LEACHATE TREATMENT REPORT 2020
NANTYCAWS LANDFILL

Prepared for: **Carmarthenshire County Council**

By: **P Knight**

Date: **March 2021**

ExCAL

DOCUMENT CONTROL SHEET

PROJECT:	Nantycaws Landfill
TITLE:	Leachate Treatment Report

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APPROVED BY:

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NANTYCAWS LANDFILL

LEACHATE TREATMENT REPORT

Contents **Page**

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 a discharge consent (EPR/PP3338CQ).

The treatment plant consists of 1 x SAF (Submerged Aerated Filter) and 4 MBBR (moving bed bio reactor) that are successively treating the leachate to enable the treated effluent to be discharged to the river.

The site also has 2 x SAF plants which act as a secondary treatment system when required.

The purpose of this report is to summarise the monitoring data obtained for the site from 1st January 2020 - 1st January 2021.

1.1 Site Address

The site location and address is: -

Nantycaws Landfill Site
Phase 1
Nantycaws
Carmarthen
SA32 8BG.

2.0 NOTABLE EVENTS

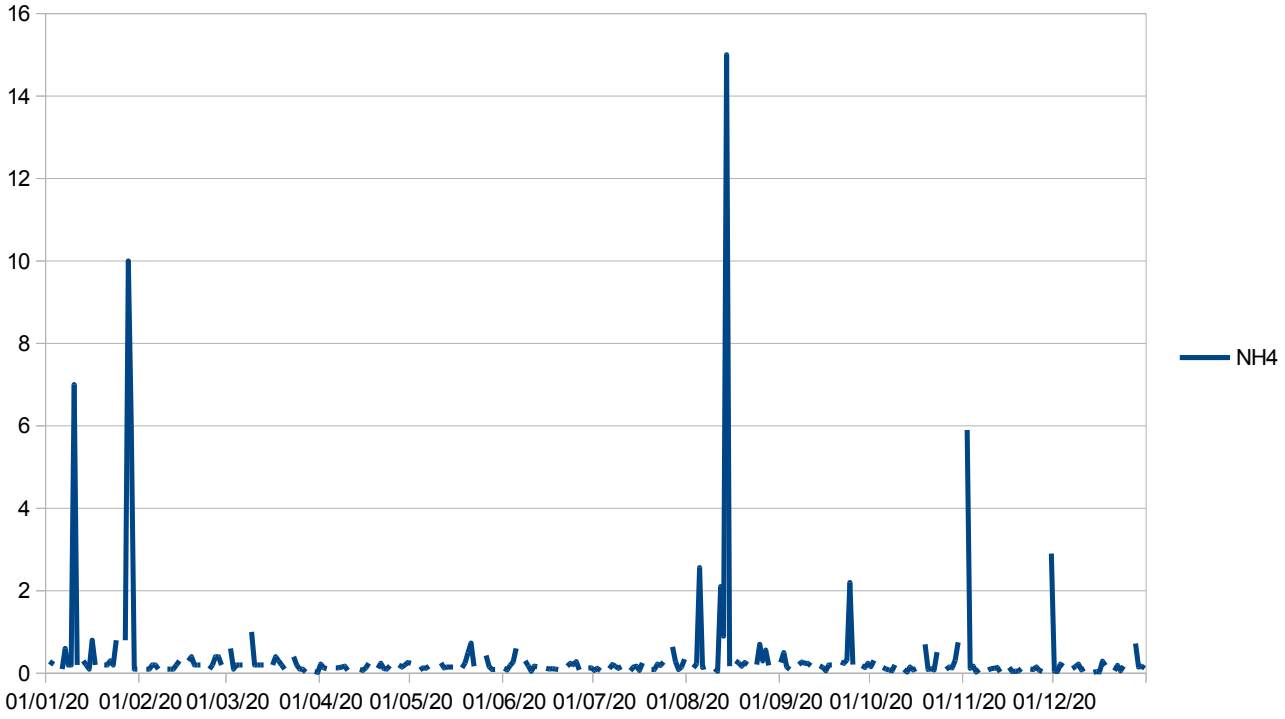
10/01/20	Power cut. Pump rates at max. reset to 2 mins
28/01/20	Power cut. Pump rates at max. reset to 2 mins. Post water to lagoon
29/01/20	Post water still lo lagoon
30/01/20	Post back to discharge
14/02/20	RCD in sludge return panel replaced
26/02/20	Pumps at 3 mins
27/03/20	Switch to Palintest ammonia test
15/04/20	Possible blower motor bearing failure
16/04/20	Blower five offline
17/04/20	Blower five replaced
27/04/20	SAF 2 pipe fault. UV damage. Repaired section
18/05/20	Blower 4 offline. Bearing or motor
19/05/20	Blower 4 offline.
20/05/20	Blower 4 offline.
21/05/20	Blower 4 replacement fitted
05/06/20	SAF 2 pipe fault. UV damage. Replaced flexi pipe with solid pipe.
22/06/20	Power cut. Pump rates at max. reset to 3 mins
