LEACHATE TREATMENT REPORT JULY – DECEMBER 2023 NANTYCAWS LANDFILL

Prepared for: **Carmarthenshire County Council**

By: **P Knight**

Date: **March 2024**

ExCAL

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NANTYCAWS LANDFILL

LEACHATE TREATMENT REPORT

JULY – DECEMBER 2023

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1.0 INTRODUCTION

Carmarthenshire County Council has the responsibility for the safe treatment and disposal of the leachate arising from a closed landfill site at Nantycaws, Carmarthen, UK.

Carmarthenshire County Council has contracted out the maintenance and operation of the leachate treatment plant to ExCAL Limited.

The leachate from the closed landfill section is dilute. It is being treated with a biological treatment plant prior to discharge to a local river under the discharge consent permit number; EPR/PP3338CQ.

The treatment plant consists of a subterranean SAF plant (Submerged Aerated Filter) and the above ground plant consisting of four MBBR's (moving bed bio reactors) that are successively treating the leachate to enable the treated effluent to be discharged to the river. Collectively the SAF and MBBR's are referred to as the Main Plant. The main plant receives landfill water from the well where the landfill water is first seen.

The site also has two SAF plants in series with a sediment catch system called a lamella. Collectively this is referred to as SAF2, which acts as a secondary treatment system when required. A lagoon on site receives overflow water that is pumped from the well to the main plant, both the well and main plant well operate blind to each other that results in excess water often arriving at the main plant well. SAF2 is in place to treat the lagoon water and discharge it to W1.

W1 is the discharge point to the river for both the main plant and SAF2.

The purpose of this report is to summarise the monitoring data obtained for the site from 1st July 2023 - 31st December 2023.

1.1 Site Address

The site location and address is: -

Nantycaws Landfill Site
Phase 1
Nantycaws
Carmarthen
SA32 8BG.

2.0 NOTABLE EVENTS

Below are dated events that deserved mention when the daily running of the plant is considered. These events will be discussed in more detail at the end of the report in conclusions.

03/07/23	SAF2 inlet pipe failed whilst attending site and fixed. Measures put in place so it cannot fail again.
10/07/23	power cut late Sunday. No issues resulting from it.
11/07/23	Issues with totalizer reading.
21/07/23	SAF2 well was below pump level. Pump turned off and turned back on later in the day when the water levels returned to normal. Main down to p1 & p2 at 1min.
24/07/23	Main plant 11 up to 12 min. Adjust SAF2 throughput.
03/08/23	more SAF2 to reed bed.
11/08/23	Blower pipe 1 leaking. Fixed.
16/08/23	feed pumps 12 up to 22.
31/08/23	Lagoon too low for pump. SAF2 turned off.
01/09/23	SAF2 on 99% recirc.
04/09/23	Lagoon to SAF2 well pipe found to be blocked. SAF2 pump turned off. Well p1 tripped and reset.
05/09/23	Found lagoon pipe. Started to attempt the unblocking of the pipe.
06/09/23	Rodded pipe from dry well, blockage removed.
07/09/23	Main plant pumps down to both 1min.
11/09/23	Lagoon now very low due to SAF2 well position when reinstated. Main plant pumps 11 up to 22 min.
14/09/23	More blockages with SAF2 well pump.
15/09/23	Lagoon low enough to wade out to the blocked lagoon pipes. Two inlets to SAF2 well found. One horizontal and one upstanding. Managed to unblock the pipe fully.
18/09/23	SAF2 really high in NH4.
20/09/23	Well flooded.
02/10/23	Power cut early Monday. No ill effect. Pumps set at 2min.
11/10/23	Big storm and well and lagoon are seen to be mostly rain water.
13/10/23	Lamella discharge pipe was blocked with roots. Cleared.
18/10/23	Clean down Lamella. SAF2 full to reed bed.
19/10/23	Both pumps 22 down to 21. Report breach due to storm. SAF2 90% to well.
20/10/23	Further breach.
21/10/23	Main pumps 21 down to 11.
23/10/23	Main pumps 11 up to 21. Report breach.
24/10/23	W1 flooded 21 up to 22. Note, SAF2 still 90% to the main well.
25/10/23	P1 tripped and reset. Main pumps 22 up to 23. Slowing down SAF2 throughput.
26/10/23	P1 tripped and reset. SAF2 levels down therefore send some to reed bed.
27/10/23	Heavy showers. Main pumps 32 down to 22. Lagoon sampled in different locations and proven to not be uniform in ammonia concentration.
28/10/23	W1 flooded. SAF2 more to reed bed.
30/10/23	Extreme rain.
31/10/23	Lagoon near critical height with more rains coming.
01/11/23	Very wet and windy. Main pumps 22 up to 23.
02/11/23	SAF2 wound back. Breach.
03/11/23	AQC 0.45 should be 0.5. Good result. Breach.
04/11/23	Main 23 up to 33.
06/11/23	Main dropped 33 down to 22. Breach.
08/11/23	Breach. Reported. W1 flooded and river found to be 6.6 mg/l NH4.
09/11/23	SAF2 cabinet tripping out feed. Over budget on power.
10/11/23	Added higher rated trip switch to supply power to SAF2 cabinet. Breach.
11/11/23	Main pumps 23 up to 33.
13/11/23	Well P1 tripped and reset. W1 flooded.
14/11/23	Increase SAF2.
15/11/23	Pushing main plant. Pumps up from 33 to 34. Breach.
16/11/23	Water is coming out of the manhole covers at the sub tanks due to lots of water in the well.
17/11/23	Breach. Well was in fault mode (High float was activated) due to excess water and therefore pumping too much water to sub tanks. The lagoon to well pump was turned off to prevent the fault mode.

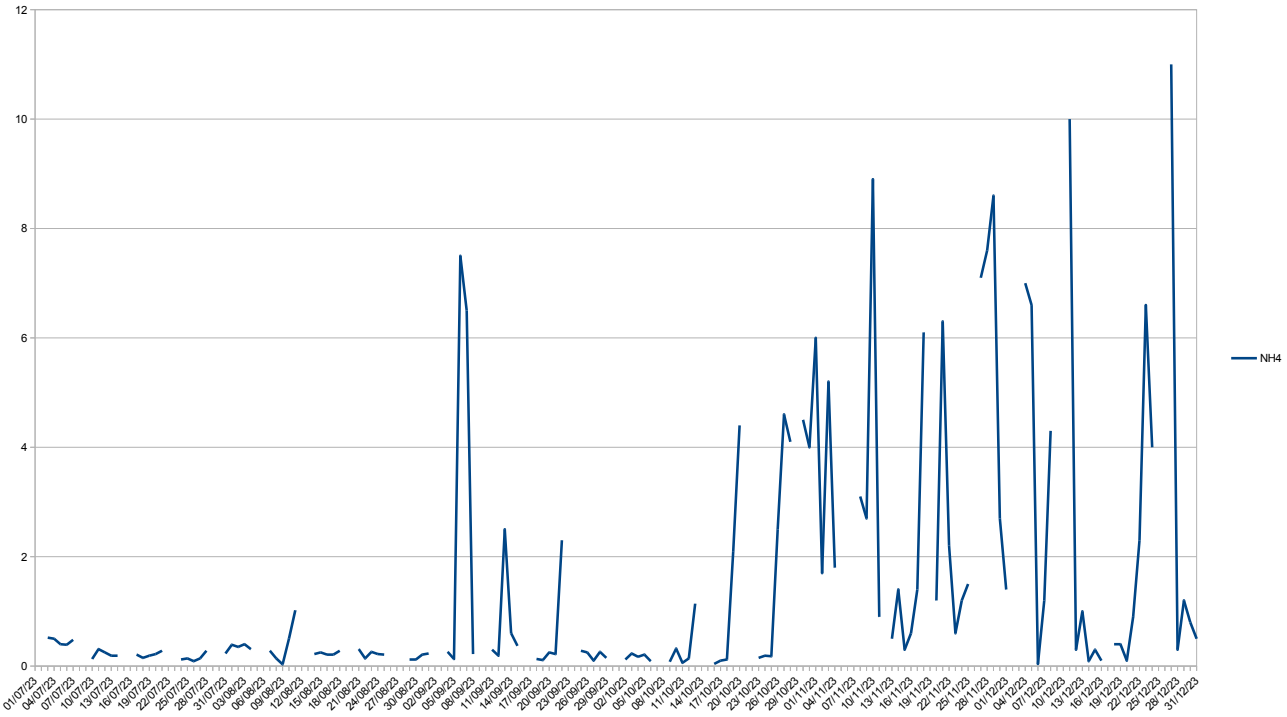
18/11/23	Pumps down from 43 to 33. SAF2 wound back. Lifted high float higher up so it would not pump the well water so often.
20/11/23	Lagoon very high after storm. Pumps 33 up to 43.
21/11/23	Pumps from 33 down to 22.
22/11/23	Pumps 22 up to 32.
23/11/23	Power cut. No ill effects. Pumps 32 up to 33.
25/11/23	0.2^{o}c on site.
27/11/23	Warmer. 9.2^{o}c. Main 33 down to 23. Breach.
28/11/23	pH probe need conditioning.
29/11/23	Main 23 down to 22.
30/11/23	River sampled at 4.6mg/l NH4. SAF2 slowed down. Main up from 22 to 23.
01/12/23	Sludge pump tripped. Need removing and replacing.
02/12/23	Post 1.4 and temp 2.6.
04/12/23	More rain. Stream in high flow. Note again, SAF2 mostly to lagoon and a little to the reed bed.
05/12/23	Main down from 32 to 21.
06/12/23	Main up from 21 to 32.
07/12/23	Another storm. Main 32 up to 33.
08/12/23	Slow SAF2 to a crawl.
09/12/23	W1 in flood.
11/12/23	Main plant 33 down to 11. SAF2 is struggling. Slow down to absolute minimum.
12/12/23	Extreme rain again. Main plant 11 up to 32.
13/12/23	Lagoon to Well.
14/12/23	Washed media from under lid of SAF2 tanks. Lid knocked an aerator pipe that was subsequently fixed.
15/12/23	SAF2 now very foamy. Need new pH probe.
18/12/23	Main 32 up to 33.
19/12/23	Lagoon so high due to the rain that its now flowing back into the well. Retire pH probe. Conditioning failed.
21/12/23	SAF2 very high in ammonia, but low in volume. The reed bed is still active.
23/12/23	Main 33 down to 32.
24/12/23	Main 32 up to 33.
27/12/23	Extreme rain. Main 33 down to 23. W1 flooded.
29/12/23	Intense rain continues.
30/12/23	Achieved optimum flow rates for SAF2.
31/12/23	More intense rain.

3.0 FIELD ANALYSIS

Daily tests are carried out during the week to monitor the plant's performance. Ammonia, pH, temperature and turbidity are recorded and monitored.

The results for the period 1st July 2023 to 31st December 2023 are summarised in graphs 1 to 5 below. The raw data can be found in appendix A. The graphs depict the results from the final discharge and the SAF 2 treatment system as well as the main discharge well (W1) that was monitored daily (unless SAF2 was diverted to the lagoon). W1 is the final well to the stream and receives the treated water from the main plant as well as the water from the reed bed that is fed by the treated water from SAF2. If the SAF2 discharge is returned to the lagoon then W1 will be the same water as the main plant discharge, named Post.

