Investigation report - Porirua WWTP Faecal Coliform Limit Exceedances

10 March 2025

Control Sheet

Document Title:	Investigation report - Porirua WWTP Faecal Coliform Limit Exceedances 10 March 2025
Prepared by:	[redacted] Pursuant to Condition 35A (c)
Reviewed by:	[redacted]
Authorised by:	[redacted]

Document Control

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0.1	Draft	28 March 2025	Initial Draft of Report and Email Response.
0.2	Review	09 April 2025	Circulated for feedback.
0.3	Revise	10 - 11 April 2025	Revised from feedback.
1.0	Final	11 April 2025	Final for Approval.

Veolia Internal Distribution	Position	Email
[redacted]	Regional Manager (Wellington)	[redacted]
[redacted]	Northern Region Treatment Supervisor	[redacted]
[redacted]	Process Engineer	[redacted]

External Distribution	Position	For	Email
[redacted]	Wastewater Operations & Assets Advisor	WWL	[redacted]
[redacted]	Senior Advisor Wastewater Assets and Operations	WWL	[redacted]
[redacted]	Wastewater Contracts Manager	WWL	[redacted]

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Incident Outline

Date	10 March 2025
Location	Porirua Waste Water Treatment Plant (MPWWTP / the Plant)
Consent Ref	Resource Consent WGN200229 [36816] - Condition 35A refers
Background	On 10 March Veolia received results that showed the concentration of faecal coliforms in the treated waste water exceeded 2000 cfu per 100 millilitres on 5, 6 and 7 March. Pursuant to the Plant's Discharge Consent, such occurrences require an investigation to be undertaken with outcomes and recommendations (if any) to be provided within a month of the results.
Consent Requirements	Condition 35A refers An investigation shall: c. Be undertaken by a suitably qualified and experienced professional, d. Consider the results of UV transmissivity monitoring undertaken in accordance with condition 8, e. Assess the likely cause of the exceedance, f. If considered necessary, recommend further investigations, improvements, operational actions or upgrades to reduce the risk of similar exceedances..in the future, g. Include an implementation programme for recommendations (referred above).

Chronology		
Date	**Time**	**Activity**
04/03/2025	07:50	Faecal Coliform daily result = 1,549 cfu/100 ml
05/03/2025	07:53	Faecal Coliform daily result = 10,040 cfu/100 ml
06/03/2025	08:15	Faecal Coliform daily result = 2,098 cfu/100 ml
07/03/2025	08:10	Faecal Coliform daily result = 2,121 cfu/100 ml
08/03/2025	07:30	Faecal Coliform daily result = 261 cfu/100 ml
09/03/2025	07:30	Faecal Coliform daily result = 28 cfu/100 ml
11/03/2025	10:34	Veolia notifies Wellington Water (WW) that Faecal Coliforms were over the 2000 cfu limit from 5 - 7 March.

11/03/2025	11:39	WW notified Greater Wellington Regional Council (GWRC). WW also reported that the 8 March result was below 2,000 cfu/100ml
09/04/2025		Investigation Report Drafted

Ref	Consent WGN200229 [36816] - Condition 35A Investigation Scope	
d	Consider the results of UV transmissivity monitoring undertaken in accordance with condition 8,	Refer Process (below)
e	Assess the likely cause of the exceedance,	Refer Assessment (below)
f	If considered necessary, recommend further investigations, improvements, operational actions or upgrades to reduce the risk of similar exceedances...in the future,	Refer Corrective Actions (below)
g	Include an implementation programme for recommendations (referred above).	

Notification

Initial notification was issued on 11 March.