06/07/20	Rationing of Palintest supplies due to pandemic related supply issues
05/08/20	Big rise in ammonia at discharge. Pumps dialled back
06/08/20	Calibrated pH probe
07/08/20	Settlement tank pumped dry
10/08/20	Multiple power cuts. Pumps set to 1min
11/08/20	Pumps set back to 3 min
12/08/20	Pumps back to 1min
13/08/20	Blower 3 tripped
14/08/20	Post far too high and put to lagoon
18/08/20	Observation. Main treatment at min. Lagoon conc NH4 increased. SAF2 working harder
02/09/20	SAF2 high and to lagoon
24/09/20	Pumps down to 1 due to high NH4
25/09/20	Lack of material on the media balls noticed
28/09/20	Well float switches need replacement
29/09/20	Well float switches replaced
05/10/20	Well pump 2 tripped. Reset and working
07/10/20	Start monitoring of discharge to river
09/10/20	SAF2 macerator pump tripped and swapped for non-macerator spare
14/10/20	New SAF2 pump ordered
15/10/20	SAF2 pump fitted and pipework reworked so backup pump can be used immediately.
26/10/20	Dropping O2 levels in the treatment tanks, 1 at a time to drive off snails etc. to bring back media
27/10/20	Reed bed is shutting down due to onset of winter
29/10/20	O2 levels in tank 2 low. Lacking media. SAF2 to lagoon as it is high and main discharge high
30/10/20	SAF2 50/50 reed bed and lagoon. Tank 2 resting. Pumps at 2 min
02/11/20	Power cut resulting in main plant running at full speed. This washed through the settling media hence the high turbidity. Pumps set to 1 min
23/11/20	Tank 2 blower back on and tank 3 blower off to rest it.
30/11/20	Power cut. Pumps back up to 5 min as a result of power cut. Blower 3 had tripped. Reset and working.
02/12/20	SAF2 fully to lagoon
03/12/20	Outdoor temp dropped. Reed bed likely suffering and main discharge effected as a result. SAF2 still to lagoon
07/12/20	Tank 3 back online. SAF2 50/50 reed bed and lagoon
18/12/20	Stream in flood

