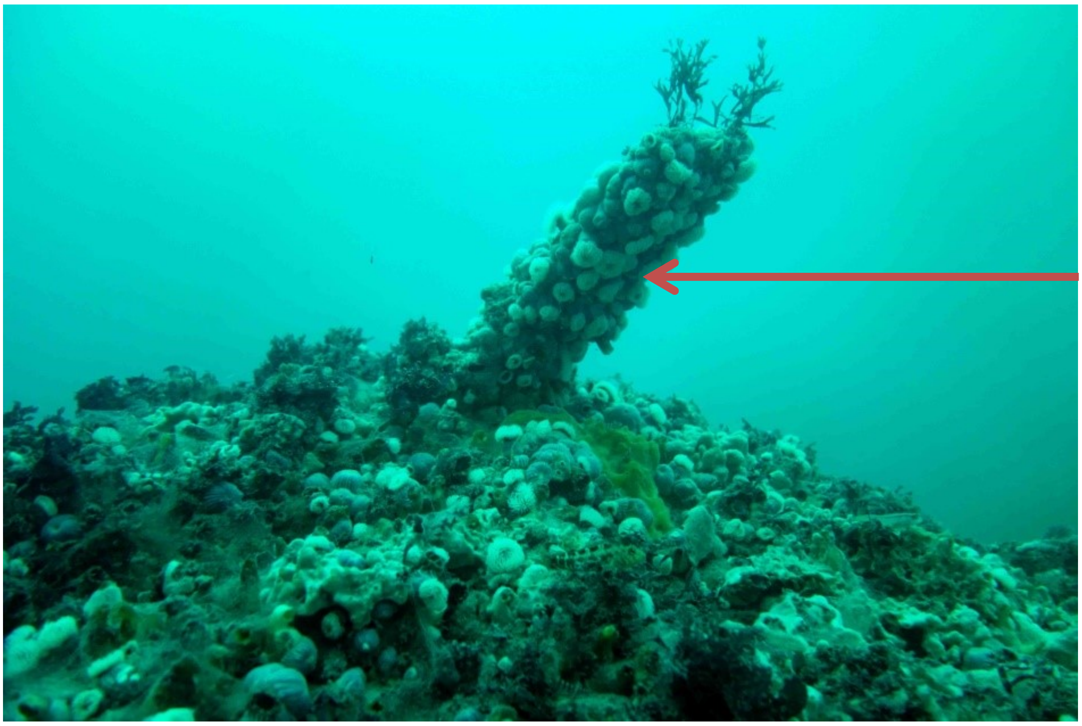


Figure 23:
Diffuser # 1 (seaward southern- most diffuser) – CP test point.
Readings at this position provide evidence of electrical continuity through the diffuser section

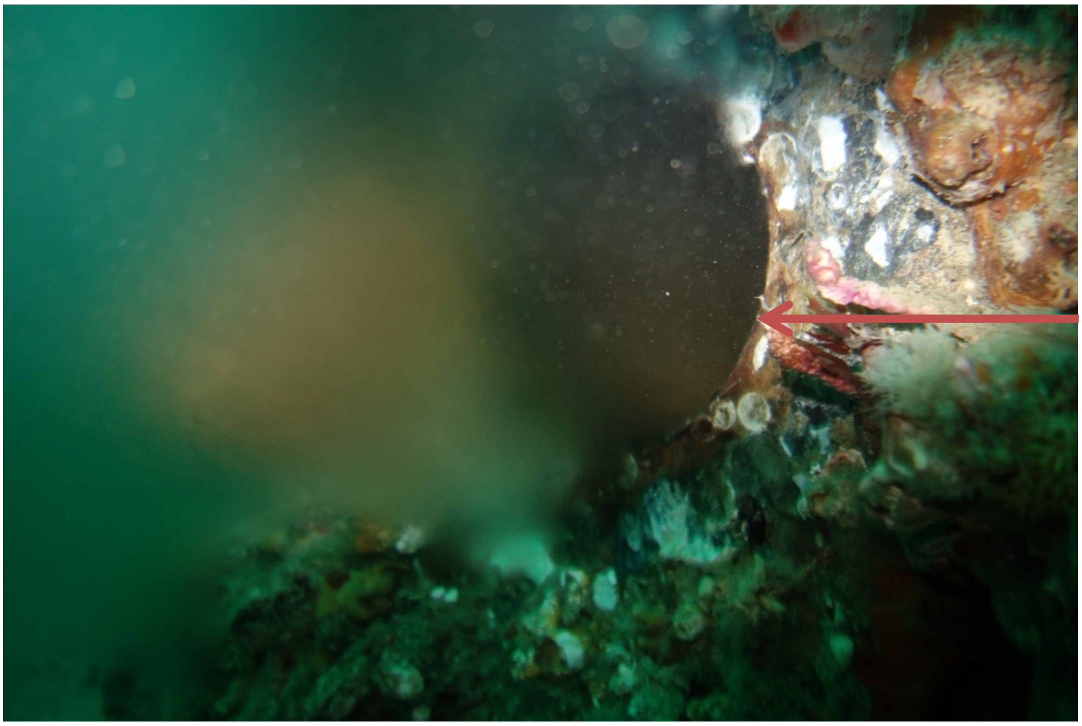


Figure 24:
The steel diffuser nozzle outer flange is where the diver makes contact with the Bathycorrometer to obtain the Cathodic Potential values