Process Quality Control

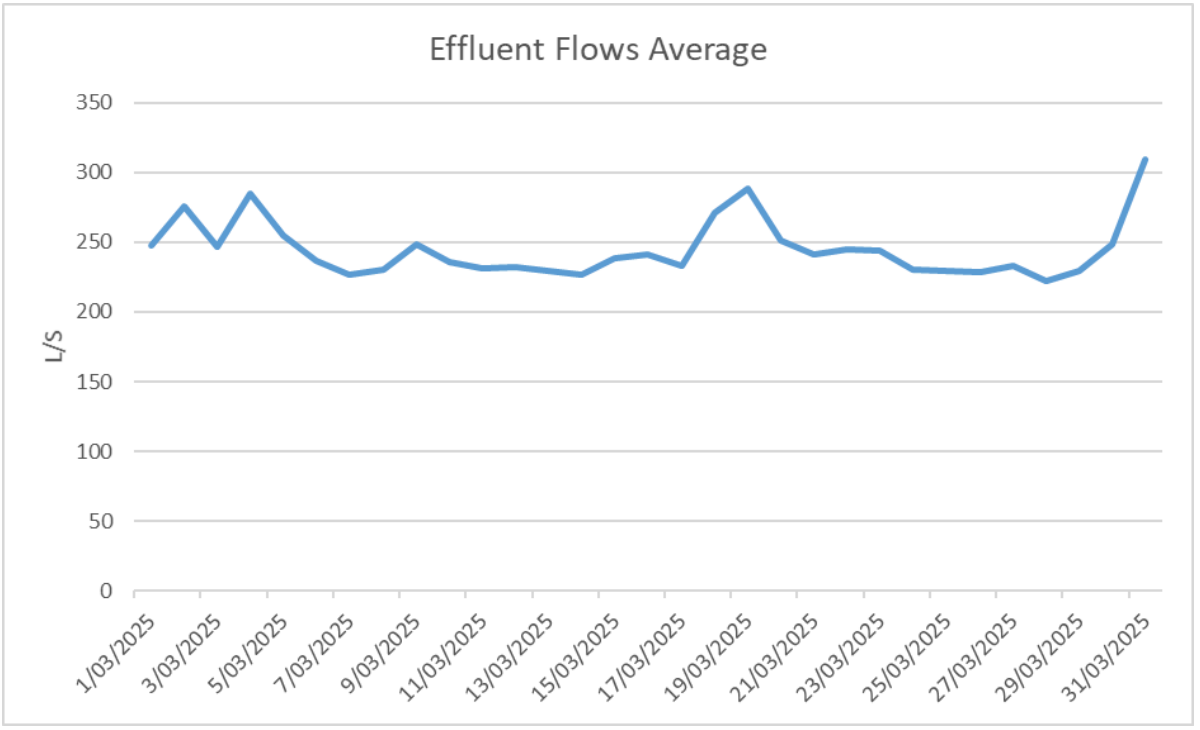
The tables below show the daily inlet and effluent results over the period of the exceedances and days immediately following.

Table 1 - Daily Average, Peak, and Total Inlet Flow			
Date	Average	Peak	Total
	L/s	L/s	m3
04/03/2025	274	1,148	23,653
05/03/2025	240	1,104	20,734
06/03/2025	226	1,126	19,535
07/03/2025	216	849	18,676
08/03/2025	223	848	19,289
09/03/2025	255	848	22,001

Table 2 - Inlet 5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) and Suspended Solids				
Date	Daily Composite cBOD5	Calculated Daily $cBOD_5$ Load	Daily Composite SS	Calculated Daily SS Load
	g/m3	kg/day	g/m3	kg/day
04/03/2025	387	9,154	267	6,315
05/03/2025	201	4,168	140	2,903
06/03/2025	222	4,337	216	4,220
07/03/2025	180	3,362	139	2,596
08/03/2025	207	3,993	163	3,144
09/03/2025	223	4,906	160	3,520

Table 3 - Daily Average, Peak, and Total Effluent Flow			
Date	Average	Peak	Total
	L/s	L/s	m3
04/03/2025	284	672	24571
05/03/2025	255	577	22021
06/03/2025	236	445	20411
07/03/2025	227	422	19606
08/03/2025	231	422	19917
09/03/2025	249	459	21489

Figure 1 - Flows for March 2025



The tables and graph above show that flows peaked prior to the event (on 4 March). High flow events may be a contributing factor to decreased effluent quality.

Table 4 - Clarifier blanket height levels (meters)[1]						
	Morning			Afternoon		
Date	#1	#2	#3	#1	#2	#3
04/03/2025	2.00	2.40	0.40	2.00	2.50	0.50
05/03/2025	2.00	2.60	0.50	2.00	2.50	0.50
06/03/2025	1.70	2.70	0.50	1.90	2.50	0.50
07/03/2025	1.50	2.00	0.50	1.50	2.00	0.50
08/03/2025	1.50	2.40	0.50	NA	NA	NA