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 of 1st January 2020 – 1st January 2021 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 that was monitored daily from the 7/10/20.

Graph 1. Ammonia, Final Discharge



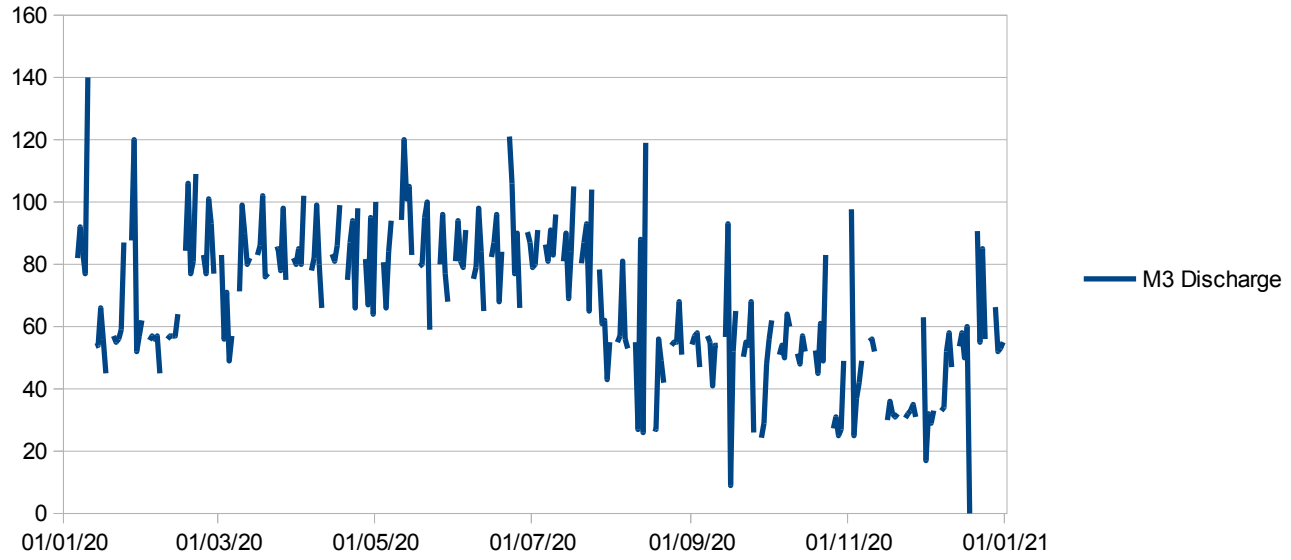
Key: 0 – 16 mg/L NH4

The daily discharge was kept at an average of roughly 90 m^3 until the latter quarter of the year when issues with the treatment process were discovered and the plants throughput reduced to compensate. The throughput, as depicted in the following graph shows that in order to maintain the consent discharge level of up to 4mg/L NH4, the throughput had to be reduced. At the beginning of the year a couple of power cuts resulted in the pumps running at full speed with resulting loss of treatment. Upon discovering these events the discharge was sent to the lagoon and the pumps set back to their desired pump rate. The situation was then monitored through the day until treatment was back to satisfactory levels before discharge was commenced. Blower or aerator failures can cause a loss in treatment as there is not enough oxygen in the water for the conversion process, this happened twice, the event in May (see notable events) was caught in time before any treatment was lost and the event in August caused a loss of treatment whereby the discharge was diverted to the lagoon until treatment was regained.

September proved to be the beginning of a loss of treatment that was discovered to be an infestation of life forms, possibly due to the hot summer. The life forms were proved to have eaten the media to which the bacteria reside; therefore a loss of ammonia treatment resulted. The matter is further discussed in conclusions.

The various spikes in the following months were dealt with in the same manner as a power-cut event, detailed above.