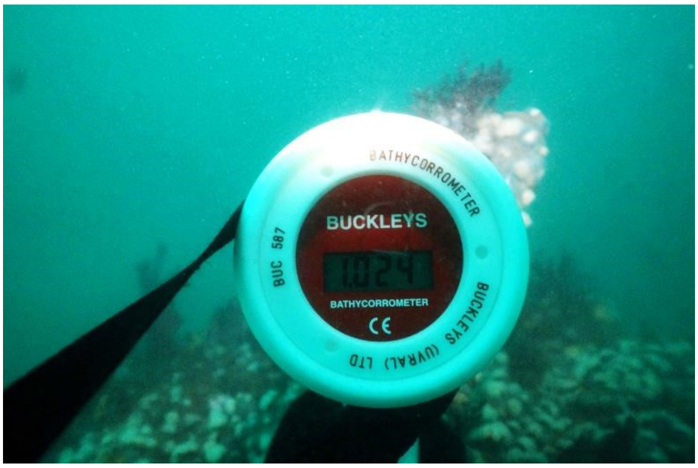


Figure 25: Diffuser # 1 test point – 1.024mV

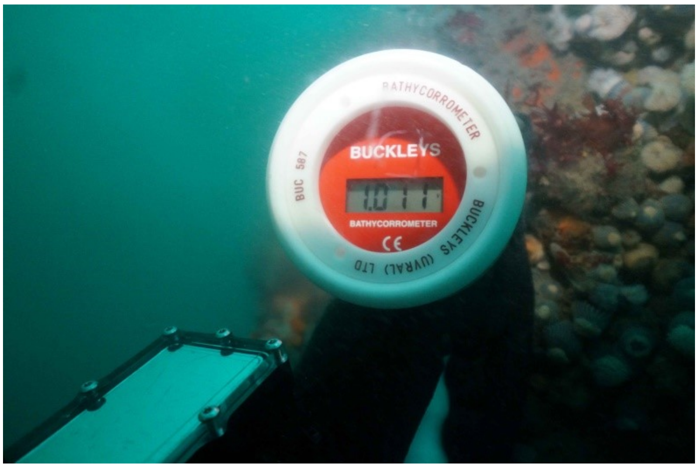


Figure 26: Diffuser # 5 port nozzle – 1.011mV

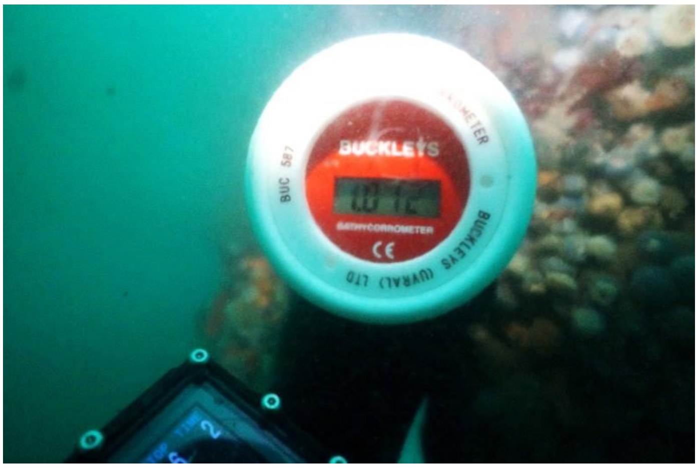


Figure 27: Diffuser # 10 port nozzle – 1.012mV

Figure 28: Diffuser # 15 port nozzle – 1.005mV

Cathodic potential (CP) measurements are taken to monitor the effectiveness (need for anode replacement) of the cathodic protection system.
The main objective of corrosion prevention in structures is to provide enough anodes to keep the potential, or voltage, levels to less than – 800mV.
The function of a cathodic protection system is to provide enough potential to maintain an optimum level of protection through the entire structure.
It is emphasised that this level must be maintained at between –800mV to 1.050V.

It's the Test Point at the top of Diffuser # 1 (position 'F') that provides the most accurate Cathodic Potential readings. Although representative readings are obtained at several diffuser outlet nozzles across the diffuser section; variations in water salinity at nozzle flange locations, and / or significant changes in water temperature can subsequently cause Potential differences.

Cathodic Potential (CP) Readings		
Zinc Calibration Test Block Reading		1.050mV
C.P. test point	Diffuser # 1	1.024mV
Discharge flange	Diffuser # 5 (east)	1.011mV
Discharge flange	Diffuser # 10 (west)	1.012mV
Discharge flange	Diffuser # 15 (east)	1.005mV

Table 4: Cathodic Potential readings

All logged cathodic potential readings confirm that the sacrificial anode system in place is providing effective corrosion protection throughout the diffuser section of the pipeline structure.