Graph 1. Ammonia. Main plant (post)



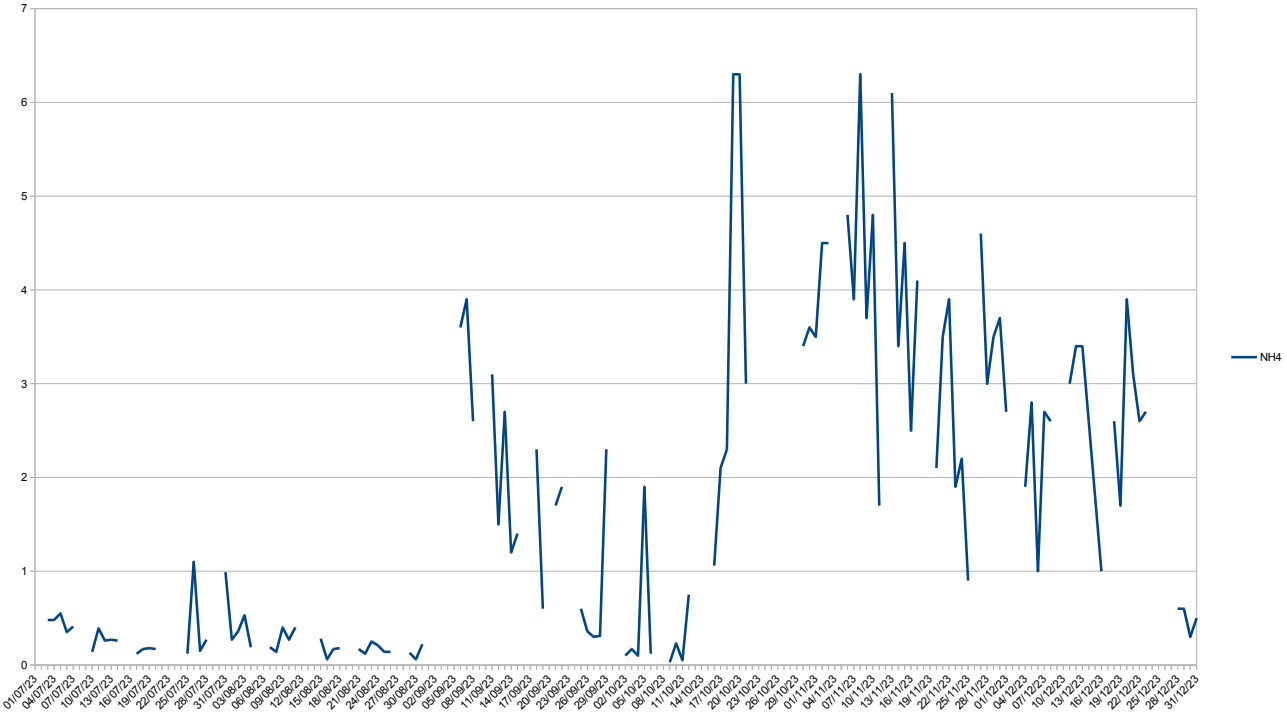
Key: 0 – 12 mg/L NH4

The main plant treats the water pumped over from the landfill. The landfill waters can be as high as 100 mg/L NH4 and during normal operating parameters the discharge to W1 can be under 1 mg/L NH4.

The first spike in ammonia was due to the plant being pushed hard as the pipe that feeds the lagoon to the SAF2 pumping well had become blocked and the lagoon had to be kept as low as possible.

The onset of autumn and winter bought a lot of problems on site with elevated water levels present in the well and months of intense rain. The plant parameters were changed almost daily in order to keep the lagoon levels as low as possible whilst processing the most amount of water whilst remaining in compliance. The plant continuously swung between extremely good performance to poor performance with an adequate performance very difficult to achieve. As of the New Year the plant has settled down.

Graph 2. Ammonia, Final Discharge to stream. W1



Key: 0 – 7 mg/L NH4

The location of sampling is the final well or W1. It consists of both the main plant water and the SAF2 water after it has gone through the reed bed.

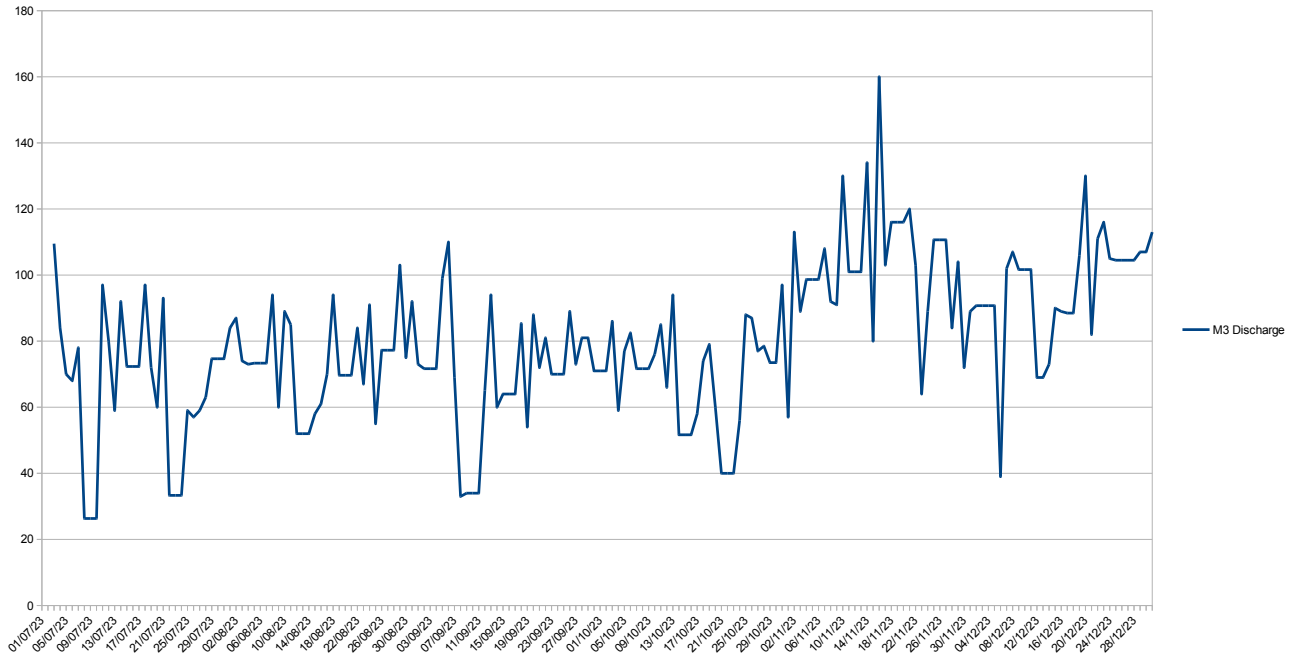
The main plant and SAF2 were pushed hard given the extreme weather of late 2023 with adjustments constantly being made in order to process sufficient water to avert a lagoon overflow event. The issue of breaches mainly arose from SAF2 and the lagoon. An acceptable balance would be achieved with SAF2 for example and then owing to the non-uniform nature of the ammonia concentration in the lagoon one would find the SAF2 unit unable to cope with a rich area of lagoon water.

The breaches are as follows in mg/L NH4: -

19th October = 6.3
20th October = 6.3
23rd October = 5.7
2nd November = 4.5
3rd November = 4.5
6th November = 4.6
8th November = 6.3
10th November = 4.8
13th November = 6.1
15th November = 4.5
17th November = 4.1
27th November = 4.6

These breaches will be discussed in detail in Section 5 - Conclusions.

Graph 3. Daily Flow, Final Discharge



Key: 0 – 180 m^3 discharge through meter.

The total discharged water on the 1/7/2023 was 368,055m^3 and at the end of 2023 it was 382,633m^3 therefore a total of 14,578m^3 was processed by the main plant during this time. This is a lot more than the first half of the year at a recorded 9,061m^3. This is owing to the increased influx into the system and a resultant need for more throughput.

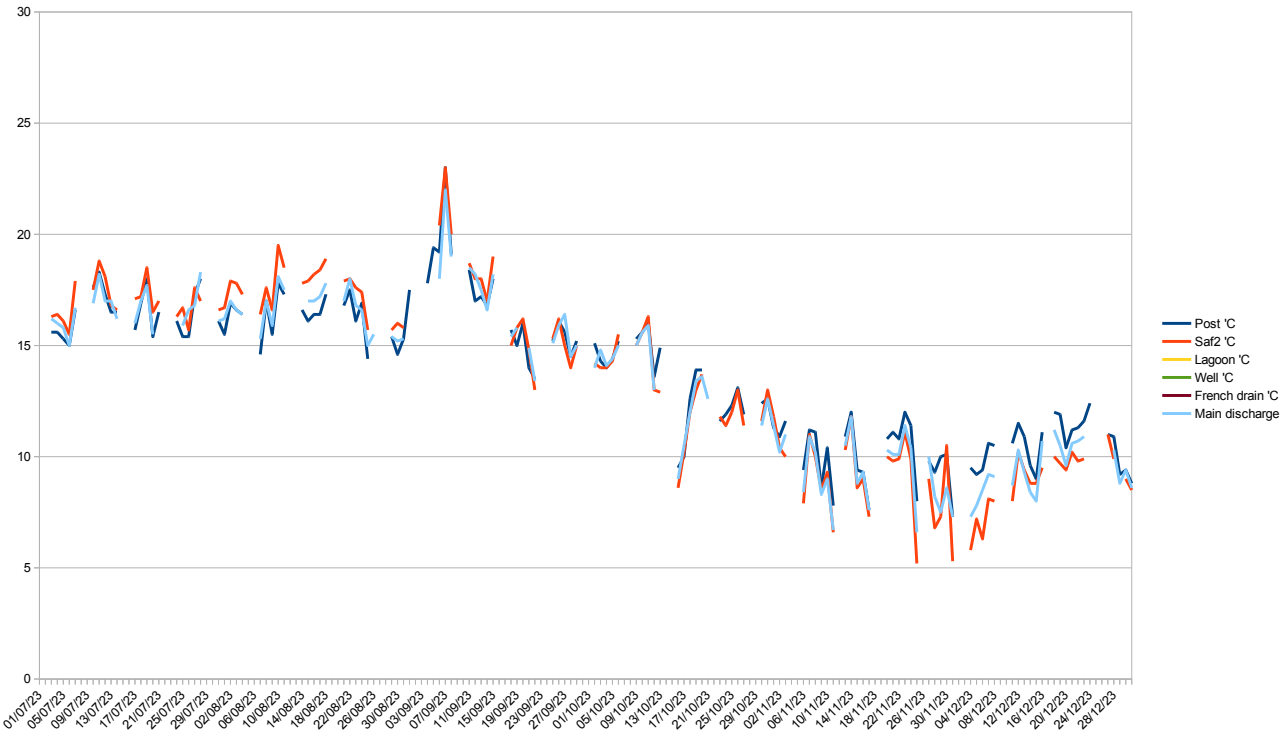
SAF2 was discharging water to the reed bed and W1 for the second half of 2023. But the amount varied. The pump rate for SAF2 at a minimum is 0.2L/s. The maximum pump rate is 1.9L/s and currently the rate is set at 0.9L/s.

Therefore on average the pump rate can be considered to be 1L/s, equating to 86m^3 per day.
184 days at 86m^3 = 15,824m^3.
A minimum value for clarification would be 17.2m^3 and the maximum rate would be 164m^3. It is worth noting that the pump has been changed since last year, where a figure of 200m^3 was calculated from the flow rates.

The total discharge is therefore 14,578m^3 + 15,824m^3 = 30,402m^3.

The lagoon can hold roughly 2,752m^3 and at the end of 2023 was nearly full due to inclement weather.

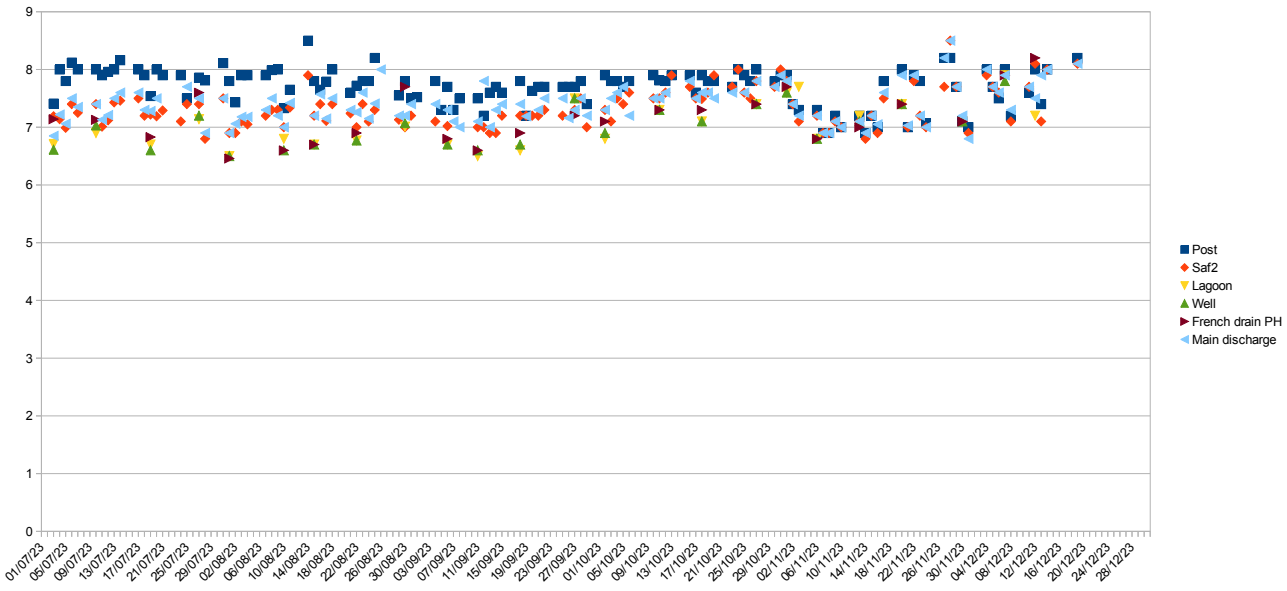
Graph 4. Temperatures



Key. 0 – 30°C

Temperature in all the recorded media depicts a trend that follows yearly variations. The highest temperature is observed in August and and the decline in temperature, as westerly storm systems bought mild weather in autumn through to winter, can also be observed. There were a couple of sudden drops in temperature that proved troublesome for the plant.