Figure 2 - Clarifier #1 Sludge Blanket Levels
4 - 9 March 2025

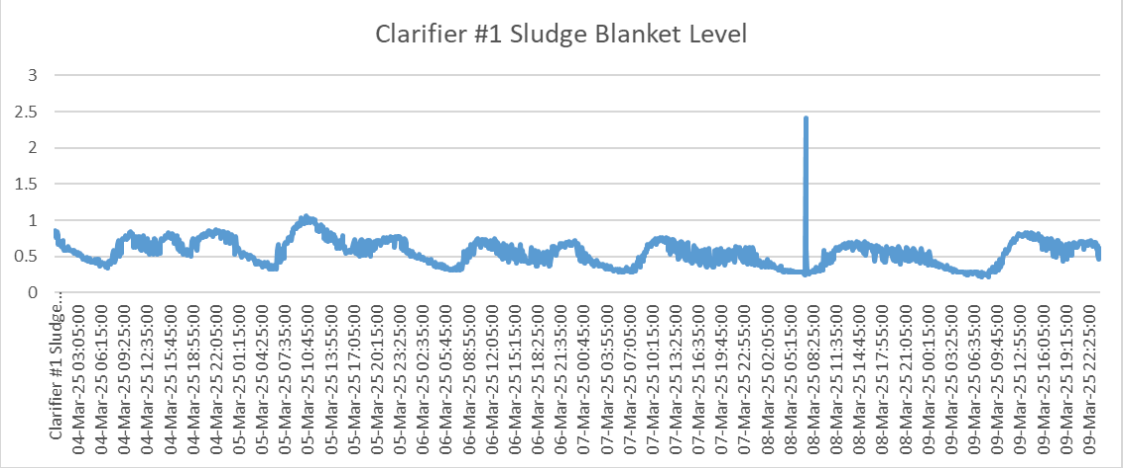
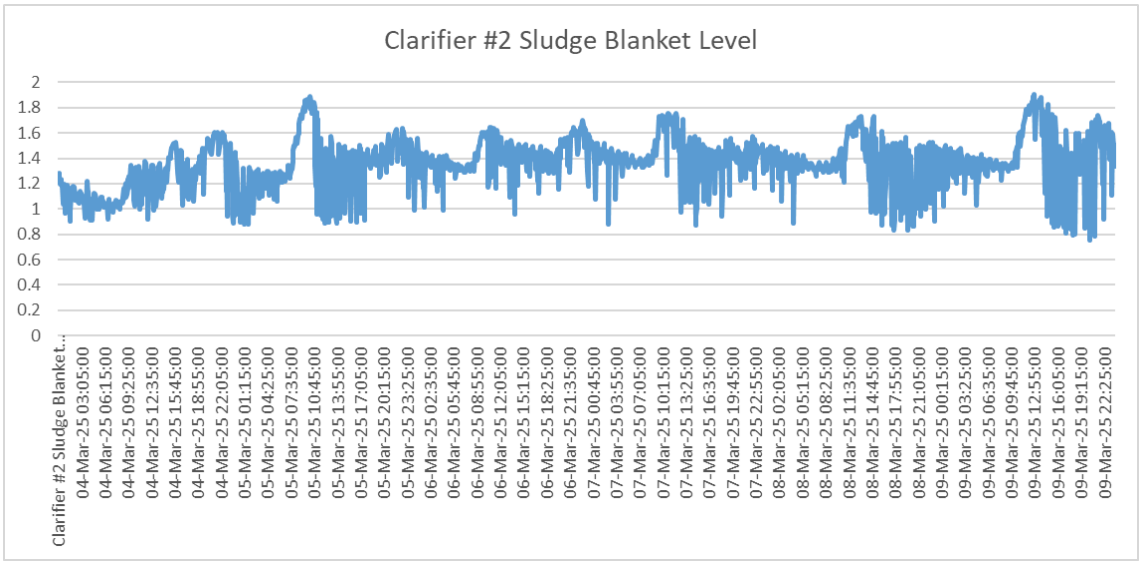


Figure 2 - Clarifier #2 Sludge Blanket Levels
4 - 9 March 2025



[1] Note measurements are taken morning and afternoons Monday- Friday and Saturday morning only. Measurements aren't taken on Saturday afternoons and Sundays.