Summary

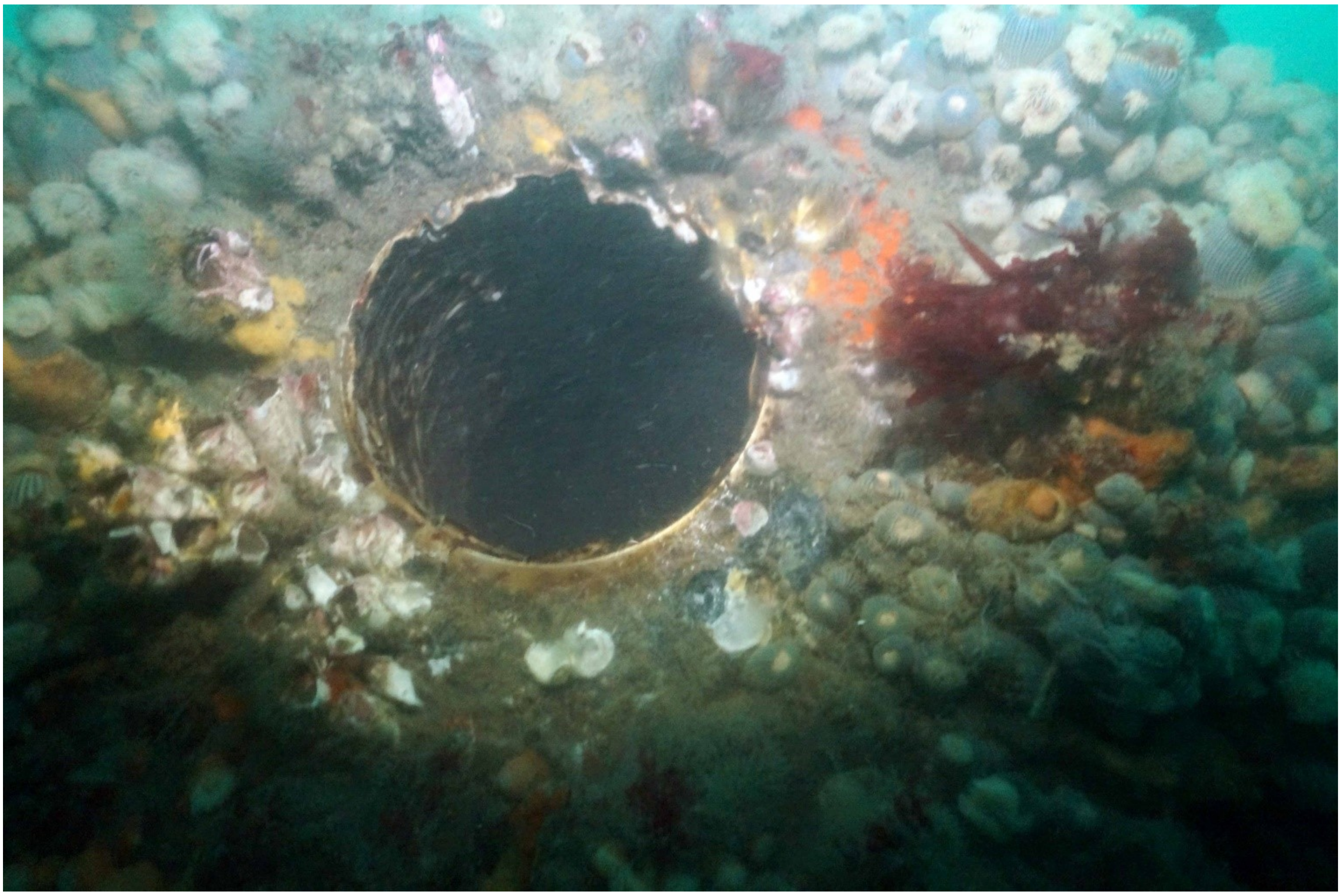


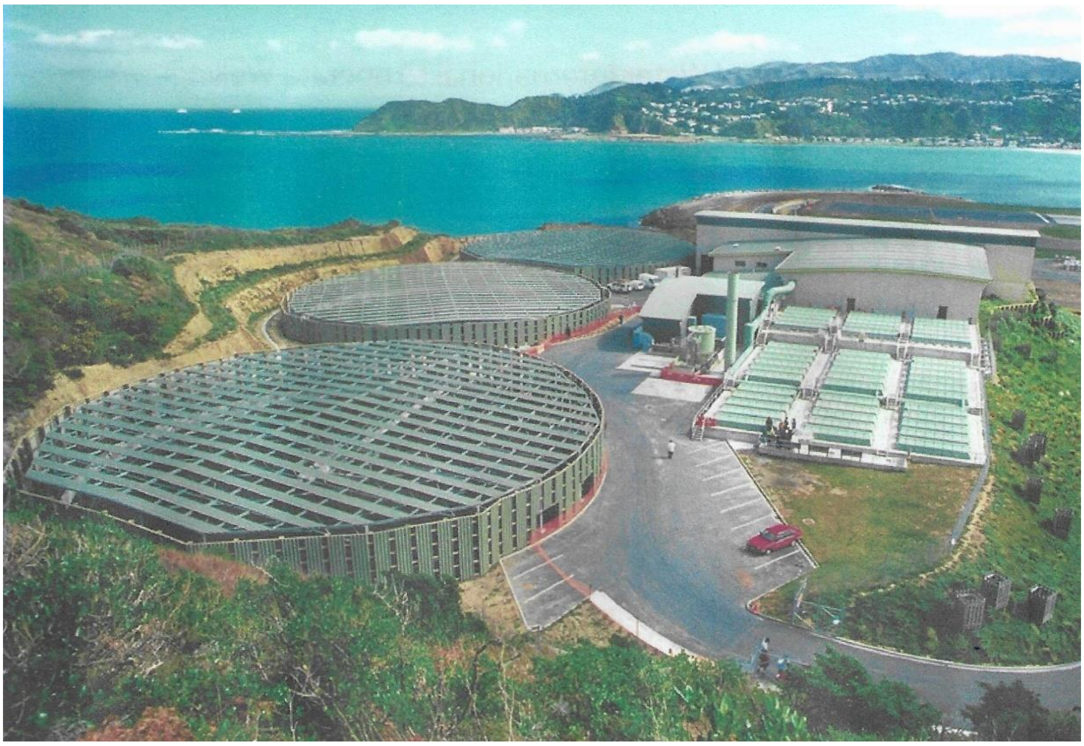
Figure 29: Diffuser Port intermittently stops flowing

A very interesting observation was made during the inspection of the Diffuser section: external sea swell wave pressure experienced during surface swell conditions of between 1 – 1.5 metres had sufficient effect to intermittently stall flows in Diffusers facing the sea current direction.
It would have been thought that the greater head pressure of the gravity feed into the pipe would prevent this.