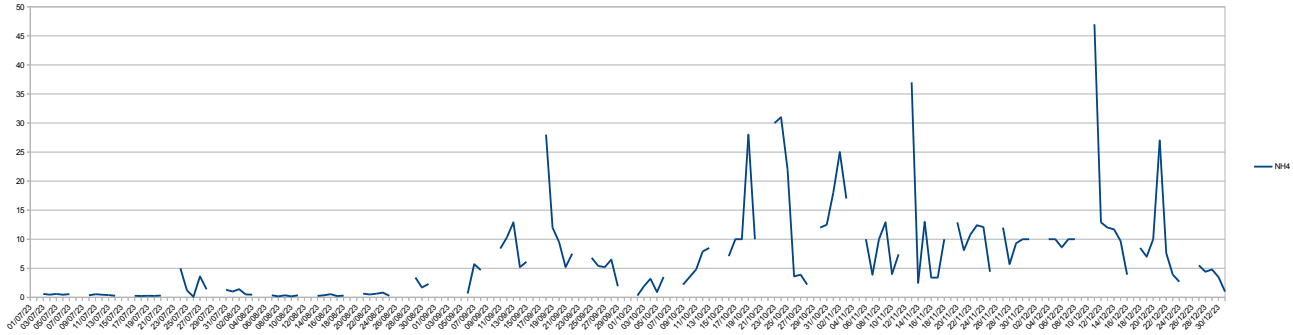
Graph 5. pH levels



Key 0 – 9 pH units

The acidity and alkalinity levels or pH levels of the recorded media are in concert with each other with no serious deviations from the average. The consent levels for discharge are a range of 6 to 9 pH units. The probe failed toward the end of the year and a new one has been ordered.

Graph 6. SAF2 Ammonia Levels



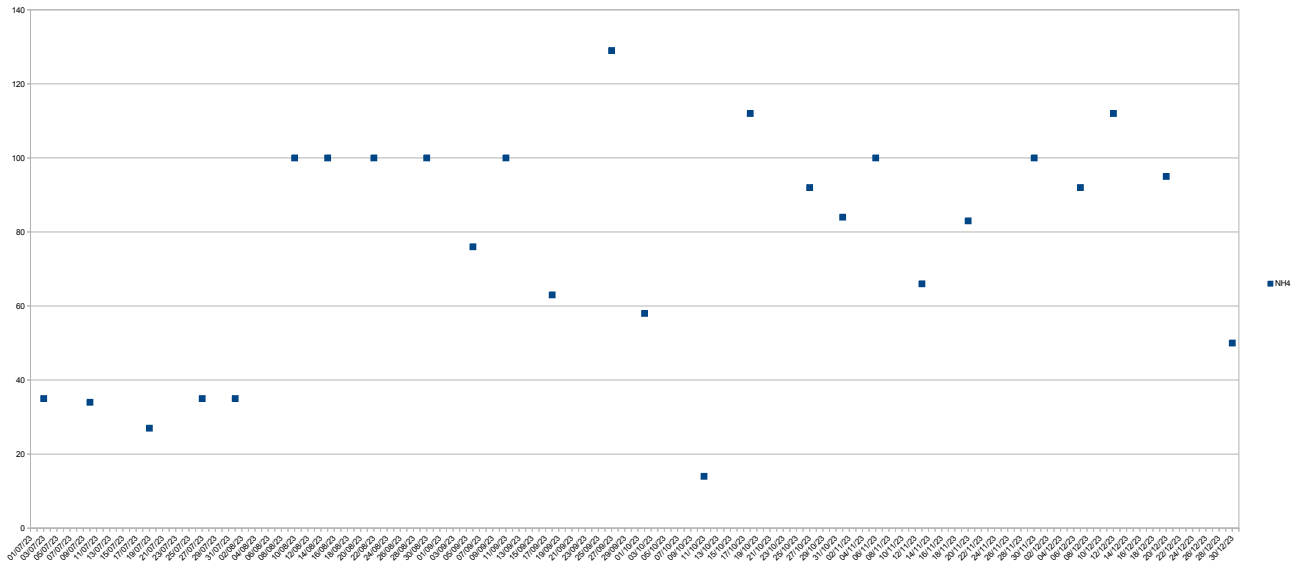
Key. 0 – 50 mg/L NH4

SAF2 treats the water from the holding lagoon and is normally discharged to the reed bed that feeds the stream via W1 when the ammonia levels are acceptable. The graph above shows spikes in ammonia. When these are detected the SAF2 is diverted to the lagoon. It is thought that waves of ammonia rich waters drift through the near still lagoon from the overflow pipe that feeds raw leachate to the plant from the well. The reed bed that receives the SAF2 water is able to reduce ammonia, but no exact figures have been recorded and its effectiveness is seen to reduce dramatically when winter sets in and the reeds drop their blades.

The spikes in ammonia seem alarming, but it must be noted that less than 10% of the SAF2 discharge was directed to W1. The old methodology saw the discharge of the SAF2 unit being split to the lagoon and reed bed and W1. The new methodology applied has a split manifold before the SAF2 inlet. One leg feeds the SAF2 unit and the second leg heads straight back to the lagoon. Both legs are controlled via a valve. This allows for a much finer and improved retention time to be applied to SAF2.

The elevated levels seen are due to the elevated influx of water into the system.

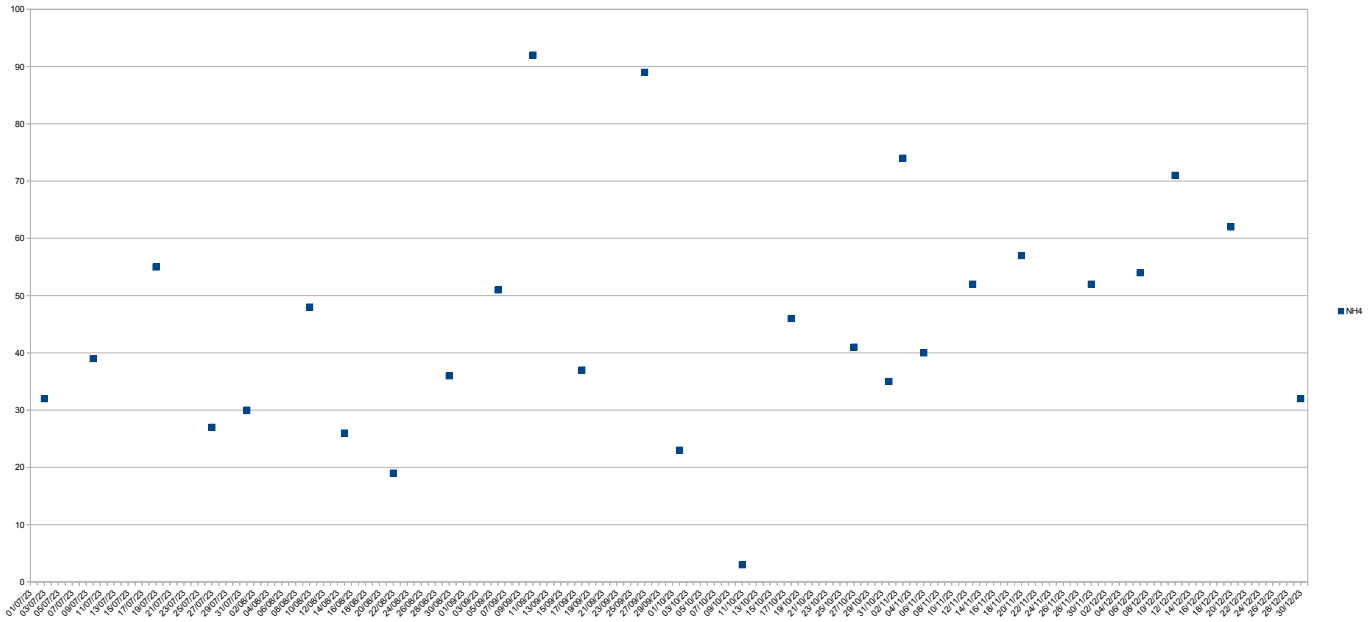
Graph 7. Well Ammonia Levels



Key. 0 – 140 mg/L NH4

The ammonia levels of the well vary and can be observed to be nearly 125 mg/L NH4 on occasion and sometimes as low as 20 mg/L NH4 and less. The low levels are due to the influx of SAF2 water from the diversion system that serves to dilute the well water. This diversion system was refined resulting in the influx of SAF2 water to the well being removed later in the year at around the end of November.

Graph 8. Lagoon Ammonia Levels



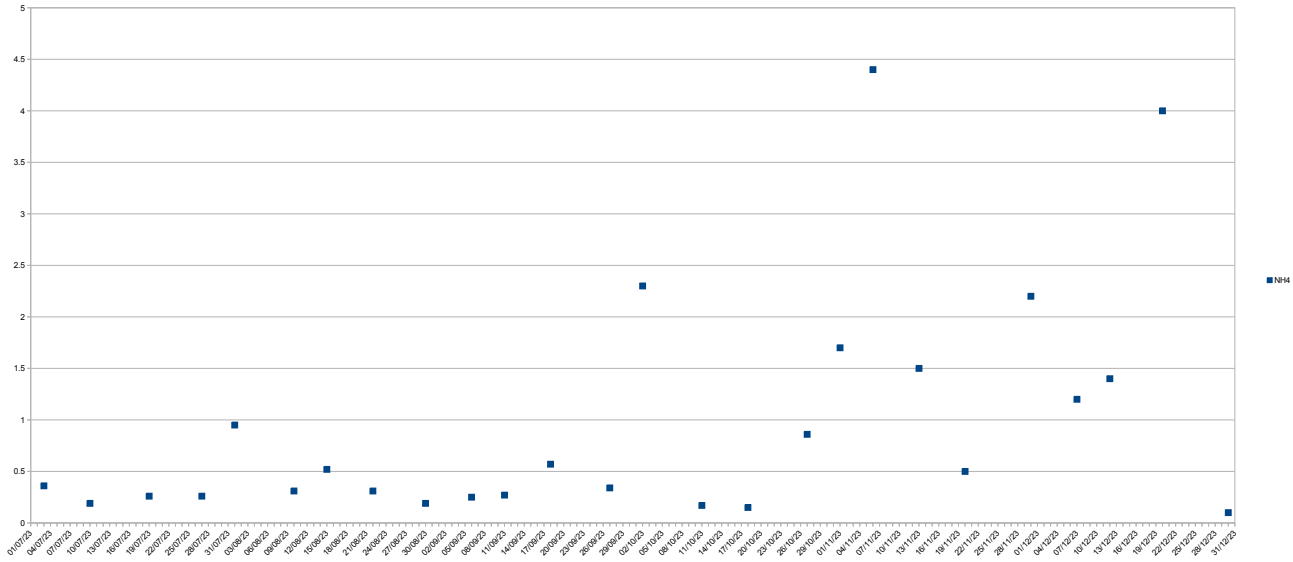
Key. 0 – 100 mg/L NH4

The lagoon is the overflow storage area for the landfill water. This water is treated by the SAF2 unit before discharge via W1 to the watercourse. The lagoon showed ammonia to be on the rise as the inclement weather persisted into autumn. The levels of ammonia recorded were around 30 mg/L NH4 with one sample found to be over 90 mg/L NH4.

It was also proven that ammonia levels do vary across the lagoon when sampled in various locations within the same time frame.

The samples were taken on the 27th of October. One was taken near the lagoon side by the main plant and was found to be 41mg/L NH4. The second sample was taken roughly 20m away off the pontoon and was found to be 13mg/L NH4 and the third sample was taken near the SAF2 plant and it was found to be 14mg/L NH4.