Figure 3 - Clarifier #3 Sludge Blanket Levels
4 - 9 March 2025

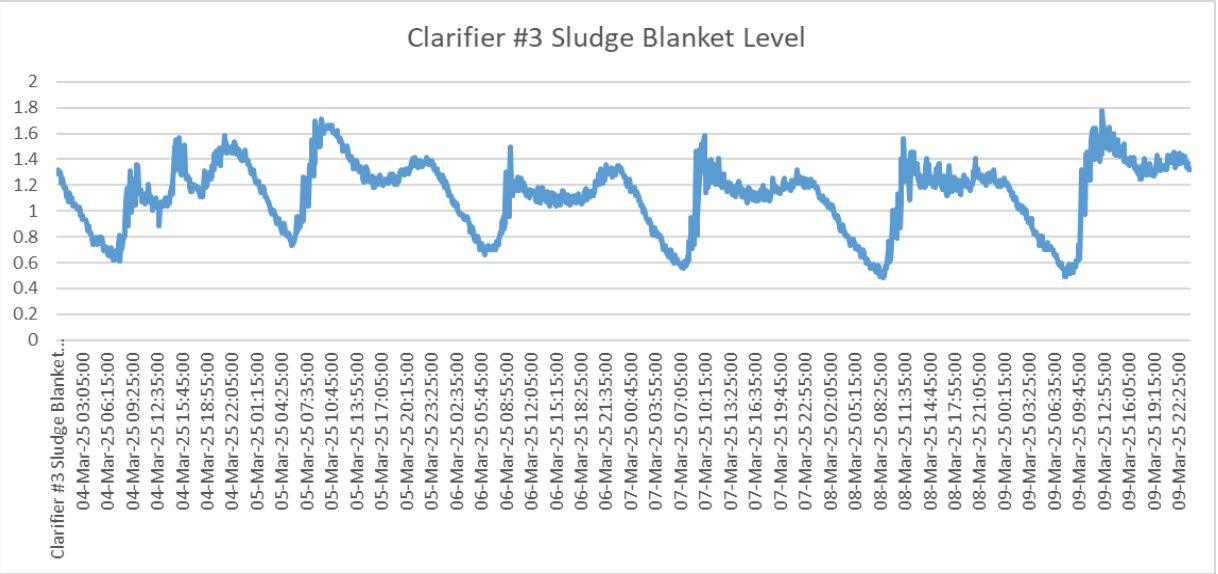


Table 5 - Suspended Solids (NZ.WEL.POR.WE01.TSS.DRESULT)					
	Daily Results	90 Day Geometric Mean	90 Day Percentile	Limit	
Date	g/m3	g/m3	g/m3	Geometric Mean	Percentile
04/03/2025	10	8	17.1	30	90
05/03/2025	20	8.1	18.1	30	90
06/03/2025	13	8.1	18.1	30	90
07/03/2025	5	8.1	18.1	30	90
08/03/2025	6	8.1	18.1	30	90
09/03/2025	12	8.1	18.1	30	90

Table 6 - BOD_5 (NZ.WEL.POR.WE01.TOT_BOD5.DRESULT)					
	Daily Results	90 Day Geometric Mean	90 Day Percentile	Limit	
Date	g/m3	g/m3	g/m3	Geometric Mean	Percentile
04/03/2025	17	9.7	20	30	90
05/03/2025	19	9.7	20	30	90
06/03/2025	28	9.7	20	30	90
07/03/2025	31	9.8	20.1	30	90
08/03/2025	22	9.8	21	30	90
09/03/2025	51	10	21	30	90

Table 7 - Faecal coliforms (NZ.WEL.POR.WE01.FCOLIFORMS.DRESULT))	
	Daily Results
Date	g/m3
04/03/2025	1549
05/03/2025	10040
06/03/2025	2098
07/03/2025	2121
08/03/2025	261
09/03/2025	28

Effluent quality - Total suspended solids content

UV removal efficiency is directly dependent on the final effluent quality. Solids present in the wastewater absorb the UV light reducing pathogens' removal efficiency. Table 5 shows an increase in suspended solids values on 5 March, although final effluent quality results for the period did not exceed consent condition limits.

Considering that the disinfection efficiency of the TAK system is less than the Duron system, this minor increase can significantly contribute to TAK's inferior performance.

UV Disinfection System Performance

Table 8 shows pre-UV faecal coliforms counts during the period.

Pre-UV faecal coliforms counts are analysed twice a week (Tuesdays and Thursdays) and an extended period is reviewed here compared to the focal period of 4 - 9 March. Table 8 shows that at the start of the investigation focal period the value was significantly higher than the periods prior to and following the focal period and this change occurred suddenly. The result on the 4th March, in particular, indicates increased demands on the UV disinfection system.

Log removal data is taken at the same time and results show that on 27 February, the log removal was 4.25, indicating very good UV performance with the final faecal coliforms count that day of 10 cfu/100 ml. Log removal values on 4 and 6 March is less than results on 27th February and 11 - 13 March, which is below the expected optimal removal value and indicates other contributing factors, such as increased suspended solids content as seen on 5 March in Table 5.