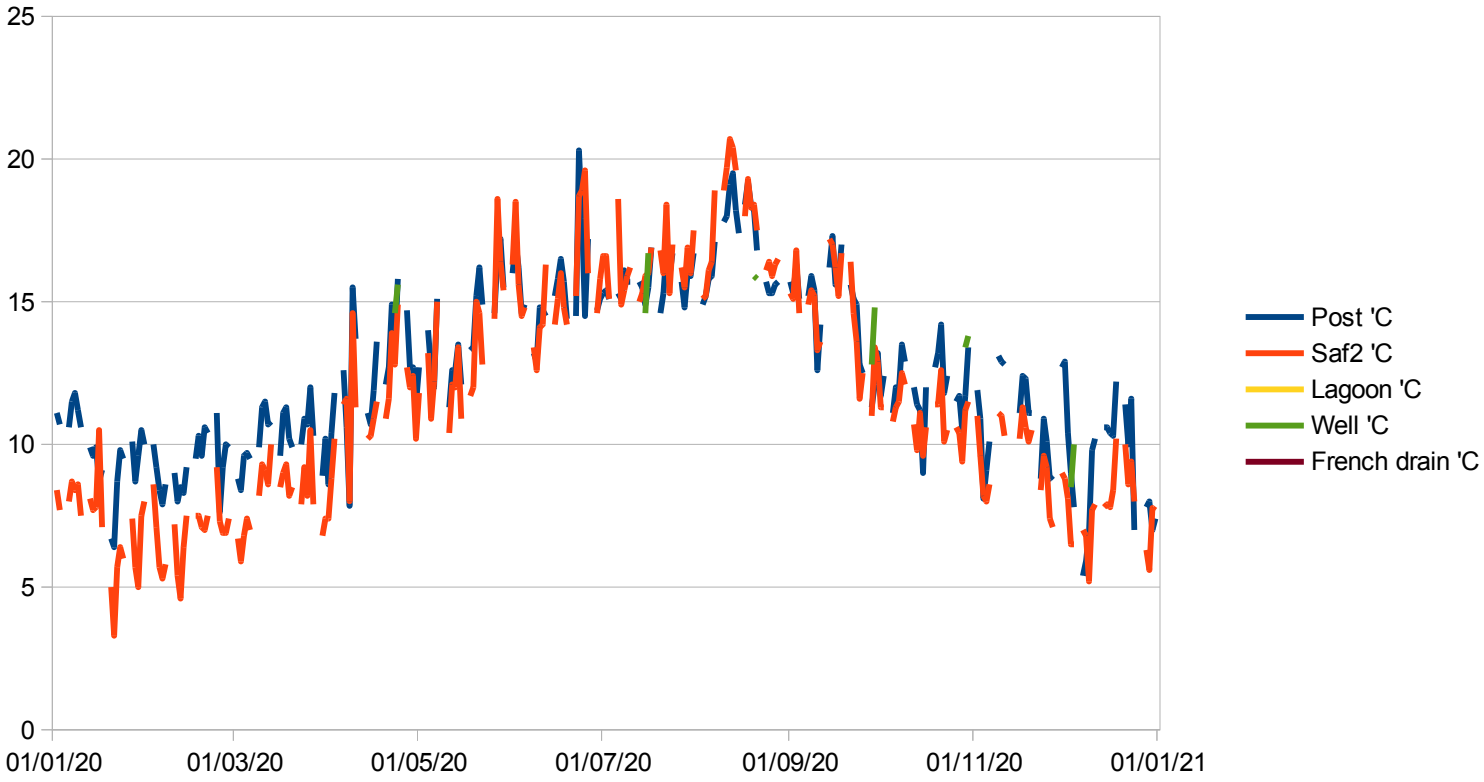
Graph 2. Daily Flow, Final Discharge



Key: 0 – 160 m^3 discharge through meter.

The daily flow levels to the discharge point are low during the summer and higher during the wet and stormy conditions. The lagoon is used to hold water during wet periods to keep discharge levels below the consent level of 400 m^3/day. During the year the smallest discharge was roughly an average of 20 m^3 and this, as discussed later in conclusions, is due to the lowering of throughput in order to maintain the conversion of ammonia to nitrate. The spikes depicted on the graph are due to either power cuts whereby the plants reverts back to full throughput or due to attempts at increasing the throughput to monitor the plants operation.