In completing the tasks as detailed within the scope of work UCL personnel didn't observe any evidence of abnormal or aggressive wear, defect, damage, deterioration, or loss of function.

Appendix iv: Smoke Test Report

Veolia Water Services (ANZ) Pty Ltd



MOA POINT WASTEWATER TREATMENT PLANT SMOKE TESTING, MARCH 2022

Issue

March 2022

Veolia Water Services (ANZ) Pty Ltd

MOA POINT WASTEWATER TREATMENT PLANT SMOKE TESTING, MARCH 2022

Issue

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Approved by

Name	Title	Signature
Matthew Newby, CAQP	Senior Air Quality Scientist	

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Contents

1. Introduction

Source Testing New Zealand Limited (STNZ) was commissioned by Veolia Water Services (ANZ) Pty Ltd (Veolia) to conduct smoke testing at the Moa Point Wastewater Treatment Plant (Moa Pt WTP), Wellington. The objective of the smoke testing was to demonstrate compliance with the Company's resource consent (26183). Condition 10 stipulates:

The permit holder shall undertake smoke testing of the Moa Point wastewater treatment plant and ventilation system. The smoke tests are to be carried out on an annual basis between the months of August and November.

The results of the smoke testing shall be submitted to the manager, environmental regulation, Wellington Regional Council within one month of the testing being carried out by the permit holder. A copy of the analysed results shall be provided to the Community Liaison Group, if requested.

The smoke testing involved discharging smoke from an industrial smoke machine into the Inlet Pump Station (IPS), Primary Tanks and Moving Bed Bio-Reactor (MBBR) Tanks and visually assessing the ventilation system to ensure there were no fugitive smoke emissions, in doing so, demonstrating the extraction system was sealed and the ventilation rates are sufficient to prevent fugitive emissions.

Matthew Newby, Senior Air Quality Scientist conducted the Moa Pt WTP smoke testing on 10 March 2022. Matthew has 25 year's air quality monitoring and consulting experience and is designated as a Key Technical Person under STNZ's IANZ accreditation. Matthew is also a Certified Air Quality Professional (CAQP) under the Clean Air Society of Australia and New Zealand (CASANZ) certification programme. This report presents the results of the smoke testing of the Moa PT WTP.

2. Inlet Pump Station Smoke Testing

On 18 March 2022, a smoke test was conducted on the Moa Pt WTP IPS to assess any fugitive emissions. The smoke machine was inserted into an inspection hatch and allowed to fill the inlet chambers. Figure 1 depicts the volume of smoke discharged by the smoke machine which was quickly able to fill the IPS wet wells.

Within a few minutes, smoke was observed exiting the IPS scrubber stack (See Figure 2). A site walk around was conducted to assess the seals and try to identify any potential leaks. While one of the seals (See Figure 3) exhibited minor damage, the remainder were all in good working order. There were no visible discharges from any of the seals or any other locations, confirming the foul air within the IPS was being extracted at a ventilation rate significant enough to prevent any fugitive discharge.

- **Figure 1: Moa Pt IPS Smoke Machine, 10 March 2022**

- **Figure 2: Moa Pt IPS Scrubber Stack, 10 March 2022**

- **Figure 3: Moa Pt IPS Seals, 10 March 2022**

3. Moa Pt Primary Tanks Smoke Testing

On 18 March 2022, a smoke test was conducted on the Moa Pt WTP Primary Tanks to assess any fugitive emissions. The smoke machine was placed in the Primary Tanks and allowed to fill the building (Figure 4). After about 30 minutes the building was full of smoke (Figure 5) and the smoke machine was turned off to determine how long it would take to remove the build-up of smoke. While the smoke was clearing (Figure 6), a site walk around was conducted with no visible emissions of smoke being observed. After about 20 minutes, 95 % of the smoke had cleared (Figure 7) indicating a ventilation rate of approximately three room changes per hour. Given the large volume of the building, limit requirement for access and good seals, three room changes per hour should be sufficient to prevent fugitive emissions.

The smoke machine was then relocated to the eastern wall of the building where the extraction ducting is located. Smoke was observed being extracted by the system (Figure 7) indicating suitable ventilation.

The results of the Moa Pt Primary Tanks smoke testing showed that the building was well sealed with a ventilation rate of approximately 3 room changes per hour. Hence, the extraction system is actively maintaining the building under negative pressure preventing any potential fugitive emissions.

- **Figure 4: Moa Pt Primary Tanks, 10 March 2022**

- **Figure 5: Moa Pt Primary Tanks Full, 10 March 2022**

- **Figure 6: Moa Pt Primary 95% Removed, 10 March 2022**

- **Figure 7: Moa Pt Primary Extraction Ducting, 10 March 2022**

4. Moving Bed Bio Reactor Tanks

On 18 March 2022, a smoke test was conducted on the Moa Pt WTP MBBR Tanks to assess any fugitive emissions. The smoke machine was placed at four different locations at access ports on the MBBR Tank covers. Figure 8 depicts the smoke machine filling the tanks and it can be clearly seen the smoke was being sucked into the tank indicating the covers are under negative pressure. After a few minutes, smoke was observed being discharged from the Moa Pt main scrubber stack (Figure 9).

A site walk around was conducted to try and identify any potential sources of fugitive emissions. The seals were also inspected and while they were more weathered than the IPS, they were still fit for purpose with no visible smoke emissions observed (Figure 10). There were a number of minor gaps, but these were tested with smoke tubes and found to be under negative pressure preventing any fugitive emissions. However, one of the old instrument ports had not been sealed (Figure 11) which had the potential to allow fugitive emissions. It is recommended that this port and any other worn seals be replaced.