Graph 9. French Drain Ammonia Levels



Key. 0 – 5 mg/L NH4

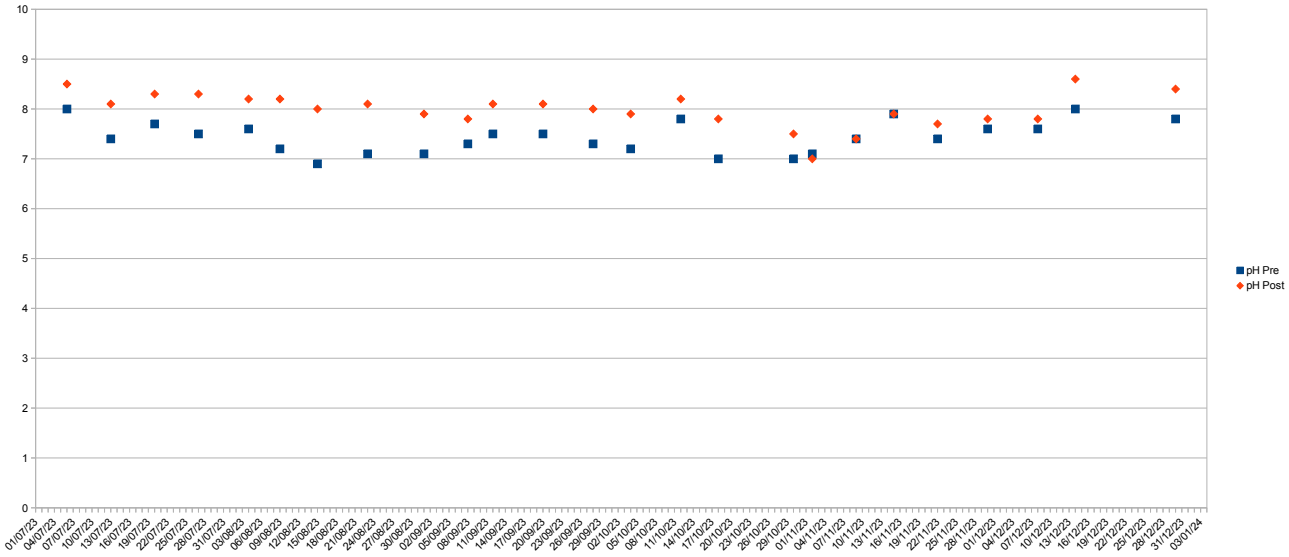
The French drain captures surface water from the low portion of the capped landfill and is monitored weekly for any elevated ammonia discharge.

During storm events the French drain is shown to have elevated ammonia levels.

4.0 LABORATORY ANALYSIS

The graphs numbered 10 to 19 show a comparison of the effluent pre and post treatment. The data was obtained from samples sent for analysis at Decus Research, a UKAS accredited laboratory based in Capel Hendre, Carmarthenshire.

Graph 10. pH Pre and Post Treatment Comparison

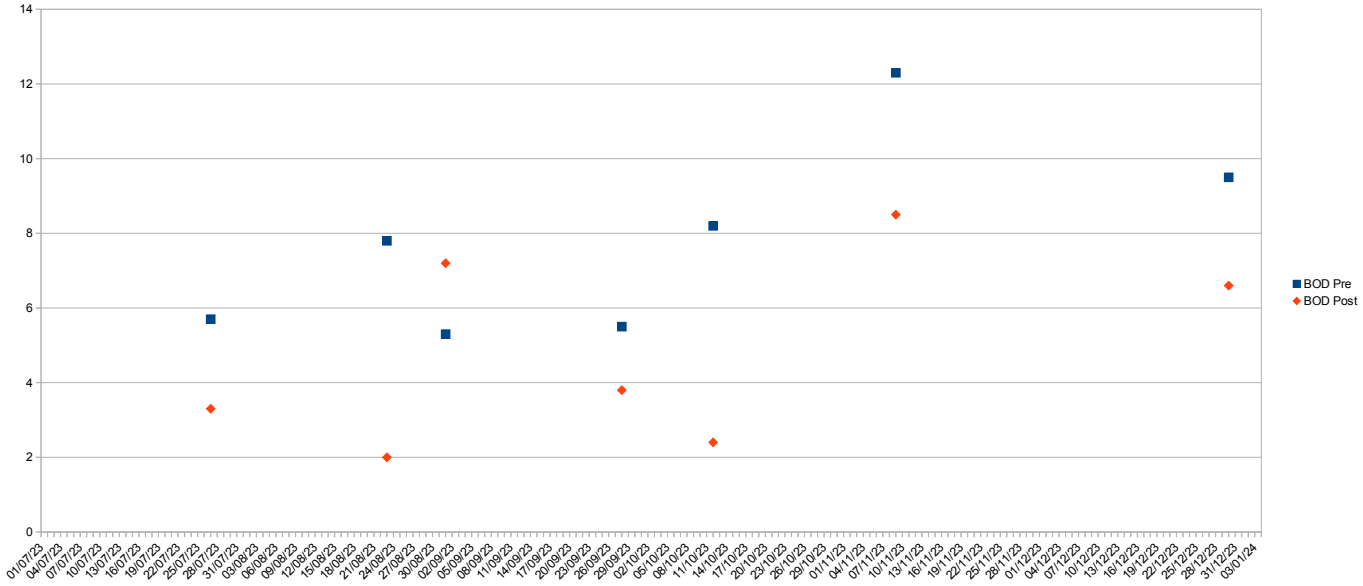


Key 0 – 10 pH units

The weekly samples of the landfill discharge (pre) and treated discharge (post) are tested for pH (acidity or alkalinity).

The results remained consistent through the second half of the year with a slight rise and fall throughout.

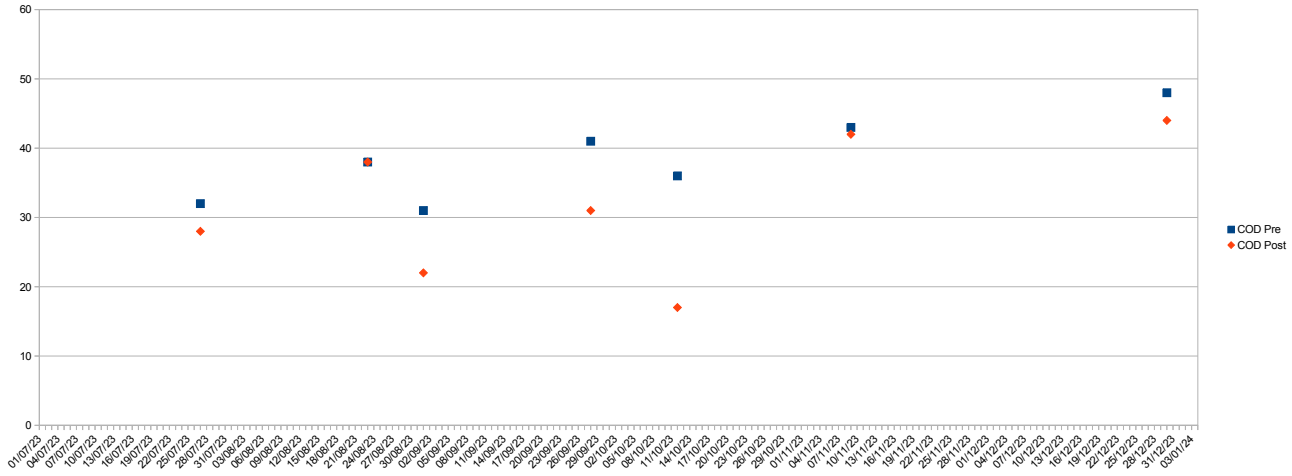
Graph 11. BOD Pre and Post Comparison



Key 0 – 14 mg/L O2

The BOD (biological oxygen demand) levels on the discharge did not breach the consent levels of 20 mg/L throughout the year.

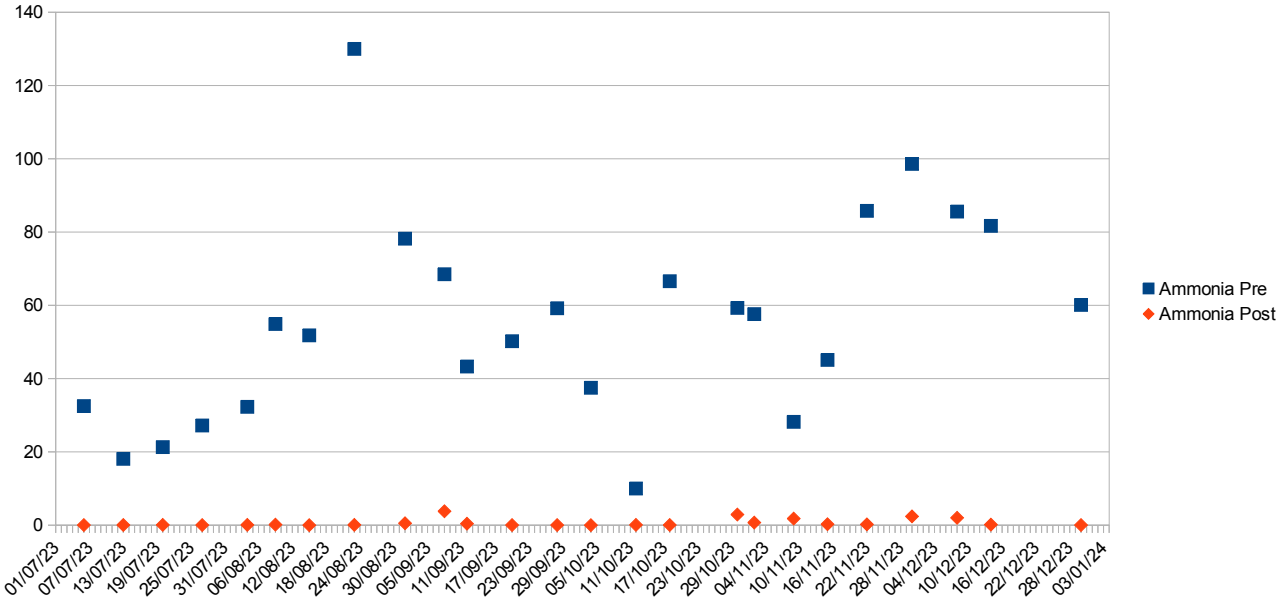
Graph 12. COD Pre and Post Comparison



Key 0 – 60 COD mg/LO2

The chemical oxygen demand (COD) levels remained consistent through the second half of the year with discharge levels varying between 15 to under 50 mg/LO2.

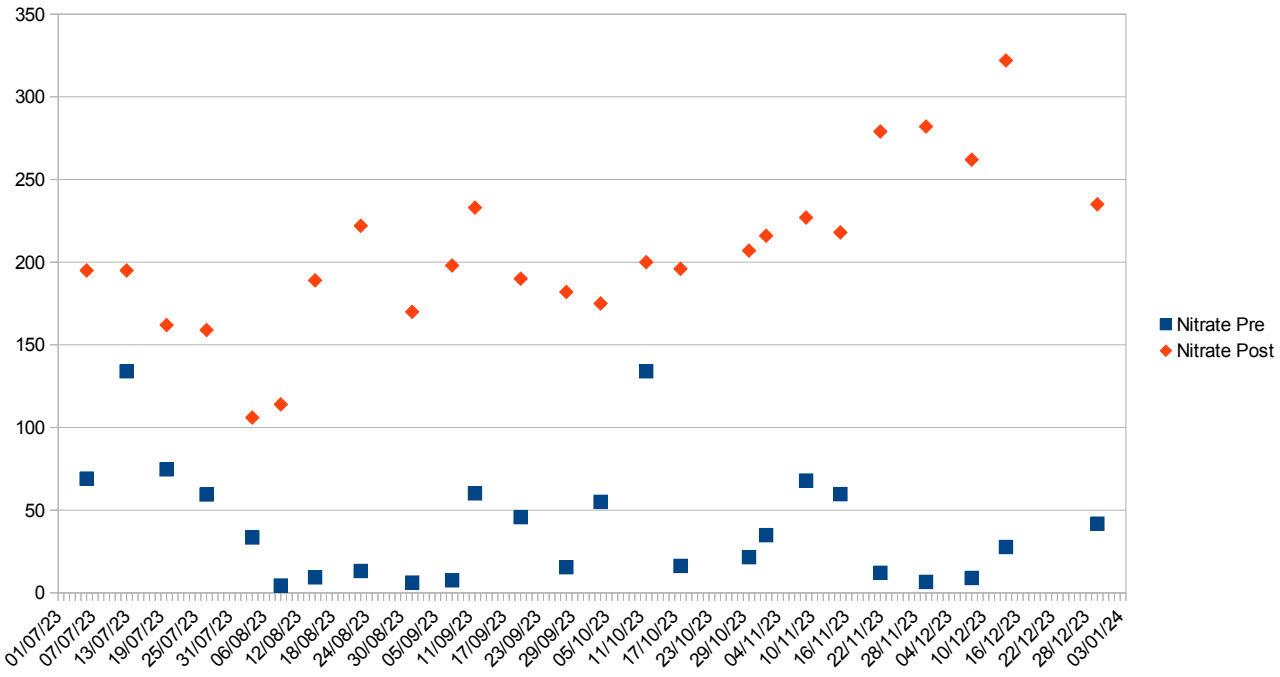
Graph 13. Ammonia Pre and Post Comparison



Key 0 – 140 mg/L NH4

There were no sampled breaches in ammonia in the laboratory samples. The water from the landfill (pre) is seen to fluctuate between roughly 10 to over 120 mg/L NH4. The low levels of ammonia seen in the pre samples are due to the influx of semi treated SAF2 waters that were diverted to the well in an attempt to maximise treatment. The diversion was later refined as discussed above in relation to graph 6.