UV Transmittance

Both UV systems are operated with 100% output to provide maximum disinfection efficiency possible. Based on the data for 2024, there is a difference in the UV systems' removal efficiency. Average log removal values were 3.2 and 2.2 for Duron and TAK UV systems respectively indicating lower disinfection performance of the TAK system.

However, due to issues with the Duron UV System effluent penstock, operation of the Duron UV system was deemed unreliable and, consequently, the TAK UV system was on duty during the period and sampling was taken from the UV channel throughout the focal period. Table 9 shows the recorded power levels and transmissivity of the TAK when the samples were taken.

The Duron UV System was only activated when the Plant was staffed, hence the lower average daily transmissivity results in table 9. Typically, between 08:00 and 17:00 on weekdays the Duron System was recording an average transmissivity of around 60%.

Figure 6 shows that effluent flows did not reach the 750 l/s which is the level that activates the stand-by UV system.

Table 8: Pre-UV coliforms

Date	pre-UV (cfu/100 ml)[2]	Log removal
25/02/2025	80000	1.925823775
27/02/2025	180000	4.255272505
4/3/2025	280000	2.257106614
6/3/2025	200000	1.979224512
11/03/2025	150000	3.26760624
13/03/2025	140000	3.333214679

Table 9:UV Average Daily Transmissivity Performance			Recorded Performance Of TAK System At Time of Sampling		
Date	Duron	TAK	Sampling Time	Power Level	Transmissivity
4/3/2025	41%	50%	07:50	100%	55%
5/3/2025	41%	54%	07:53	100%	46%
6/3/2025	39%	59%	08:15	100%	63%
7/3/2025	32%	54%	08:10	100%	53%
8/3/2025	12%	54%	07:30	100%	59%

[2] The average value for 2024 was 254,292 cfu/100 ml.