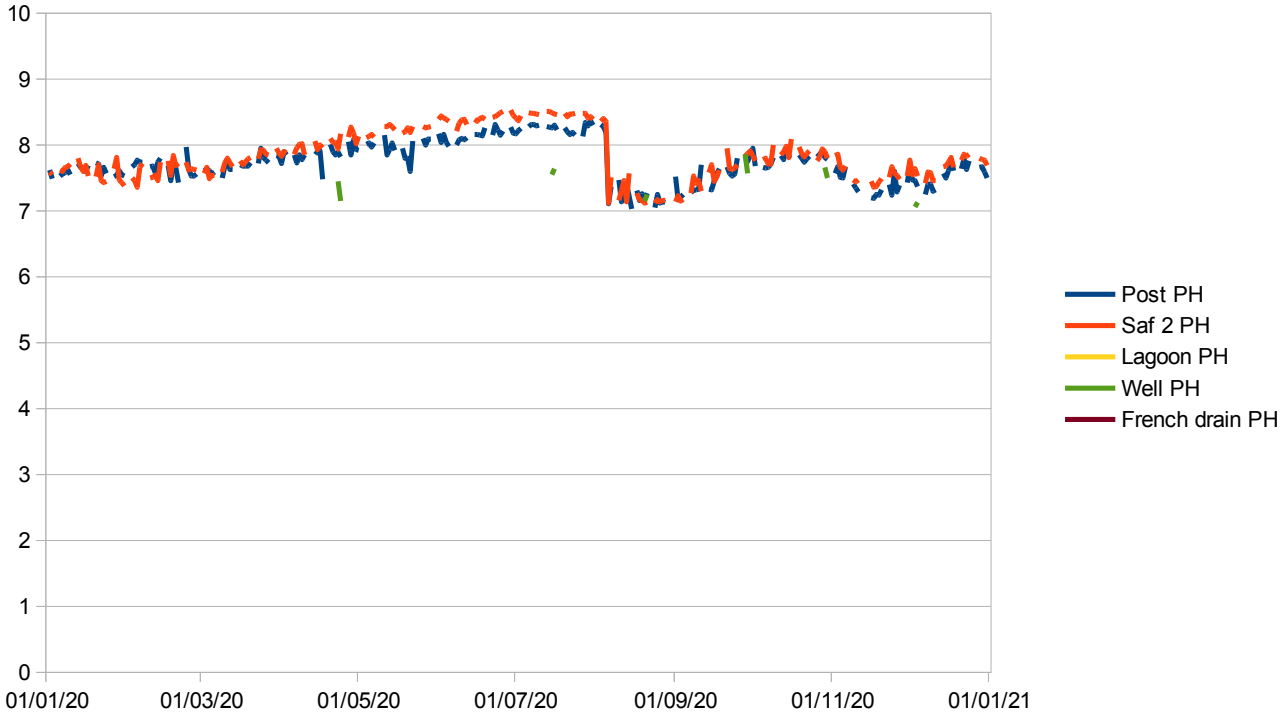
Graph 3. Temperatures



Key. 0 – 10 'C

Temperature in all the recorded media depicts a trend that follows yearly variations.

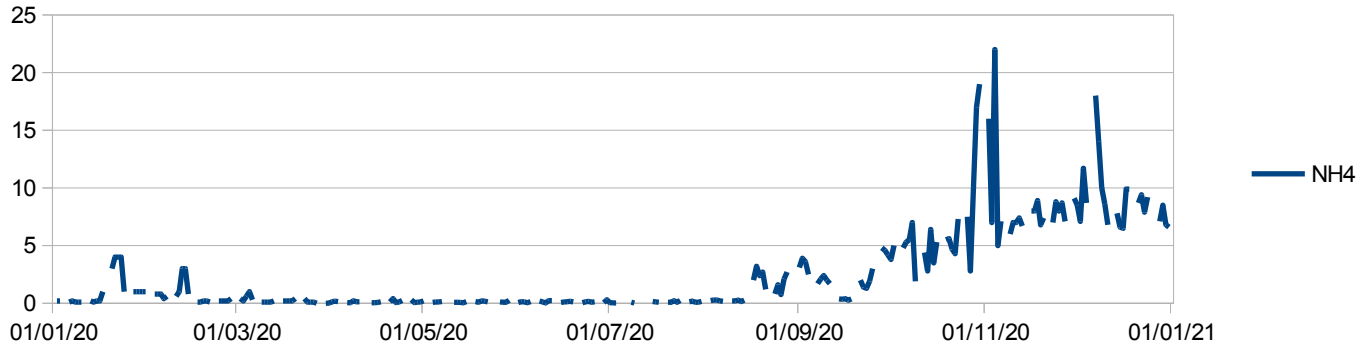
Graph 4. pH levels



Key 0 – 10 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 French drain is normally rainwater and therefore shows the lowest value on occasion. The trend upward of pH levels is due to the probe drifting out of calibration. The sharp decrease shows that the calibration has been performed and further into the year it is observed that the levels fluctuate due to the plant failing in treatment. This event coincides with the end of summer.