Graph 14. Nitrate Pre and Post Comparison

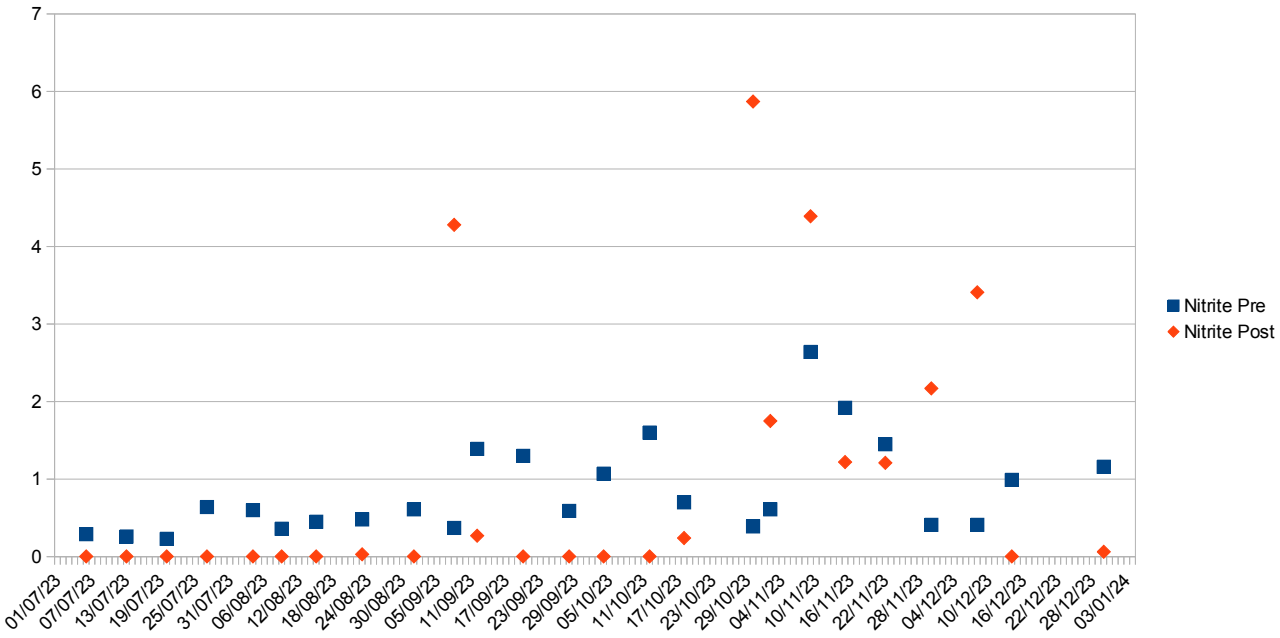


Key 0 – 350 mg/L NO_3

The treatment process utilizes bacteria (Nitrosomonas and Nitrosolobus for example) to oxidize ammonia to nitrite. The second stage utilises another group of bacteria (Nitrobacteria and Nitrococus for example) to oxidise the nitrite to nitrate, and this whole treatment process is seen to work by observing the rise in nitrate levels and the drop in ammonia levels at the discharge point. The post levels of nitrate are seen to be between 100 and 350 mg/L NH4. In the final discharge nitrite should be low, nitrate high and ammonia low.

The Nitrate levels are expected to be quite low coming from the landfill as shown in the pre samples. There are some elevated Nitrate levels seen from July onwards. This is due to SAF2 waters being passed to the main well. The SAF2 waters have already undergone treatment, but due to the cold and wet weather the ammonia levels were too high in ammonia for full discharge to W1.

Graph 15. Nitrite Pre and Post Comparison

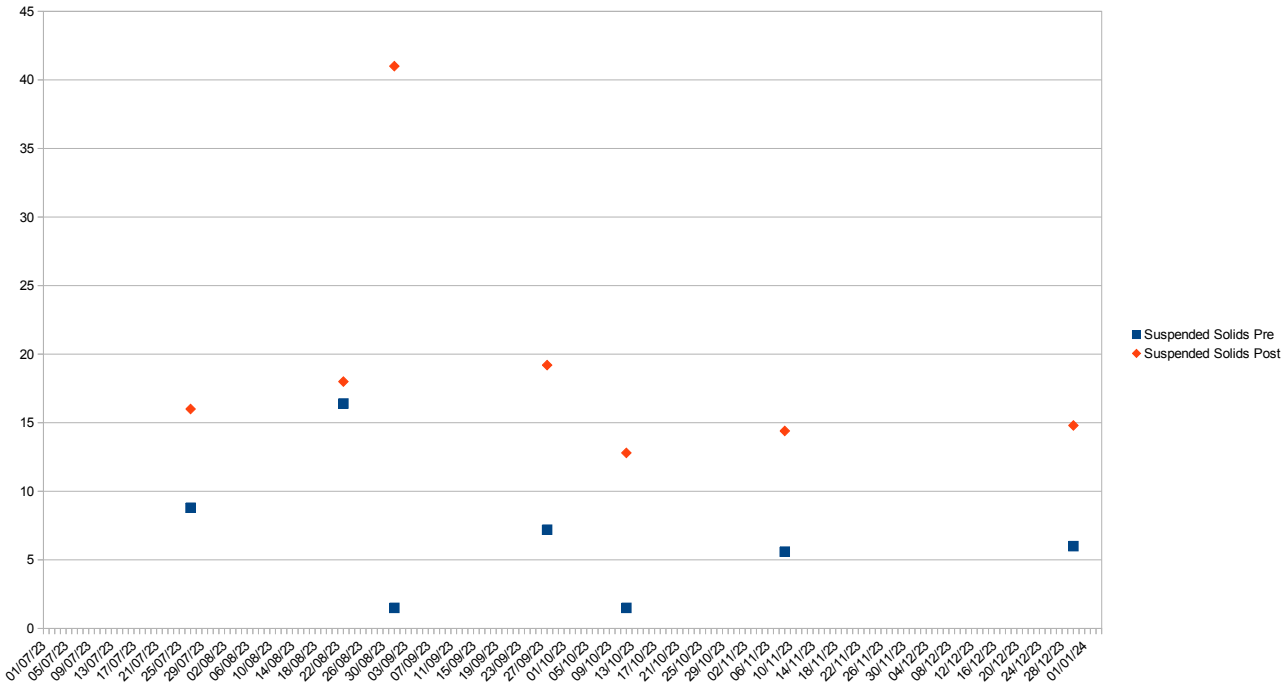


Key 0 – 7 mg/L NO2

The intermediate stage sees bacteria oxidise the ammonia to nitrite that will be finally converted to nitrate. Therefore, the successful treatment of ammonia rich effluent should show close to zero nitrite as shown above.

A couple of anomalies stand out, but the range is very very small, but clearly the tumultuous treatment issues due to the weather can be seen toward the end of the year. In the final discharge nitrite should be low, nitrate high and ammonia low.

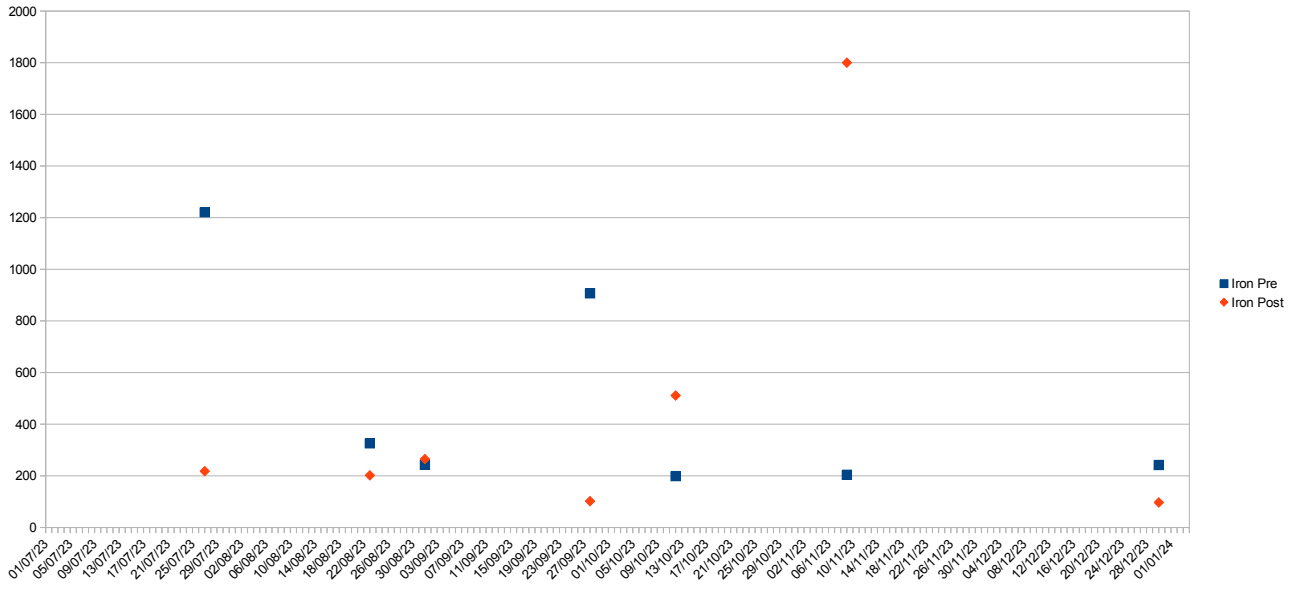
Graph 16. Suspended Solids Pre and Post Comparison



Key 0 – 45 mg/L

There was one instance of the 30 mg/L of suspended solids permitted level being breached. The average being around 15 mg/L.

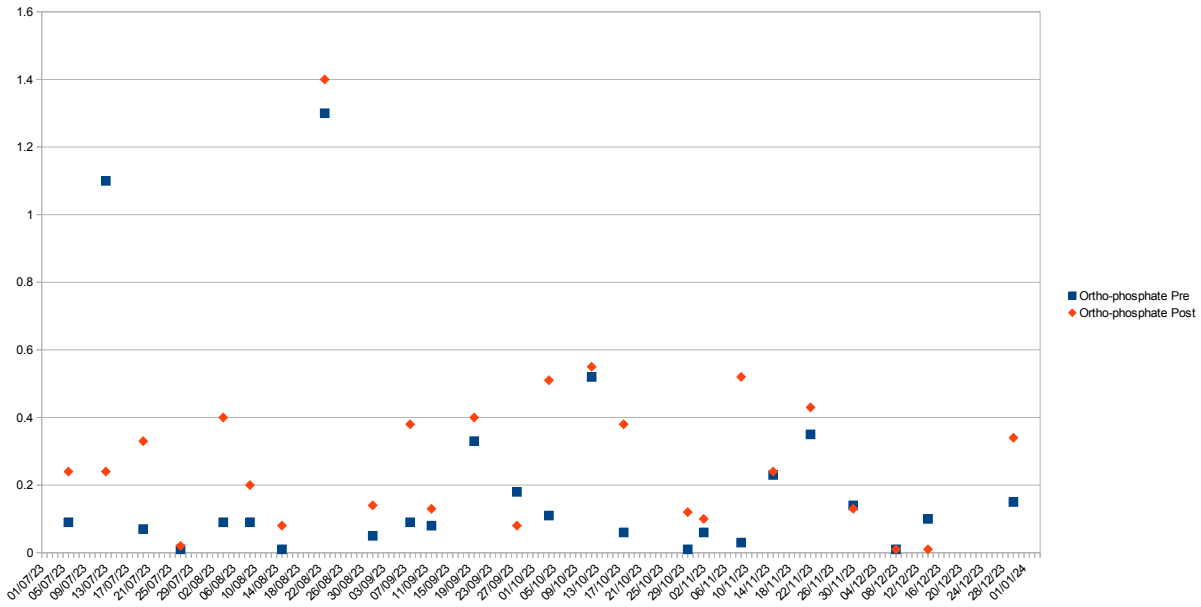
Graph 17. Iron Pre and Post Comparison



Key 0 – 2000 ug/L

Discharge levels of iron are seen to be low in the last half of 2023, staying under 600 ug/L except for one instance in November where the iron level was seen to be 1800 ug/L. The leachate from the landfill is seen to fluctuate in iron content from 200 ug/L to as high as nearly 1300 ug/L.