Figure 4 - Online TAK System UV Transmissivity
4 - 9 March 2025

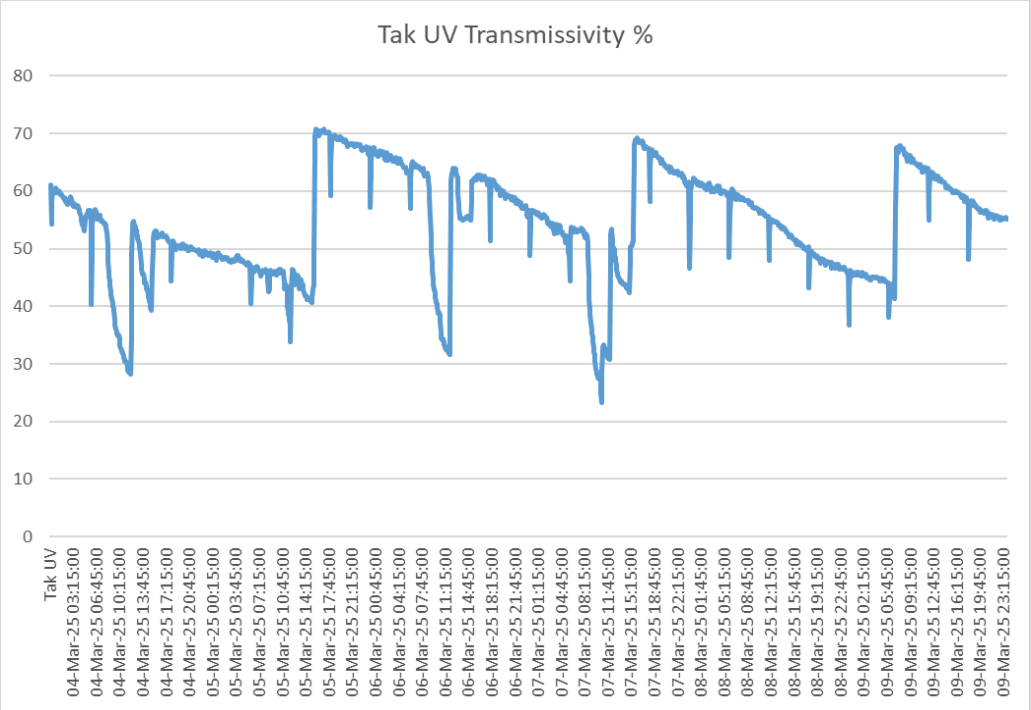


Figure 5 - Online Duron System UV Transmissivity
4 - 9 March 2025

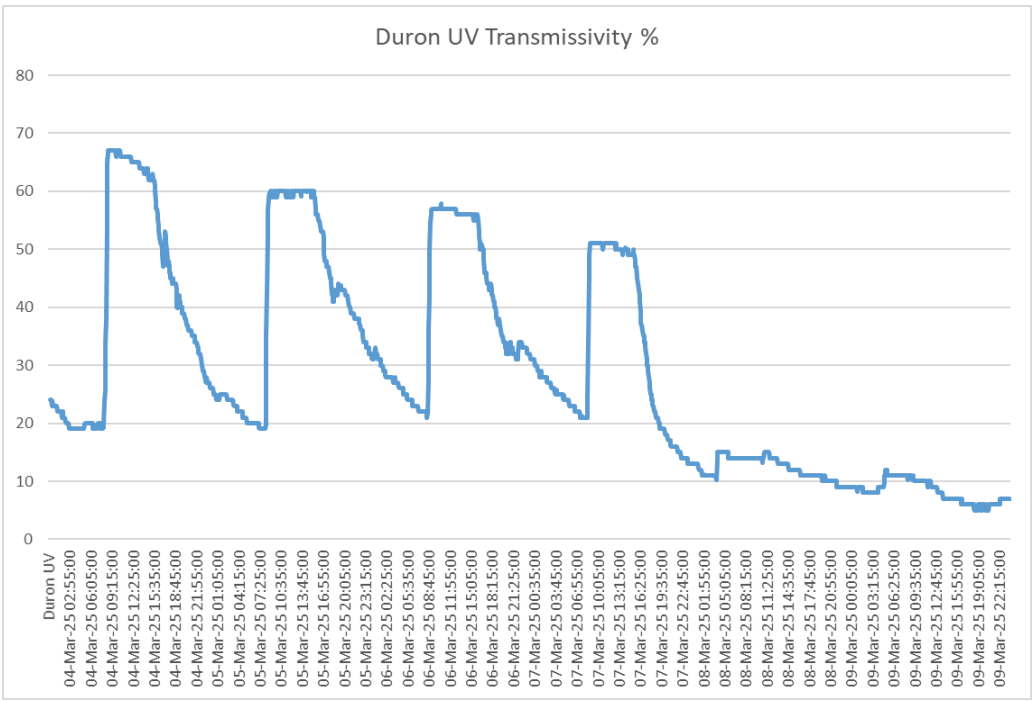