In addition to the smoke testing, the actual pressure of the tank covers was determined at a total of six locations, with the observed vacuum ranging from -0.6 to -1.4 mmH2O indicting the tanks are under a good degree of extraction.

In summary, the smoke testing of the MBBR tanks demonstrated that the system was under sufficient negative pressure to prevent fugitive emissions of foul air. However, it is recommended that the replacement of worn seals be conducted as needed.

- **Figure 8: Moa Pt MBBR Tanks Smoke Test, 10 March 2022**

- **Figure 9: Moa Pt Main Scrubber Stack, 10 March 2022**

■ **Figure 10: MBBR Seals, 10 March 2022**

- **Figure 11: MBBR Instrument Port, 10 March 2022**

Appendix v: Moa Point WWTP Complaints

Date	Investigation
11/02/2022	Caller has phoned wanting to find out if there are any issues with the wastewater treatment plant as there is a very bad odor at their property and this has been an issue in the past. They are not able to open their windows at the moment as the smell is very bad. Please investigate and contact the customer. There are no abnormal issues with the Moa Point WWTP other than Clarifier #3 being offline for inspection and corrective maintenance. A odour survey was conducted by the administrative assistant and they did not notice anything out of the ordinary. Notification was also forwarded to Wellington Water for investigation. "Notifications submitted to GWRC and Wellington Water."

Appendix vi: Inflow and Infiltration Report

Condition (13)

The annual report required by condition 19 of this permit shall detail what steps have been taken in the reporting year and what steps are proposed to be undertaken in the future to reduce infiltration and stormwater ingress into the Wellington City sewerage network.

This information shall include, but not be limited to, the following information:

a) Details on the adoption of a policy to identify, and to repair or replace, defective private sewer drains in the Wellington City catchment. If such a policy is adopted, detail on its implementation made within the previous year
b) Details of additional works that have been undertaken and what these works are expected to achieve
c) An indication of when any on-going works will be completed
d) Details of any investigations undertaken with regard to inflow and infiltration in the Wellington City catchment
e) Details of any works or investigations planned for the next financial year

Inflow and Infiltration Report

A variety of mitigation measures have been undertaken to reduce Inflow and Infiltration (I&I) and to contain wastewater within the reticulated wastewater network. This work aims to reduce the wet weather flows at Moa Point Wastewater Treatment Plant (WWTP) and to also improve the health of waterways. Sections (a), (b), (c), (d) and (e) of Condition 13 are addressed below through the various activities and work programs that contribute to reducing I&I.

Section (a)

Wellington City Council (WCC) have updated the ownership arrangement for wastewater laterals, which came into effect on 1 July 2021. The section of wastewater lateral located in the legal road was previously a private asset and is now council owned.

Detection of faulty laterals contributing to infiltration and inflow from stormwater to wastewater cross connections continue to be identified through ongoing operations and maintenance work and targeted inspections. Property owners are advised to repair faults within their property and faults within the legal road from 1 July are repaired or replaced by Wellington Water.

Section (b), (c), (d) and (e)

The following work programs and activities described below provide information relating to Condition 13, sections (b) to (e).

Inflow Surveys

Inflow surveys have been undertaken in 2021-2022 financial year in the Moa Point WWTP Catchment. The map showing the status of recent inflow surveys projects is provided in Figure 1 below. Kingsbridge inflow survey was recently completed and is shown below in green. Karori North/Northland Inflow Survey is in progress and will be completed in July 2022. This catchment is shown below in green to reflect impending completion. Haitaitai and Trelissick Park catchments were inflow survey projects that commenced in 2017-2018 and were only partially completed, which are shown in red and purple in Figure 1. The Trelissick Park catchment is planned to be completed in the 2022-2023 financial year (shown in purple). The Hataitai catchment is currently delayed and will be a focus for any new projects that are able to commence in the 2022-2023 financial year or following years.