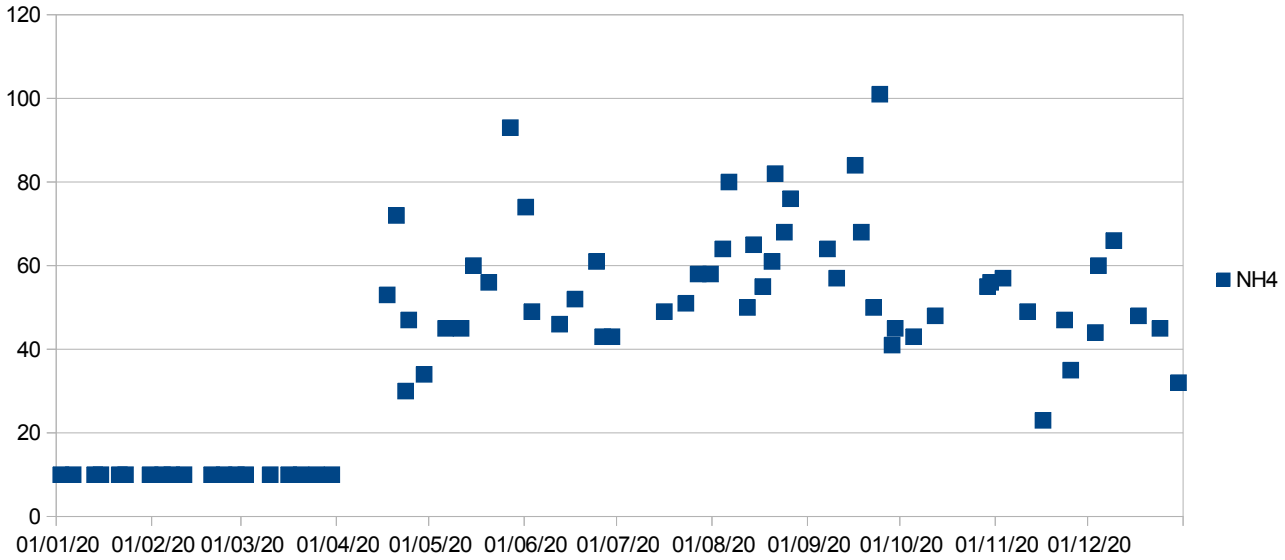
Graph 5. SAF2 Ammonia Levels



Key. 0 – 25 mg/L NH4

SAF 2 treats the water from the holding lagoon and is normally discharged to the reed bed and then the stream when the ammonia levels are acceptable. The lagoon was taking increasing volumes of well water during the latter part of the year due to the loss of complete treatment in the main plant. This increased the ammonia level of the lagoon water beyond the treatment capability of the SAF2 unit and the discharge was therefore sent back to the lagoon. Further details can be found in the conclusions.

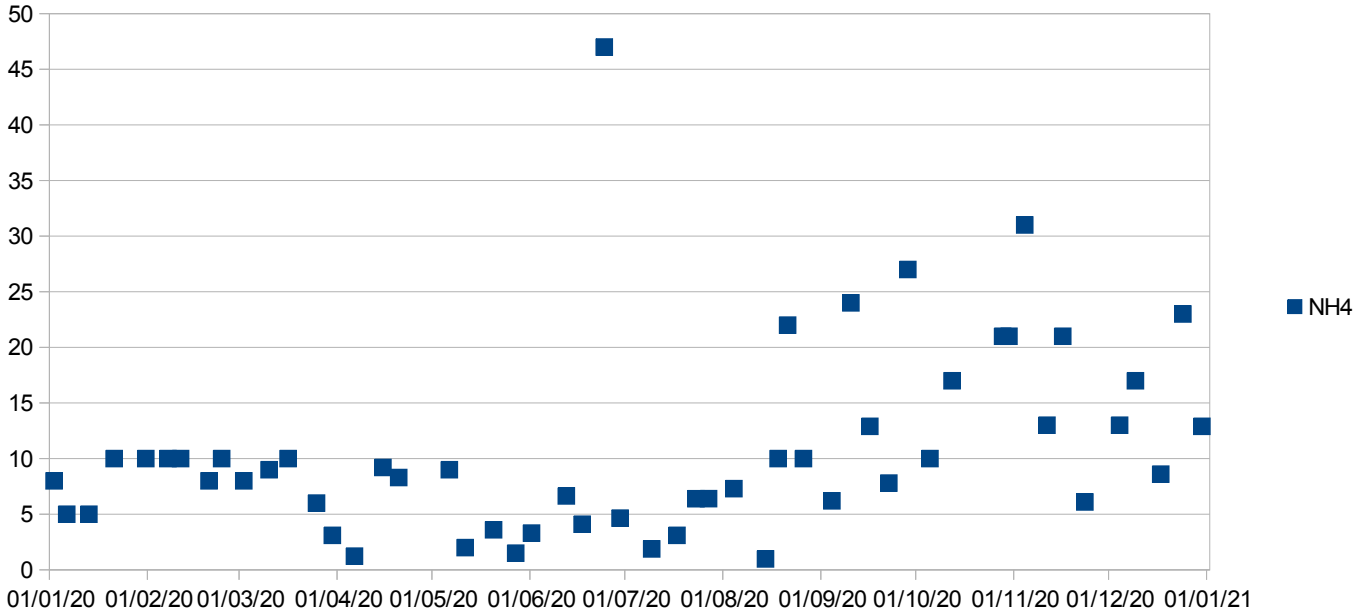
Graph 6. Well Ammonia Levels



Key. 0 – 120 mg/L NH4

The field data was taken with colour indicator tests in the first quarter of the year and the maximum reading obtainable was 10 mg/L. The field data was then gathered with a Palintest Photometer 7500 that allowed accurate data to become obtainable in the field. The ammonia levels of the well vary and can be observed to be 100 mg/L on occasion and sometimes as low as 20 mg/L. The well reacts quickly to inclement weather and this is thought to dilute the water with regard to ammonia.