Figure 6 - Effluent Flows
4 - 9 March 2025

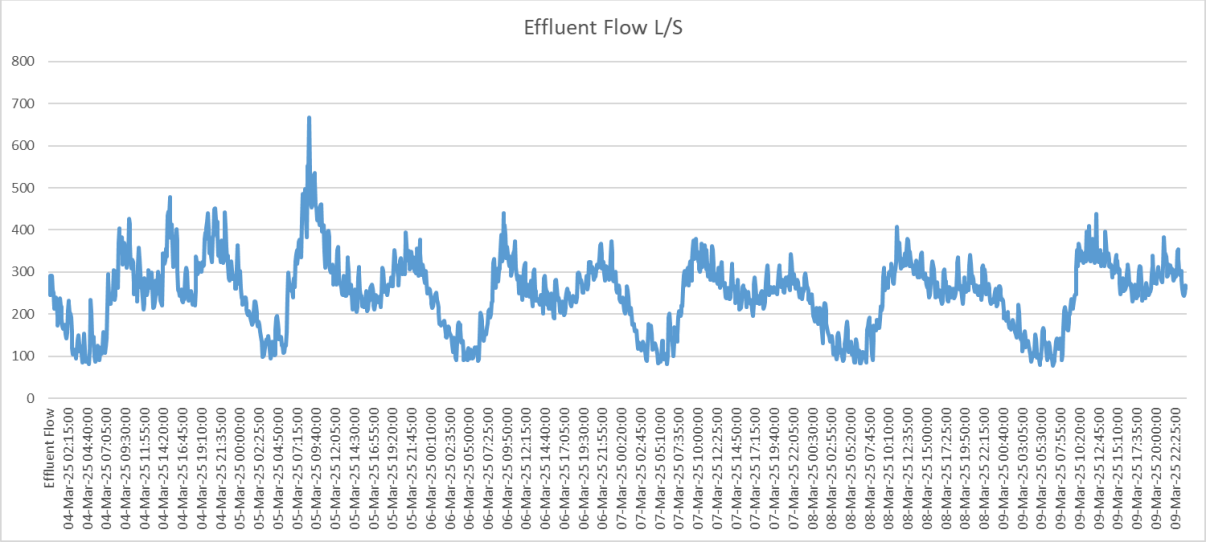


Figure 7 - TAK UV System Flow
4 - 9 March 2025

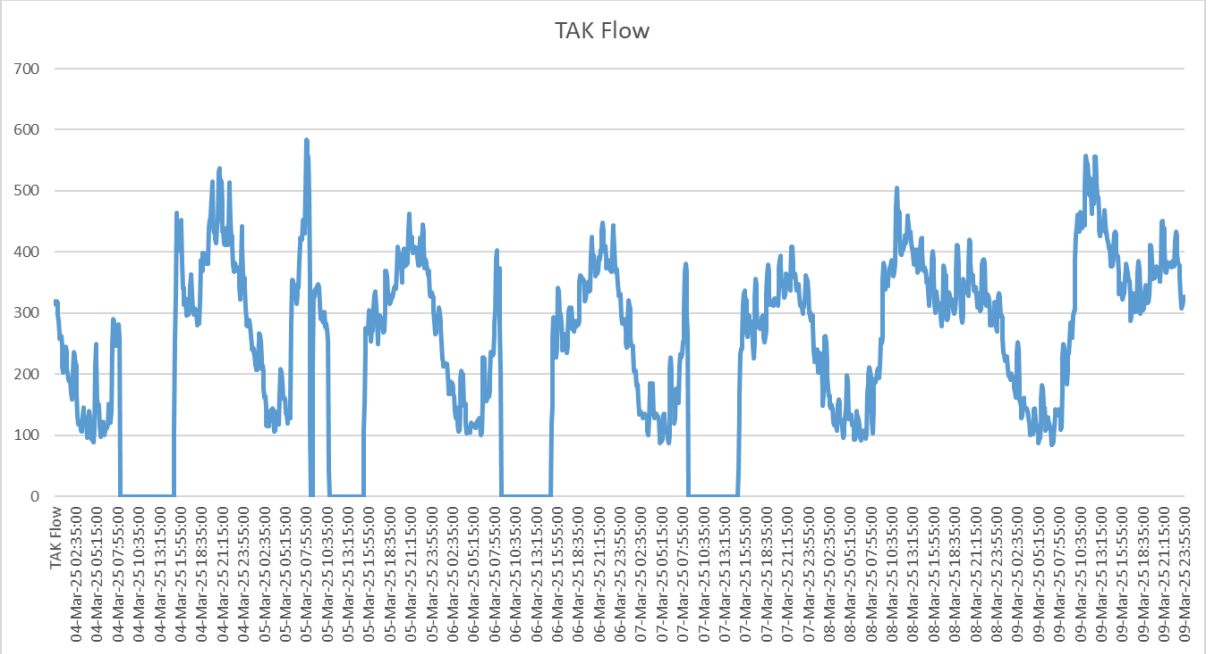
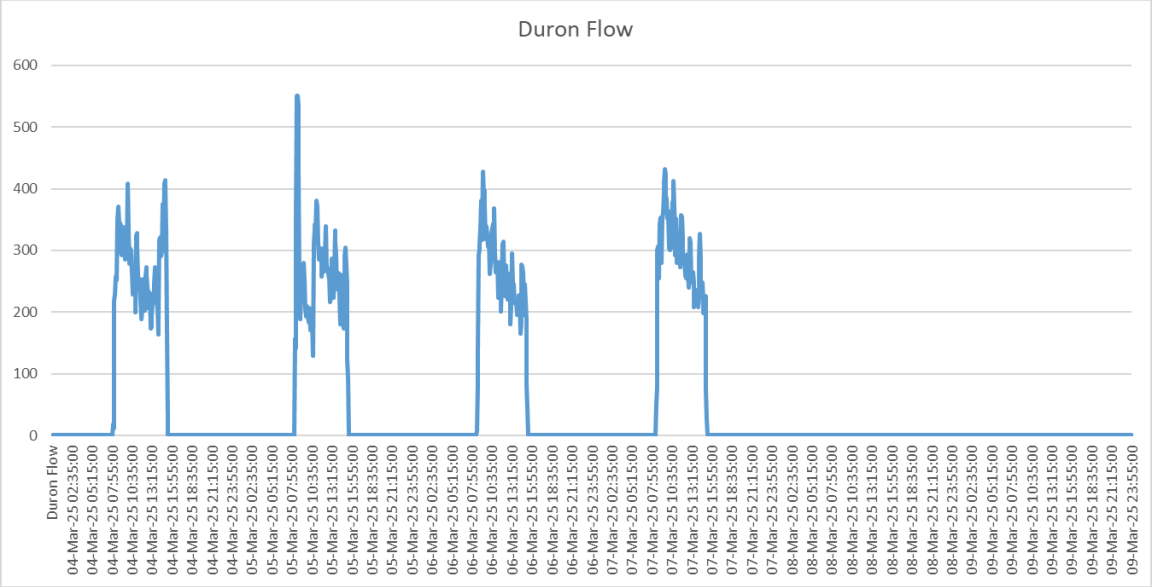