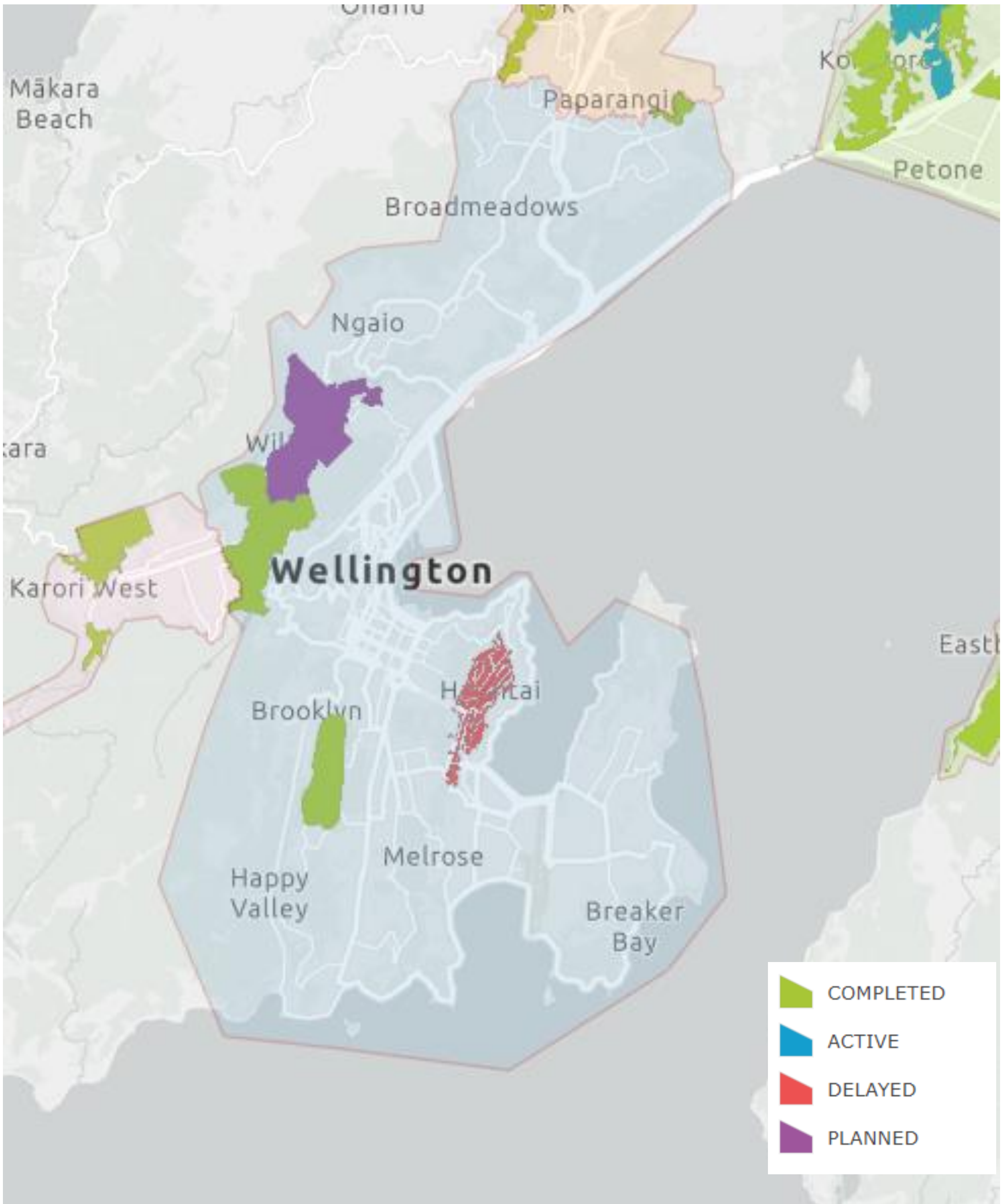

Figure 1 - Inflow Survey Project Locations for Moa Point WWTP catchment

The final inspections for the Kingsbridge Inflow Survey were completed in December 2020. This catchment was selected for an inflow survey due to significant peak wet weather flows. Two properties in this catchment were found to have their stormwater and wastewater pipes cross-connected which were resolved. Post-rehabilitation flow monitoring has not been undertaken, however an affected customer advised since the inflow survey works were completed, there has been no recent wastewater surcharges in wet weather at their affected property.

The Wellington Water Drainage Investigation Team completed inspections in 2021/2022 with smoke testing, dye testing and CCTV inspections for both wastewater and stormwater assets. The investigations were able to identify private and public faults. The areas inspected within the Moa Point WWTP Catchment boundary are listed below:

- Owhira Bay (smoke/dye: 221 assets, CCTV: 80 assets)
- Newlands at Gorge (smoke/dye: 251 assets, CCTV: 251 assets)
- Churton Park (smoke/dye: 141 assets, CCTV: 20 assets)

Flow Monitoring and Rain Gauge Monitoring

These active long-term flow monitoring sites within the Moa Point WWTP Catchment are shown within the blue polygon in Figure 2 below. There are seven flow and 21 overflow monitoring sites currently installed within the Moa Point WWTP catchment.

These monitoring sites are part of the long-term monitoring contract. The latest regional contract commenced in July 2021 and some updates to the monitoring locations were undertaken. This data is used to understand network performance and the extent of inflow and infiltration in various catchments. This data also enables investigation of network issues and maintenance of hydraulic models. Wastewater monitoring is also undertaken at most Wastewater Pump Station sites.