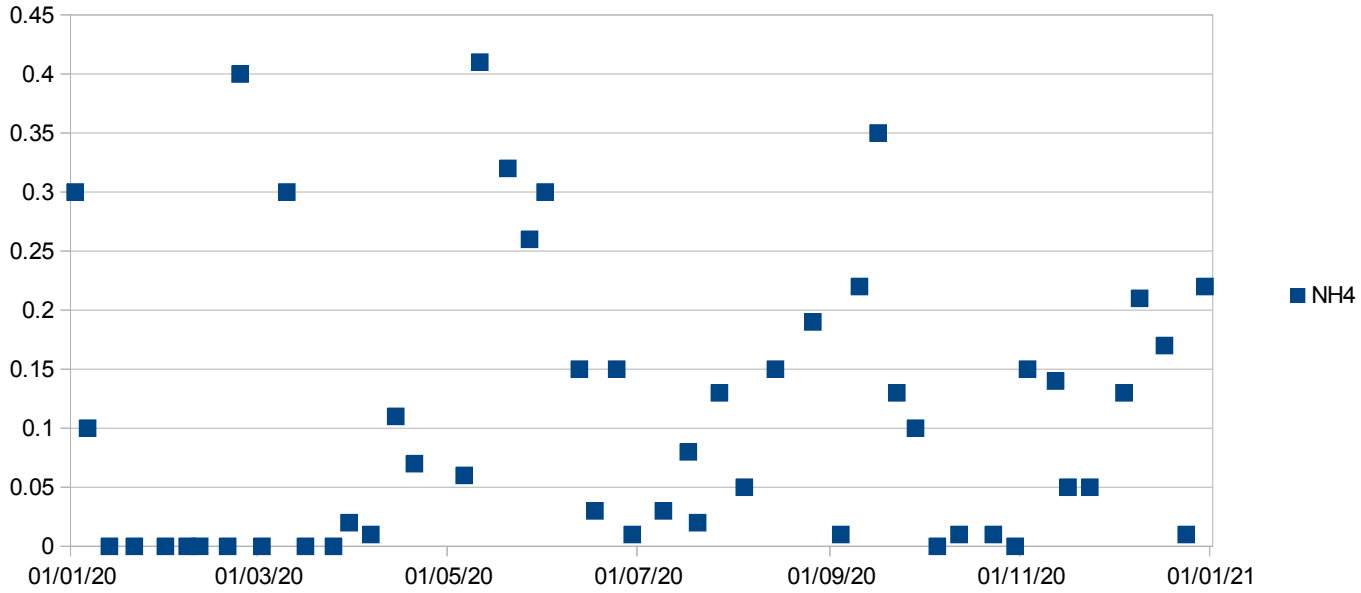
Graph 7. Lagoon Ammonia Levels



Key. 0 – 50 mg/L NH4

An anomalous reading of over 45 mg/l was observed mid-year and is likely due to bad timing with regard to sampling time. If the sample is taken after a fresh discharge of well overflow then one is essentially sampling the well. The ammonia levels in the lagoon are recorded as up to 10 mg/l during the first part of the year using the colour indicator tests. Once the switch to the Palintest was made the observed ammonia levels remained consistent until the plant failure and the concentration of the lagoon steadily increased. This had an adverse effect on the SAF2 unit.