Figure 8 - Duron UV System Flow
4 - 9 March 2025



Personnel / Team Actions

The preventive maintenance and cleaning tasks for the UV systems were performed as required. The duty UV system's lamps are scheduled to be cleaned on a fortnightly cycle and the TAK system's lamps were cleaned on 26 February; only a week prior to the initial exceedance. They were cleaned, again, on 11 March.

Defects

In May 2024 the TAK system underwent an audit[3]. The report's overall conclusion was that the TAK system is 'operating well considering its age.' The report identified several issues and set out recommended component replacement actions. A summary is set out below:

Issue	Recommended
Dosing effectiveness	Replace the wiping system. Check calibration sensors and settings.
Lamps have a 12,000 hour life span	Replace lamps and wiper rings. Replacing lamps should be done as complete banks, ensure amalgam dot is always at bottom of lamp to ensure maximum lamp life is achieved.
Pneumatic cylinders and air supply	Due to the age of the lines, they are brittle and should be replaced.
Intensity sensors	The two banks were within (i.e. less than) 15% deviation. Most wastewater treatment sites have a sensor deviation threshold of 15%
Redundant / Obsolete Parts	The PLC should be replaced. When a new unit is obtained the code will need to be re-written and tested. Ballast racks to be replaced along with cooling fans. One Ballast Interface Board should be replaced.

Assessment

Higher flows were recorded on 4 March and, subsequently, higher Suspended Solids were recorded on 5 March. Table 5 shows that on 5 March, suspended solids had doubled from the prior day's reading, which is considered significant.

Problems with the Duron UV Treatment system led to the TAK system being used as the duty system at the time of the event. Previous comparative results show that the Duron UV system has higher removal efficiency compared to the TAK system.

The TAK system's comparatively inferior performance (compared with the Duron System in 2024) has already been noted. Its performance is also likely to have been impaired by age and issues identified in a system audit completed in May 2024, which identified the need to replace multiple components. The overall effect of these issues could have impaired the system during a period of high flows and higher Suspended Solids which has resulted in Faecal Coliforms in the final effluent that exceeded the consent condition limits over the focal period.

[3] Wedec Audit Inspection Report 10 May 2024

Corrective Actions

Corrective Action	Reference of issue on captured system or Defect raised	Responsibility	Measurement
Operate Duron System as duty UV treatment system.	Xylem undertook repairs on 26 March. The Duron system has been activated as the duty UV system since this date.	Completed	NA
Refurbishment of TAK System	Refurbishment of the TAK system is programmed and soon to commence. That includes wiping system, control cabinet items, sensors and lamps. It is anticipated this will improve the TAK system's performance.	Veolia	Refurbishment is expected to be completed by end of May 2025

Conclusion

Higher flows were recorded on 4 March and, subsequently, higher Suspended Solids were recorded on 5 March. Table 5 shows that on 5 March, suspended solids had doubled from the prior day's reading, which is considered significant.

Problems with the Duron UV Treatment system led to the TAK system being used as the duty system at the time of the event. Previous comparative results show that the Duron UV system has higher removal efficiency compared to the TAK system.

The TAK system's comparatively inferior performance (compared with the Duron System in 2024) has already been noted. Its performance is also likely to have been impaired by age and issues identified in a system audit completed in May 2024, which identified the need to replace multiple components. The overall effect of these issues could have impaired the system during a period of high flows and higher Suspended Solids which has resulted in Faecal Coliforms in the final effluent that exceeded the consent condition limits over the focal period.

The Duron system has been activated as the duty UV system since the event.

A refurbishment of the TAK system is soon to commence. It is anticipated this will result in improved performance of this system when activated.

No further actions are recommended.