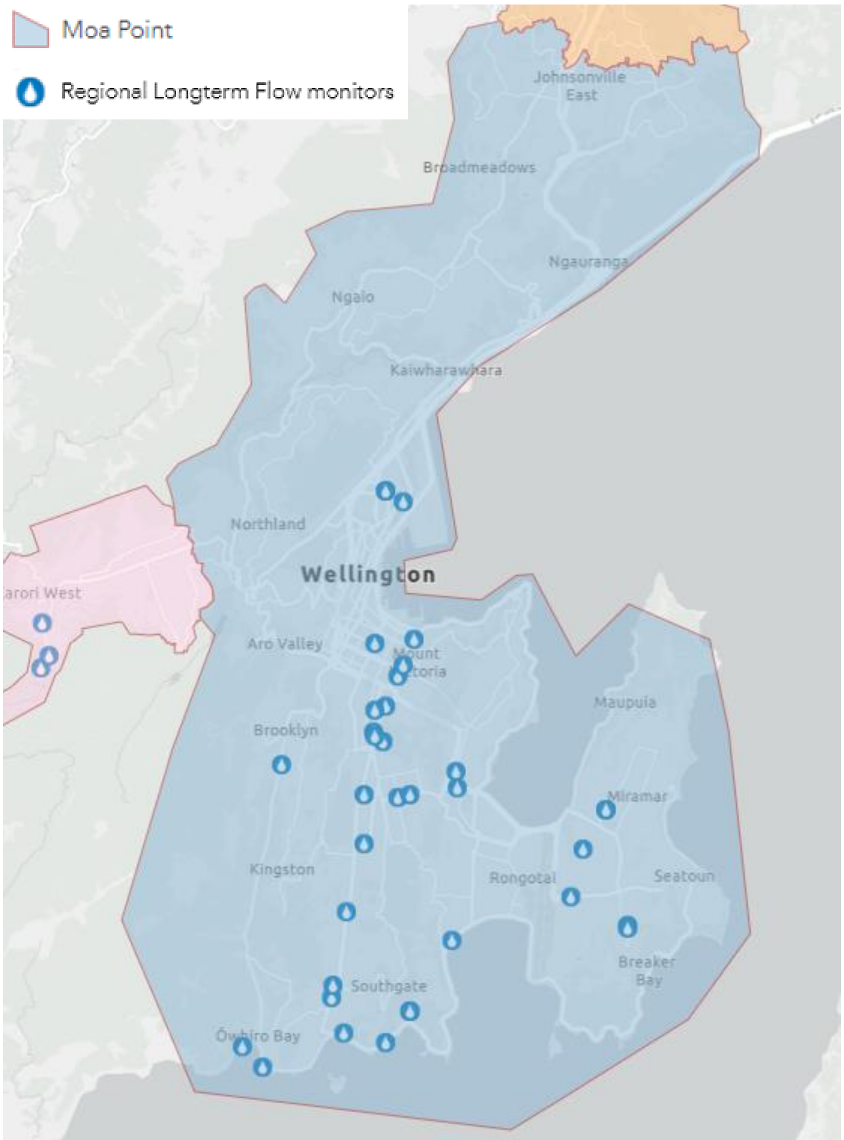

Figure 2 - Map of Active Wastewater Flow and Overflow Monitoring Sites within Moa Pt WWTP Catchment

There are currently six rain gauges monitoring stations in the Moa Point catchment. This data is used in conjunction with flow monitoring data to understand the extent of I&I for catchments. The rain gauges sites are listed below;

- Miramar at Miramar Bowling Club
- Berhampore at Nusery
- Newtown at Mansfield Street
- Hataitai at Old Post Office
- Wellington at Te Papa
- Khandallah at Library

Condition Assessments

Condition Assessment using closed circuit television (CCTV) footage or other inspection methods of wastewater networks are used to identify faults, determine the condition of assets, and inform repair and renewal programs.

The Very High Critical Assets (VHCA) condition assessments completed as of June 2022 are shown in Figure 3 below. The primary inspection techniques were CCTV and laser profiling for wastewater pipes and CCTV for stormwater pipes. For the inspections represented in the below map, approximately 10% were completed in 2020-2021 financial year and 90% completed in the 2021-2022 year.

CCTV inspections are also underway in the Owhiro Bay and Newlands catchments and planned for completion in June 2022. The data from these condition assessment programs will be analysed and used to inform the repair and renewal programs in upcoming financial years.