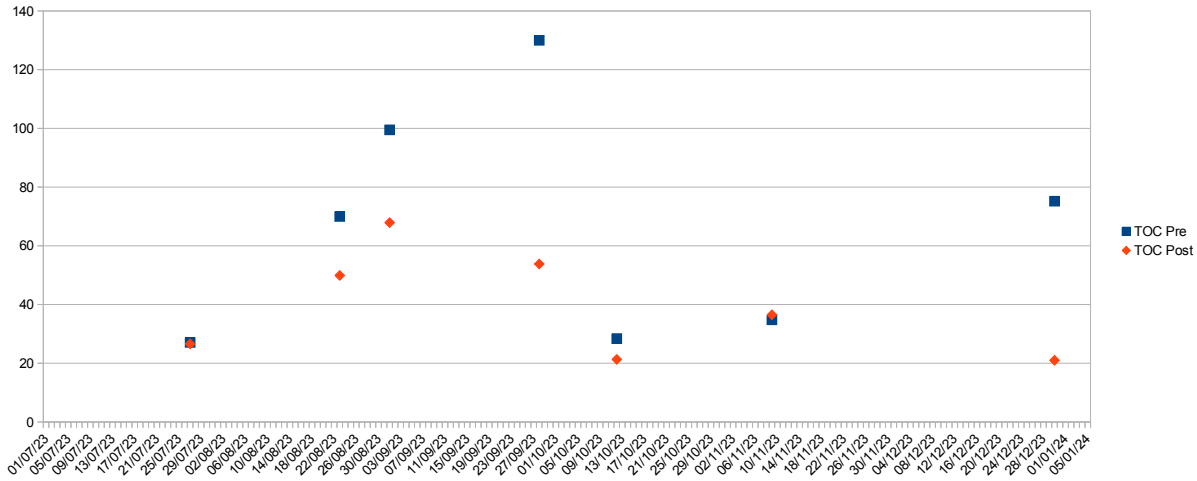
Graph 18. Orthophosphate



Key 0 – 1.6 mg/L P

The orthophosphate levels remained constant through the year except for spikes in levels in July and August.

Graph 19. TOC, Total Organic Carbon



Key 0 – 140 mg/L C

The total organic carbon (TOC) measurement is a measure of the organic carbon in the water pre and post treatment. The levels detected are consistent through the year with no major deviations from the mean observed except for elevated levels in the pre waters in September and October.

5.0 CONCLUSION

The summer of 2023 saw the lagoon levels at a record low in preparation for winter. During the low levels the pipe feeding the lagoon to the SAF2 pumping well became blocked. This was rectified.

The October breaches were due to intense storms bringing an elevated influx of water to the main well and lagoon. More intense rain occurred at the start of November with the lagoon water level reaching a critical level. Adjustments to the SAF2 units throughput and the main plant were made in order to prevent a lagoon overflow event.

It was on the 8th of November that the river was sampled up river from the plant and it was found that the background of the river itself was 6.6mg/L NH4 during this particular storm event.

Trouble with the SAF2 unit treating the extremely high ammonia present in the lagoon caused further breaches during November. It was then decided to bring the SAF2 throughput to an absolute minimum and to monitor very closely the lagoon levels. The feed to the SAF2 was adjusted such that the pumped feed can be adjusted through a manifold. The manifold feeds the SAF2 unit as well as the lagoon. The two valves can therefore be adjusted in a very fine manner to achieve the desired throughput and therefore desired treatment levels.

The consequence of this methodology was the back-flow of the lagoon waters to the main well where the lagoon waters would slowly be processed by the first subterranean tank at the very least. It was found that the system could just about cope, but also the site was fortuitous in the amount of rainfall seen after November.

The side effect of the back-flow was the continuous running of the main well pumps. They used to run in cycles with only a few hours operation each day, but due to the never before seen levels of water the pumps were running non-stop. Eventually the high-high float switch in the main well was raised so that only one pump at a time would run. Following this the pumps were duty cycled manually when needed, sharing the duty to help alleviate costly pump failures.

The weather, be it global warming or El-Nino related, caused great upheaval to the treatment process and lessons were learnt. As a consequence the plant stands in a better position to deal with future events.

In the past few years a couple of problems have been identified and eliminated. Power cuts used to cause havoc and that is no longer an issue due to a power cut reset switch installed.

The throughput of SAF2 used to cause problems and now the pre manifold has alleviated this issue.

It also became apparent that media build up occurs in the SAF2 units so it is now routine to clean down the inside of the tank and this has proven to help the treatment process.

The media balls in the main plant were found to be blocking the outflow from the third tank, impeding flow. This was alleviated with a custom made up-stand that has solved all the issues relating to the blockages.

Finally, the aeration feeds within the main plant tanks were found to be leaking owing to ablation caused by the media balls contacting the pipe over the years. Sleeves have been installed to protect the pipes.

A system of monitoring, fault finding, fixing and improvement continues on site in order to maximise plant operations.