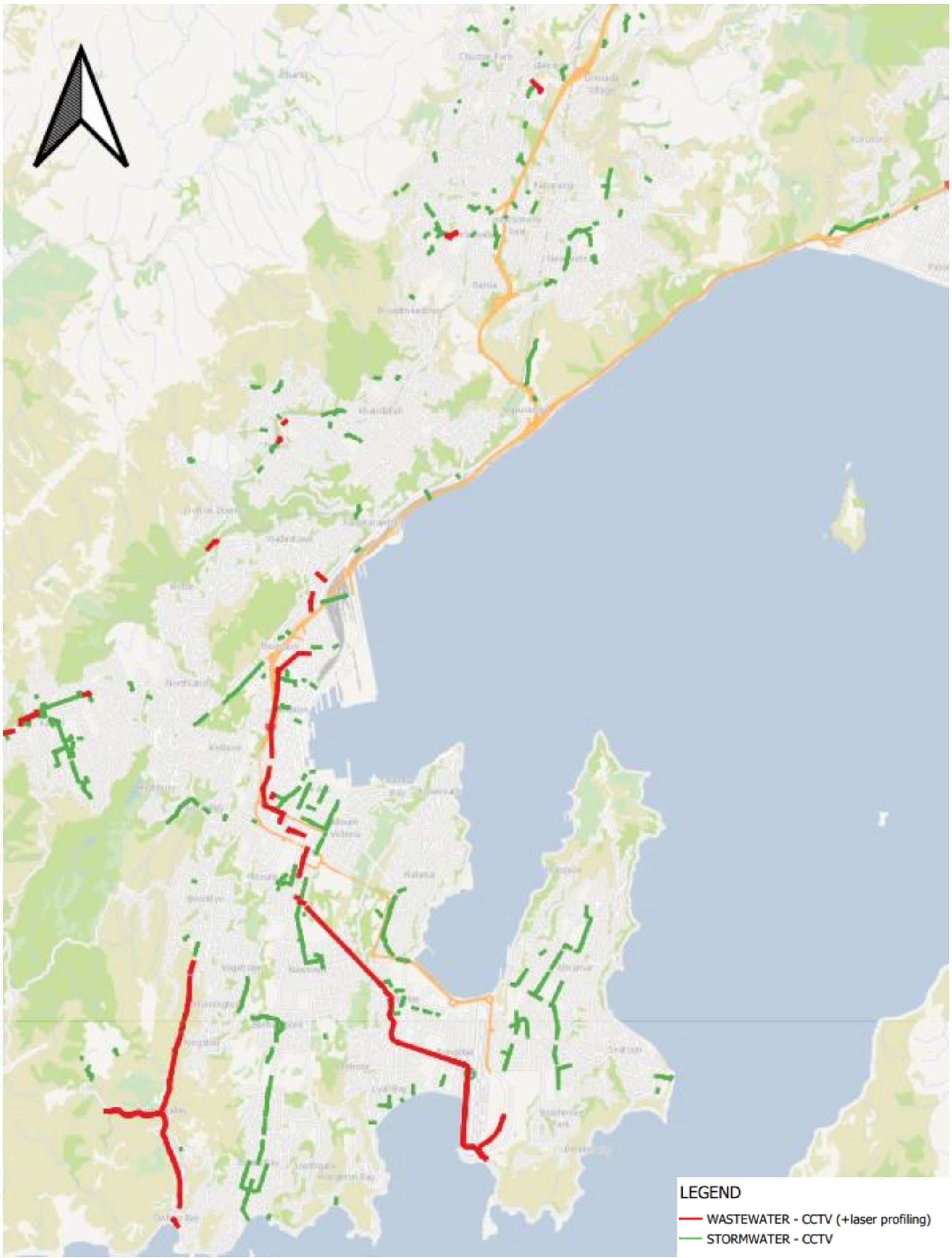

Figure 3 - Very High Critical Assets (VHCA) CCTV and laser profiling inspections completed as of June 2022.

Wastewater Modelling

The Moa Point WWTP Catchment has four wastewater network models including; Evans Bay, Island Bay, CBD Model and Western hills model. Recently work has been carried out to integrate all models into the one model to reflect the entire Moa Point WWTP Catchment.

Stormwater and Wastewater Capital Projects

Table 1 below provides a summary of planned capital projects for wastewater and stormwater assets that were undertaken in 2021-2022 as well as works scheduled for 2022-2023. The projects are proposed and subject to approval by council. Ongoing operational work such as investigations, reactive maintenance and renewals are also carried out in addition to the planned work listed below. Some projects in the table below are noted in both columns as the project is delivered over multiple years or ongoing programmes of work.

Table 1 - Stormwater and Wastewater Capital Projects in the Moa Point WWTP Catchment

Activity	2021/2022	2022/2023
Stormwater	• Agra Crescent (5-10A) Stormwater Renewal • Karori Road (357a) Stormwater Renewal (with WW) • Wakefield Street (142-150) Stormwater Renewal • Waikare Street (4-7) Stormwater Renewal • Hawkestone Street (6-27) and Molesworth Street (79-83) Stormwater Renewal • Newcombe Crescent Stormwater Renewal • Mortimer Terrace Stage 3 (Relining)	• Agra Crescent (5-10A) Stormwater Renewal • Karori Road (357a) Stormwater Renewal (with WW) • Waikare Street (4-7) Stormwater Renewal • Hawkestone Street (6-27) and Molesworth Street (79-83) Stormwater Renewal • Mortimer Terrace Stage 3 (Relining) • Ross St (43-45) Stormwater Renewal (with Yule WW) • WCC-SW-VHCA Pipe Renewal Programme
Wastewater	• CBD Wastewater Pump Stations and Rising Main Renewals • Featherston St (Whitmore St to Waring Taylor St) Rising Main Renewal • Torrens Terrace (2-48), Arlington Street (6-14, 24-31) and Hopper Street (20-70) Wastewater Renewal • Buller Street (27) - Vivian Sreet (175) Wastewater Renewal • Yule Stoke Tainui and Broomhedge Wastewater Renewals • Hania Street (3-18) - 60 Kent Terrace Wastewater Renewal • Hawkestone Street (6-27) and Molesworth Street (79-83) Wastewater Renewal • Waikare St (4-7) Wastewater Renewal • Whitmore Street (17) - Bowen Street (38) Rising Main Renewal • Maida Vale Road Wastewater Pipe Renewals	• WCC Wastewater Pump Stations PLANNED Renewals • Featherston St (Whitmore St to Waring Taylor St) Rising Main Renewal • Torrens Terrace (2-48), Arlington Street (6-14, 24-31) and Hopper Street (20-70) Wastewater Renewal • Hania Street (3-18) - 60 Kent Terrace Wastewater Renewal • Hawkestone Street (6-27) and Molesworth Street (79-83) Wastewater Renewal (with SW) • Maida Vale Road Wastewater Pipe Renewals • Murphy Street • Taranaki Pipes • Landfill Road Manhole Rehabilitation (Careys Gully Centrate Line rehab) • WCC WW manhole cover safety improvements

Activity	2021/2022	2022/2023
	• Kio Bay Pump Station (PS15) Mechanical and Electrical Refit with Magflow Installation • Severn Street Wastewater Renewal - Portion 2 (CIPP) • Landfill Road Manhole Rehabilitation (Careys Gully Centrate Line rehab)	• WCC Moa Pt WWTP PLANNED Renewals • Taranaki St new PS • Wakefield St West of Taranki St Renewal • Wakefield St East - New Rising Main • Kent Tce Rising main renewal • Victoria St Rising Main renewal • Pump Stations 1 - 7 Upgrades • Stebbings Wastewater Upgrade Stage 1 • [Package] WCC Wastewater Renewals - Newtown - 21-24 • Danube St (9-14) to Rhine St (48) Sewer • WCC-WW-VHCA Pipe Renewal Programme • Aro Valley Wastewater Renewals (Adams Aro Holloway Maarama Fairlie Landcross Streets) • Cable St (6-21) Wastewater Pipe Renewal • [Package] Pitt, Stratford, and Wilton Wastewater Renewal • Eastern trunk main and PS23 rising main upgrade • Kemp St WW Renewal • Kingsbridge Place WW Renewal • Pahia St WW Renewal • Parade, Island Bay WW Renewals • Rolleston St WW Renewal • Seatoun WW Renewals • Willeston and Harris WW Renewal • Buller Street (27) - Vivian Sreet (175) Wastewater Renewal • Yule Stoke Tainui and Broomhedge Wastewater Renewals • Severn Street Wastewater Renewal - Portion 2 (CIPP)