APPENDIX A

Raw Data

		POST					SAF2			LAGOON			WELL			FRENCH DRAIN			Saf2 and reed bed at discharge to river		
		NH4	'C	PH	Turb	M3	NH4	'C	PH	NH4	'C	PH	NH4	'C	PH	NH4	'C	PH	NH4	'C	PH
30/06/23		0.28	16.9	8.19	10	368055	0.71	17.6	7.14										0.32	16.7	7.38
01/07/23																					
02/07/23																					
03/07/23	SAF2 inlet pipe failed whilst attending site and fixed. Measures put in place so it cant fail again.	0.52	15.6	7.41	10	368274	0.58	16.3	7.19	32	16.8	6.71	35	16	6.61	0.36	15.4	7.14	0.48	16.2	6.85
04/07/23		0.5	15.6	8	10	368358	0.46	16.4	7.14										0.48	16	7.22
05/07/23		0.4	15.3	7.8		368428	0.58	16.1	6.99										0.55	15.8	7.06
06/07/23		0.39	15	8.12	10	368496	0.45	15.5	7.4										0.35	15	7.5
07/07/23		0.48	16.6	8		368574	0.55	17.9	7.25										0.41	16.7	7.35
08/07/23																					
09/07/23																					
10/07/23	power cut late sunday. No issues resulting from it.	0.13	17.6	8	10	368653	0.35	17.5	7.4	39	17.7	6.9	34	16.4	7.03	0.19	17	7.13	0.14	16.9	7.4
11/07/23	Issues with totalizer reading.	0.31	18.3	7.9		368750	0.54	18.8	7.01										0.39	18.2	7.13
12/07/23		0.25	17.3	7.96	10	368830	0.45	18.1	7.12										0.26	17	7.21
13/07/23		0.19	16.5	8	10	368889	0.39	16.8	7.43										0.27	17	7.5
14/07/23		0.19	16.5	8.16		368981	0.27	16.6	7.46										0.26	16.2	7.6
15/07/23																					
16/07/23																					
17/07/23		0.21	15.7	8	10	369198	0.27	17.1	7.5										0.12	16	7.6
18/07/23		0.15	16.9	7.9	10	369295	0.23	17.2	7.2										0.17	17	7.3
19/07/23		0.19	18	7.54	10	369367	0.27	18.5	7.22	55	21.8	6.7	27	18.1	6.6	0.26	17.4	6.83	0.18	17.7	7.28
20/07/23		0.22	15.4	8	10	369427	0.25	16.5	7.19										0.17	15.5	7.5
21/07/23	SAF2 well was below pump level. Pump turned off and turned back on later in the day when the water levels returned to normal. Main down to p1&p2 at 1min	0.28	16.5	7.9		369520	0.31	17	7.29												
22/07/23																					
23/07/23																					
24/07/23	Main plant 11 up to 12 min. Adjust Saf2 throughput	0.12	16.1	7.9	10	369620	5	16.3	7.1												
25/07/23		0.14	15.4	7.5		369679	1.2	16.7	7.4										0.12	15.9	7.7
26/07/23		0.09	15.4			369736	0.1	15.7											1.1	16.6	
27/07/23		0.14	17.3	7.86	10	369795	3.6	17.6	7.4	27	18.6	7.14	35	17.3	7.2	0.26	16.6	7.6	0.15	16.8	7.5
28/07/23		0.28	18	7.81	11	369858	1.4	17	6.8										0.27	18.3	6.9
29/07/23																					
30/07/23																					
31/07/23		0.23	16.1	8.11		370082	1.3	16.6	7.5										0.99	16.1	7.5
01/08/23		0.39	15.5	7.8	10	370166	1	16.7	6.9	30	18.2	6.5	35	17.5	6.5	0.95	17.9	6.46	0.27	16.2	6.9
02/08/23		0.35	16.9	7.43		370253	1.4	17.9	6.9										0.36	17	7.06
03/08/23	more saf2 to reed bed	0.4	16.6	7.9	10	370327	0.5	17.8	7.1										0.53	16.6	7.18
04/08/23		0.31	16.4	7.9		370400	0.46	17.3	7.05										0.19	16.4	7.18
05/08/23																					
06/08/23																					
07/08/23		0.28	14.6	7.9	10	370620	0.35	16.4	7.2										0.19	15.3	7.3
08/08/23		0.14	17	7.99		370714	0.17	17.6	7.3										0.14	17	7.5
09/08/23		0.032	15.5	8	10	370774	0.35	16.6	7.3										0.4	15.9	7.2
10/08/23		0.5	17.8	7.33		370863	0.17	19.5	7	48	21.7	6.8	100	18.3	6.6	0.31	19.1	6.6	0.27	18.1	7
11/08/23	Blower pipe 1 leaking. Fixed.	1.02	17.3	7.65	10	370948	0.35	18.5	7.34										0.4	17.5	7.42
12/08/23																					
13/08/23																					
14/08/23		0.22	16.6	8.5		371104	0.26	17.8	7.9												
15/08/23		0.25	16.1	7.8	10	371162	0.35	17.9	7.2	26	19.3	6.7	100	17.5	6.7	0.52	16.8	6.7	0.28	17	7.2
16/08/23	feed pumps 12 up to 22	0.21	16.4	7.65		371223	0.55	18.2	7.4										0.06	17	7.57
17/08/23		0.21	16.4	7.79		371293	0.22	18.4	7.11										0.17	17.2	7.15
18/08/23		0.28	17.3	8	10	371387	0.3	18.9	7.4										0.18	17.8	7.5
19/08/23																					
20/08/23																					
21/08/23		0.31	16.8	7.6		371596	0.63	17.9	7.24										0.17	17	7.3
22/08/23		0.14	17.5	7.72	10	371680	0.49	18	7	19	18	6.77	100	16.3	6.77	0.31	16	6.9	0.12	18	7.26
23/08/23		0.26	16.1	7.8	10	371747	0.62	17.6	7.4										0.25	16.8	7.6
24/08/23		0.22	16.9	7.8	10	371838	0.82	17.4	7.1										0.21	16.6	7.15
25/08/23		0.21	14.4	8.2		371893	0.27	15.7	7.3										0.14	15	7.41
26/08/23																			0.14	15.5	8
27/08/23																					
28/08/23																					
29/08/23		0.12	15.4	7.55		372202	3.4	15.7	7.13										0.13	15.4	7.2
30/08/23		0.12	14.6	7.8	10	372277	1.7	16	7	36	16.9	7.01	100	15.9	7.07	0.19	17	7.7	0.06	15.2	7.2
31/08/23	Lagoon too low for pump. Saf2 turned off.	0.21	15.3	7.5	10	372369	2.3	15.8	7.2										0.22	15.3	7.4
01/09/23	saf2 on 99% recirc	0.23	17.5	7.52		372442															
02/09/23																					
03/09/23																					
04/09/23	Lagoon to SAF2 well pipe found to be blocked. SAF2 pump turned off. Well p1 tripped and reset.	0.26	17.8	7.8	10	372657	0.4	19	7.1										0.1	18	7.4
05/09/23	Found lagoon pipe. Started to attempt the unblocking of the pipe.	0.13	19.4	7.3		372756															
06/09/23	Rodded pipe from dry well, blockage removed.	7.5	19.2	7.7		372866	0.66	20.4	7.02	51	25	6.7	76	20	6.7	0.25	20.9	6.8	3.6	18	7.3
07/09/23	main plant pumps down to both 1min	6.5	23	7.3		372935	5.7	23											3.9	22	7.1
08/09/23		0.22	19.1	7.5		372968	4.7	20											2.6	19	7
09/09/23																					
10/09/23																					
11/09/23	lagoon now very low due to SAF2 well position when reinstated. Main plant pumps 11 up to 22 min	0.3	18.4	7.5		373070	8.4	18.7	7	92	20.3	6.5	100	16.9	6.6	0.27	17.7	6.6	3.1	18.5	7.1
12/09/23		0.19	17	7.2	10	373135	10.3	18	7										1.5	18.2	7.8
13/09/23		2.5	17.2	7.6	10	373229	12.9	18	6.9										2.7	17.5	7
14/09/23	More blockages with saf2 well pump	0.6	16.8	7.7	10	373289	5.2	17	6.9										1.2	16.6	7.3
15/09/23	Lagoon low enough to wade out to the blocked lagoon pipes. Two inlets to saf2 well found. One horizontal and one upstanding. Managed to unblock the pipe fully.	0.37	18	7.6			6.1	19	7.2										1.4	18.2	7.4
16/09/23																					
17/09/23																					
18/09/23	SAF2 really high in NH4	0.13	15.7	7.8		373545	28	15	7.2	37	17.3	6.6	63	15.3	6.7	0.57	15.1	6.9	2.3	15.4	7.4
19/09/23		0.11	15	7.2		373599	12	15.8	7.2										0.6	15.8	7.19
20/09/23	well flooded	0.25	16	7.63		373687	9.5	16.2	7.2												
21/09/23		0.22	14	7.7	10	373759	5.2	14.8	7.2										1.7	14.9	7.3
22/09/23		2.3	13.5	7.7		373840	7.5	13	7.3										1.9	13.4	7.5
23/09/23																					
24/09/23																					
25/09/23		0.28	15.2	7.7		374050	6.8	15.3	7.2										0.6	15.1	7.5
26/09/23		0.25	16.1	7.7		374139	5.4	16.2											0.36	15.9	7.16
27/09/23		0.1	15.6	7.7		374212	5.2	15	7.3	89	16.6	7.5	129	15.8	7.5	0.34	16	7.2	0.3	16.4	7.3
28/09/23		0.26	14.5	7.8			6.5	14	7.5										0.31	14.5	7.5
29/09/23		0.15	15.2	7.4	10	374374	1.9	15	7										2.3	15	7.2
30/09/23																					
01/10/23																					
02/10/23	Power cut early monday. No ill effect. Pumps set at 2min.	0.12	15.1	7.9		374587	0.3	14.2	7.3	23	16.9	6.8	58	16.7	6.9	2.3	15	7.1	0.1	14	7.3
03/10/23		0.23	14.3	7.8		374673	1.9	14	7.1										0.17	14.8	7.5
04/10/23		0.17	14	7.8		374732	3.2	14	7.5										0.1	14.1	7.6
05/10/23		0.21	14.4	7.7		374809	0.9	14.3	7.4										1.9	14.4	7.7
06/10/23		0.09	15.2	7.8		374897	3.5	15.5	7.6										0.12	15	7.2
07/10/23																					
08/10/23																					
09/10/23		0.08	15.3			375112	2.2	15											0.03	15	
10/10/23		0.32	15.6	7.9		375188	3.5	15.6	7.5										0.23	15.6	7.5
11/10/23	Big storm and well and lagoon are seen to be mostly rain water.	0.06	16	7.81		375273	4.8	16.3	7.5	3	16	7.3	14	15.7	7.3	0.17	15.3	7.3	0.05	15.9	7.5
12/10/23		0.14	13.6	7.8		375339	7.9	13	7.6										0.75	13	7.6
13/10/23	Lamella discharge pipe was blocked with roots. Cleared.	1.14	14.9	7.9		375433	8.5	12.9	7.9												
14/10/23																					
15/10/23																					
16/10/23		0.04	9.5	7.9		375588	7.1	8.6	7.7										1.06	9	7.8
17/10/23		0.1	10	7.6		375646	10	10.2	7.5										2.1	10.5	7.5
18/10/23	Clean down Lamella. SAF2 full to reed bed.	0.12	12.6	7.9		375720	10	12	7.49	46	13.5	7.1	112	14	7.1	0.15	13.3	7.3	2.3	12	7.6
19/10/23	Both pumps 22 down to 21. Report breach due to storm. SAF2 90% to well.	2.1	13.9	7.8		375799	28	13	7.6										6.3	13.4	7.6
20/10/23	Further breach	4.4	13.9	7.8		375859	10	13.7	7.9										6.3	13.6	7.5
21/10/23	Main pumps21 down to 11																		3	12.6	
22/10/23																					
23/10/23	main pumps 11 up to 21. Report breach.	0.15	11.6	7.7		375979	30	11.8	7.7										5.7	11.8	7.6
24/10/23	W1 flooded 21 up to 22. Note, SAF2 still 90% to the main well.	0.19	11.9	8		376035	31	11.4	8												
25/10/23	P1 tripped and reset. Main pumps 22 up to 23. Slowing down saf2 throughput.	0.18	12.3	7.9		376123	22	12	7.6										2.7	12.6	7.6
26/10/23	P1 tripped and reset.SAF2 levels down, therefore send some to reed bed.	2.5	13.1	7.8		376210	3.6	13	7.5												
27/10/23	Heavy showers. Main pumps 32 down to 22. Lagoon sampled in different locations and proven to not be uniform in ammonia concentration.	4.6	11.9	8		376287	3.9	11.4	7.8	41	11.3	7.4	92	12.3	7.4	0.86	11.5	7.4	2.8	12.6	7.8
28/10/23	W1 flooded. SAF2 more to reed bed.	4.1				376367	2.2														
29/10/23																					
30/10/23	Extreme rain.	4.5	12.4	7.8		376514	12	11.6	7.7										3.4	11.4	7.7

31/10/23	Lagoon near critical height with more rains coming.		4	12.6	7.9		376611	12.5	13	8											3.6	12.6	7.9
01/11/23	Very wet and windy. Main pumps 22 up to 23		6	11.3	7.9		376668	18	11.8	7.8	35	11.5	7.6	84	12	7.6	1.7	11.5	7.7		3.5	11.4	7.8
02/11/23	SAF2 wound back. Breach		1.7	10.9	7.4		376781	25	10.4	7.4											4.5	10.2	7.4
03/11/23	AQC 0.45 Should be 0.5. Good result. Breach		5.2	11.6	7.3		376870	17	10	7.1	74	10.6	7.7								4.5	11	7.2
04/11/23	Main 23 up to 33		1.8																				
05/11/23																							
06/11/23	main dropped 33 down to 22. Breach		10.8	9.4	7.3		377166	10	7.9	7.2	40	11	6.8	100	11.4	6.8	4.4	11	6.8		4.8	8.4	7.2
07/11/23				11.2	6.9		377274	3.9	11	6.9											3.9	10.9	6.9
08/11/23	Breach. Reported. W1 flooded and river found to be 6.6 mg/l NH4		3.1	11.1	6.9		377366	10	10	6.9											6.3	10.2	6.9
09/11/23	SAF2 cabinet tripping out feed. Over budget on power.		2.7	8.6	7.2		377457	12.9	8.5	7.1											3.7	8.3	7.1
10/11/23	Added higher rated trip switch to supply power to SAF2 cabinet. Breach.		8.9	10.4	7		377587	4	9.3	7											4.8	9	7
11/11/23	main pumps 23 up to 33		0.9	7.8				7.4	6.6												1.7	6.7	
12/11/23																							
13/11/23	Well P1 tripped and reset. W1 flooded.		0.5	10.9	7.2		377890	37	10.3	7.1	52	10.8	7.2	66	11	7.1	1.5	11.2	7		6.1	10.5	7.1
14/11/23	Increase SAF2		1.4	12	6.9		378024	2.5	11.8	6.8											3.4	11.8	6.9
15/11/23	Pushing main plant. Pumps up from 33 to 34. Breach.		0.3	9.4	7.2		378104	13	8.6	7.2											4.5	8.8	7.2
16/11/23	Water is coming out of the manhole covers at the sub tanks due to lots of water in the well.		0.6	9.3	7		378264	3.4	9	6.9											2.5	9.3	7.05
17/11/23	Breach. Well was in fault mode (High high float was activated) due to excess water and therefore pumping too much water to sub tanks. The lagoon to well pump was turned off to prevent the fault m		1.4	7.6	7.8		378367	3.4	7.3	7.5											4.1	7.6	7.6
18/11/23	Pumps down from 43 to 33. SAF2 wound back. Lifted high high float higher up so it wouldnt emergency pump the well water so often.		6.1					10															
19/11/23																							
20/11/23	Lagoon very high after storm. Pumps 33 up to 43		1.2	10.8	8	10	378715	12.9	10	7.4	57	10.5	7.4	83	11	7.4	0.5	11.1	7.4		2.1	10.3	7.9
21/11/23	Pumps from 33 down to 22		6.3	11.1	7	10	378835	8.1	9.8	7											3.5	10.1	7.03
22/11/23	Pumps 22 up to 32		2.2	10.8	7.9		378938	10.8	9.9	7.8											3.9	10.1	7.9
23/11/23	Power cut. No ill effects. Pumps 32 up to 33		0.6	12	7.8	10	379002	12.4	11.1	7.2											1.9	11.4	7.2
24/11/23			1.2	11.4	7.07		379091	12.1	9.9	7											2.2	10.4	7
25/11/23	0.2'c on site		1.5	8				4.4	5.2												0.9	6.6	
26/11/23																							
27/11/23	Warmer. 9.2'c. Main 33 down to 23. Breach		7.1	9.8	8.2	10	379423	12	9	7.7											4.6	10	8.2
28/11/23	pH probe need conditioning.		7.6	9.3	8.2		379507	5.7	6.8	8.5											3	8.2	8.5
29/11/23	Main 23 down to 22.		8.6	10	7.7	10	379611	9.3	7.3	7.7											3.5	7.5	7.7
30/11/23	River sampled at 4.6mg/l NH4. SAF2 slowed down. Main up from 22 to 23.		2.7	10.1	7.1	10	379683	10	10.5	7.1	52	7	7.1	100	10.5	7.1	2.2	6.9	7.1		3.7	8.6	7.2
01/12/23	Sludge pump tripped. Need removing and replacing.		1.4	7.3	7	10	379772	10	5.3	6.9											2.7	7.3	6.8
02/12/23	Post 1.4 and temp 2.6	POST					SAF2			LAGOON			WELL			FRENCH DRAIN				Saf2 and reed bed at discharge to river			
03/12/23		NH4	'C	PH	Turb	M3	NH4	'C	PH	NH4	'C	PH	NH4	'C	PH	NH4	'C	PH		NH4	'C	PH	
04/12/23	More rain. Stream in high flow. Note again, SAF2 mostly to lagoon and a little to the reed bed.		7	9.5	8			10	5.8	7.9											1.9	7.3	8
05/12/23	main down from 32 to 21.		6.6	9.2	7.7		380135	10	7.2	7.7											2.8	7.8	7.7
06/12/23	main up from 21 to 32		0.04	9.4	7.5	10	380174	8.6	6.3	7.6											1	8.5	7.6
07/12/23	Another storm. Main 32 up to 33		1.2	10.6	8		380276	10	8.1	7.9	54	7.9	7.9	92	11.7	7.8	1.2	9.7	7.9		2.7	9.2	7.9
08/12/23	Slow saf2 to a crawl		4.3	10.5	7.2		380383	10	8	7.1											2.6	9.1	7.3
09/12/23	W1 in flood																						
10/12/23																							
11/12/23	main plant 33 down to 11. SAF2 is suffering. Slow down to absolute minimum.		10	10.6	7.6		380688	47	8	7.7											3	8.7	7.7
12/12/23	Extreme rain again. Main plant 11 up to 32		0.3	11.5	8			12.9	10.2	8.1	71	9.2	7.2	112	12.9		1.4	9.5	8.2		3.4	10.3	7.5
13/12/23	Lagoon to Well.		1	10.9	7.4	10	380826	12	9.4	7.1											3.4	9.3	7.9
14/12/23	Washed media from under lid of SAF2 tanks. Lid knocked an aerator pipe that was subsequently fixed.		0.09	9.6	8		380899	11.7	8.8	8											2.6	8.4	8
15/12/23	SAF2 now very foamy. Need new pH probe.		0.3	9			380989	9.7	8.8												1.8	8	
16/12/23			0.1	11.1			381078	3.9	9.5												1	10.7	
17/12/23																							
18/12/23	Main 32 up to 33.		0.4	12			381255	8.5	10												2.6	11.2	
19/12/23	Lagoon so high due to the rain that its now flowing back into the well. Retire pH probe. Conditioning failed.		0.4	11.9	8.2		381361	7	9.7	8.1											1.7	10.5	8.1
20/12/23			0.1	10.4			381491	10	9.4		62	9.5		95	10		4				3.9	9.6	
21/12/23	SAF2 very high in ammonia, but low in volume. The reed bed is still active.		0.9	11.2			381573	27	10.2												3.1	10.6	
22/12/23			2.3	11.3			381684	7.6	9.8												2.6	10.7	
23/12/23	Main 33 down to 32		6.6	11.6			381800	3.9	9.9												2.7	10.9	
24/12/23	Main 32 up to 33		4	12.4			381888	2.7															
25/12/23																							
26/12/23																							
27/12/23	Extreme rain. Main 33 down to 23. W1 flooded		11	11				5.5	11														
28/12/23			0.3	10.9			382306	4.4	9.9												0.6	10.3	
29/12/23	Intense rain continues		1.2	9.2				4.8													0.6	8.8	
30/12/23	Achieved optimum flow rates for SAF2		0.8	9.4			382520	3.5	9		32	9		50	9.9		0.1	9.9			0.3	9.4	
31/12/23	More intense rain		0.5	8.8			382633	1	8.5												0.5	8.6	

01/01/24

APPENDIX B

Laboratory Results

Pre

	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
30/06/23											
01/07/23											
02/07/23											
03/07/23											
04/07/23											
05/07/23											
06/07/23	8			32.5	69.1	0.29	0.09				6834
07/07/23											
08/07/23											
09/07/23											
10/07/23											
11/07/23											
12/07/23											
13/07/23	7.4			18.1	134	0.26	1.1				6853
14/07/23											
15/07/23											
16/07/23											
17/07/23											
18/07/23											
19/07/23											
20/07/23	7.7			21.3	74.7	0.23	0.07				6869
21/07/23											
22/07/23											
23/07/23											
24/07/23											
25/07/23											
26/07/23											
27/07/23	7.5	5.7	32	27.2	59.5	0.64	0.01	27.1	8.8	1221	6886
28/07/23											
29/07/23											
30/07/23											
31/07/23											
01/08/23											
02/08/23											
03/08/23											
04/08/23	7.6			32.3	33.5	0.6	0.09				6906
05/08/23											
06/08/23											
07/08/23											
08/08/23											
09/08/23	7.2			54.9	4.4	0.36	0.09				6920
10/08/23											
11/08/23											
12/08/23											
13/08/23											
14/08/23											
15/08/23	6.9			51.8	9.4	0.45	0.01				6935
16/08/23											
17/08/23											
18/08/23											
19/08/23											
20/08/23											
21/08/23											
22/08/23											
23/08/23	7.1	7.8	38	130	13.2	0.48	1.3	70	16.4	326	6955
24/08/23											
25/08/23											
26/08/23											
27/08/23											
28/08/23											
29/08/23											
30/08/23											
31/08/23											
01/09/23	7.1	5.3	31	78.2	6.2	0.61	0.05	99.5	1.5	243	6980
02/09/23											
03/09/23											
04/09/23											
05/09/23											
06/09/23											
07/09/23											
08/09/23	7.3			68.5	7.6	0.37	0.09				6987
09/09/23											
10/09/23											
11/09/23											
12/09/23	7.5			43.3	60.2	1.39	0.08				6994
13/09/23											
14/09/23											
15/09/23											
16/09/23											
17/09/23											

Pre

	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
18/09/23											
19/09/23											
20/09/23	7.5			50.2	45.8	1.3	0.33				7018
21/09/23											
22/09/23											
23/09/23											
24/09/23											
25/09/23											
26/09/23											
27/09/23											
28/09/23	7.3	5.5	41	59.2	15.5	0.59	0.18	130	7.2	907	7041
29/09/23											
30/09/23											
01/10/23											
02/10/23											
03/10/23											
04/10/23	7.2			37.5	55	1.07	0.11				7058
05/10/23											
06/10/23											
07/10/23											
08/10/23											
09/10/23											
10/10/23											
11/10/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
12/10/23	7.8	8.2	36	10	134	1.6	0.52	28.4	1.5	199	7075
13/10/23											
14/10/23											
15/10/23											
16/10/23											
17/10/23											
18/10/23	7			66.6	16.3	0.7	0.06				7090
19/10/23											
20/10/23											
21/10/23											
22/10/23											
23/10/23											
24/10/23											
25/10/23											
26/10/23											
27/10/23											
28/10/23											
29/10/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
30/10/23	7			59.3	21.6	0.39	0.01				7124
31/10/23											
01/11/23											
02/11/23	7.1			57.6	34.9	0.61	0.06				7141
03/11/23											
04/11/23											
05/11/23											
06/11/23											
07/11/23											
08/11/23											
09/11/23	7.4	12.3	43	28.2	67.9	2.64	0.03	34.8	5.6	204	7164
10/11/23											
11/11/23											
12/11/23											
13/11/23											
14/11/23											
15/11/23	7.9			45.1	59.7	1.92	0.23				7183
16/11/23											
17/11/23											
18/11/23											
19/11/23											
20/11/23											
21/11/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
22/11/23	7.4			85.8	12.1	1.45	0.35				7203
23/11/23											
24/11/23											
25/11/23											
26/11/23											
27/11/23											
28/11/23											
29/11/23											
30/11/23	7.6			98.6	6.6	0.41	0.14				7216
01/12/23											
02/12/23											
03/12/23											
04/12/23											
05/12/23											
06/12/23											

						Pre						
07/12/23												
08/12/23	7.6			85.6	9	0.41		0.01				7252
09/12/23												
10/12/23												
11/12/23												
12/12/23												
13/12/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate		TOC	Suspended Solids	Iron	Lab ID
14/12/23	8			81.7	27.7	0.99		0.1				7257
15/12/23												
16/12/23												
17/12/23												
18/12/23												
19/12/23												
20/12/23												
21/12/23												
22/12/23												
23/12/23												
24/12/23												
25/12/23												
26/12/23												
27/12/23												
28/12/23												
29/12/23												
30/12/23	7.8	9.5	48	60.1	41.8	1.16		0.15	75.2	6	242	7297
31/12/23												
01/01/24												
02/01/24												

Post

	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
30/06/23											
01/07/23											
02/07/23											
03/07/23											
04/07/23											
05/07/23											
06/07/23	8.5			0.04	195	0.003	0.24				6834
07/07/23											
08/07/23											
09/07/23											
10/07/23											
11/07/23											
12/07/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
13/07/23	8.1			0.05	195	0.003	0.24				6853
14/07/23											
15/07/23											
16/07/23											
17/07/23											
18/07/23											
19/07/23											
20/07/23	8.3			0.07	162	0.003	0.33				6869
21/07/23											
22/07/23											
23/07/23											
24/07/23											
25/07/23											
26/07/23											
27/07/23	8.3	3.3	28	0.03	159	0.003	0.02	26.6	16	218	6886
28/07/23											
29/07/23											
30/07/23											
31/07/23											
01/08/23											
02/08/23											
03/08/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
04/08/23	8.2			0.08	106	0.003	0.4				6906
05/08/23											
06/08/23											
07/08/23											
08/08/23											
09/08/23	8.2			0.14	114	0.003	0.2				6920
10/08/23											
11/08/23											
12/08/23											
13/08/23											
14/08/23											
15/08/23	8			0.01	189	0.003	0.08				6935
16/08/23											
17/08/23											
18/08/23											
19/08/23											
20/08/23											
21/08/23											
22/08/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
23/08/23	8.1	2	38	0.07	222	0.03	1.4	49.9	18	202	6955
24/08/23											
25/08/23											
26/08/23											
27/08/23											
28/08/23											
29/08/23											
30/08/23											
31/08/23											
01/09/23	7.9	7.2	22	0.52	170	0.003	0.14	67.9	41	265	6980
02/09/23											
03/09/23											
04/09/23											
05/09/23											
06/09/23											
07/09/23											
08/09/23	7.8			3.8	198	4.28	0.38				6987
09/09/23											
10/09/23											
11/09/23											
12/09/23	8.1			0.4	233	0.27	0.13				6994
13/09/23											
14/09/23											
15/09/23											
16/09/23											
17/09/23											

Post

	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
18/09/23											
19/09/23											
20/09/23	8.1			0.03	190	0.003	0.4				7018
21/09/23											
22/09/23											
23/09/23											
24/09/23											
25/09/23											
26/09/23											
27/09/23											
28/09/23	8	3.8	31	0.03	182	0.003	0.08	53.8	19.2	102	7041
29/09/23											
30/09/23											
01/10/23											
02/10/23											
03/10/23											
04/10/23	7.9			0.01	175	0.003	0.51				7058
05/10/23											
06/10/23											
07/10/23											
08/10/23											
09/10/23											
10/10/23											
11/10/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
12/10/23	8.2	2.4	17	0.07	200	0.003	0.55	21.3	12.8	511	7075
13/10/23											
14/10/23											
15/10/23											
16/10/23											
17/10/23											
18/10/23	7.8			0.05	196	0.24	0.38				7090
19/10/23											
20/10/23											
21/10/23											
22/10/23											
23/10/23											
24/10/23											
25/10/23											
26/10/23											
27/10/23											
28/10/23											
29/10/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
30/10/23	7.5			2.9	207	5.87	0.12				7124
31/10/23											
01/11/23											
02/11/23	7			0.7	216	1.75	0.1				7141
03/11/23											
04/11/23											
05/11/23											
06/11/23											
07/11/23											
08/11/23											
09/11/23	7.4	8.5	42	1.8	227	4.39	0.52	36.5	14.4	1800	7164
10/11/23											
11/11/23											
12/11/23											
13/11/23											
14/11/23											
15/11/23	7.9			0.26	218	1.22	0.24				7183
16/11/23											
17/11/23											
18/11/23											
19/11/23											
20/11/23											
21/11/23	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
22/11/23	7.7			0.22	279	1.21	0.43				7203
23/11/23											
24/11/23											
25/11/23											
26/11/23											
27/11/23											
28/11/23											
29/11/23											
30/11/23	7.8			2.4	282	2.17	0.13				7216
01/12/23											
02/12/23											
03/12/23											
04/12/23											
05/12/23											
06/12/23											

Post

	pH	BOD	COD	Ammonia	Nitrate	Nitrite	Ortho-phosphate	TOC	Suspended Solids	Iron	Lab ID
07/12/23											
08/12/23	7.8			2	262	3.41	0.01				7252
09/12/23											
10/12/23											
11/12/23											
12/12/23											
13/12/23											
14/12/23	8.6			0.14	322	0.003	0.01				7257
15/12/23											
16/12/23											
17/12/23											
18/12/23											
19/12/23											
20/12/23											
21/12/23											
22/12/23											
23/12/23											
24/12/23											
25/12/23											
26/12/23											
27/12/23											
28/12/23											
29/12/23											
30/12/23	8.4	6.6	44	0.03	235	0.063	0.34	21	14.8	96.9	7297
31/12/23											
01/01/24											
02/01/24											