Graph 8. French Drain Ammonia Levels



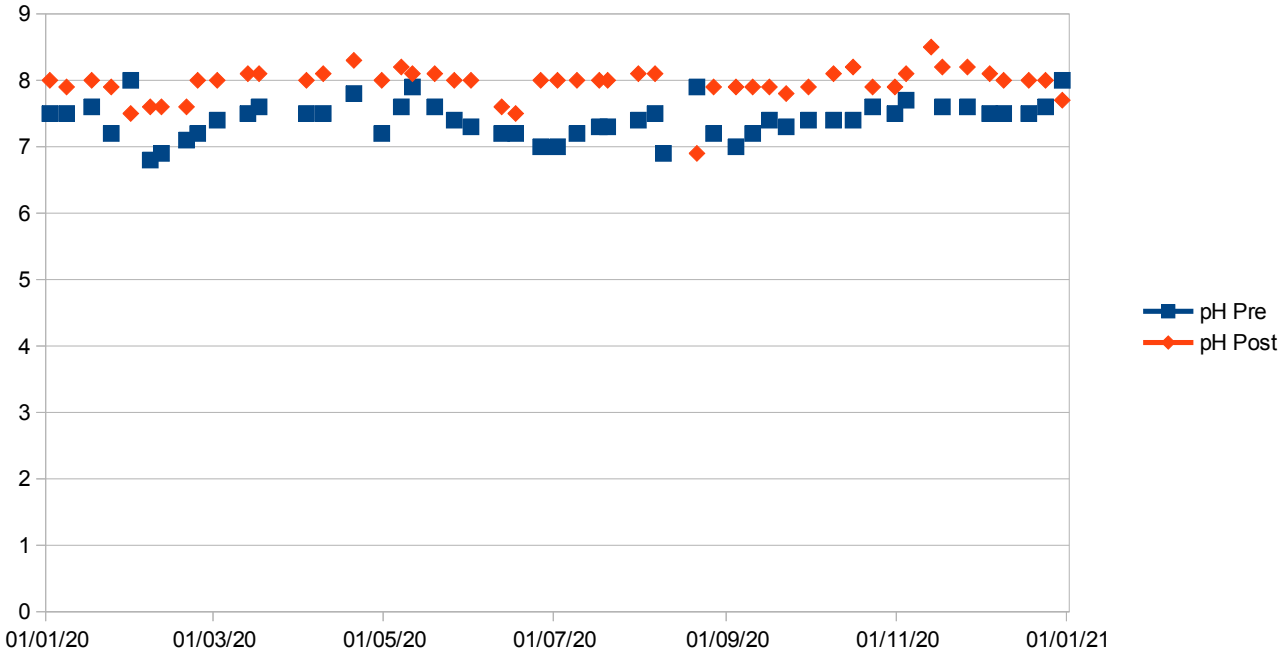
Key. 0 – 0.45 mg/L NH4

The French drain captures water from the low portion of the capped landfill and is monitored weekly for any elevated ammonia discharge. The results showed no elevated ammonia and the efflux of water through the French drain was discharged to the stream.

4.0 LABORATORY ANALYSIS

The graphs numbered 9 thru 18 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 9. pH Pre and Post Treatment Comparison

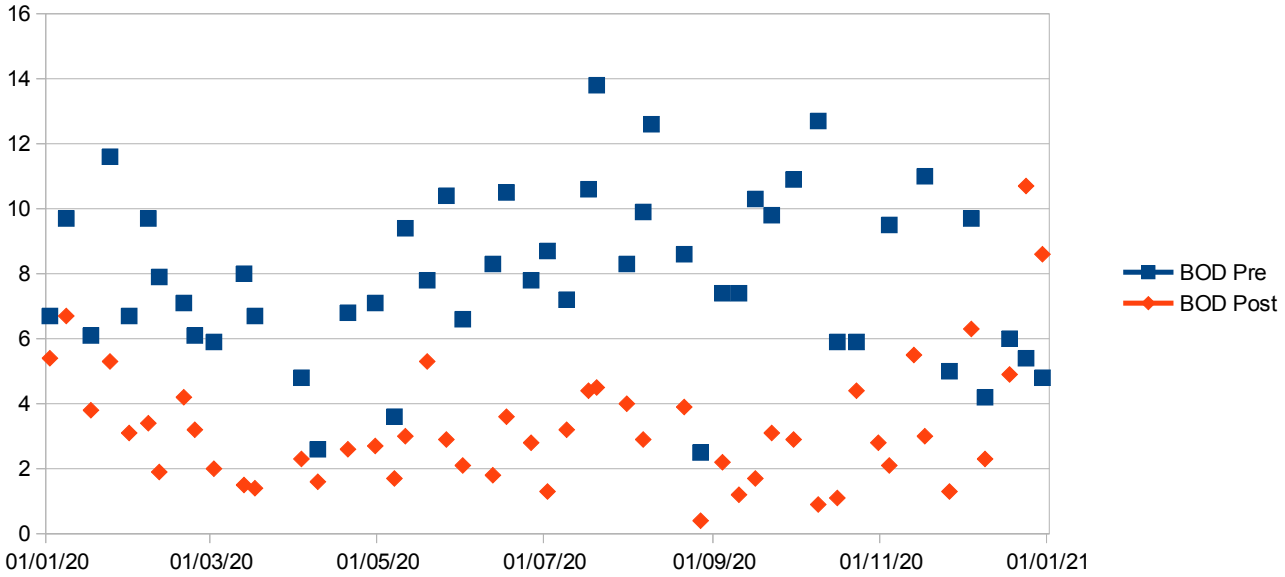


Key 0 – 9 pH units

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 year with a slight dip below the normal levels mid-summer and a slight rise above normal levels in November during the plant malfunction, detailed in conclusions.

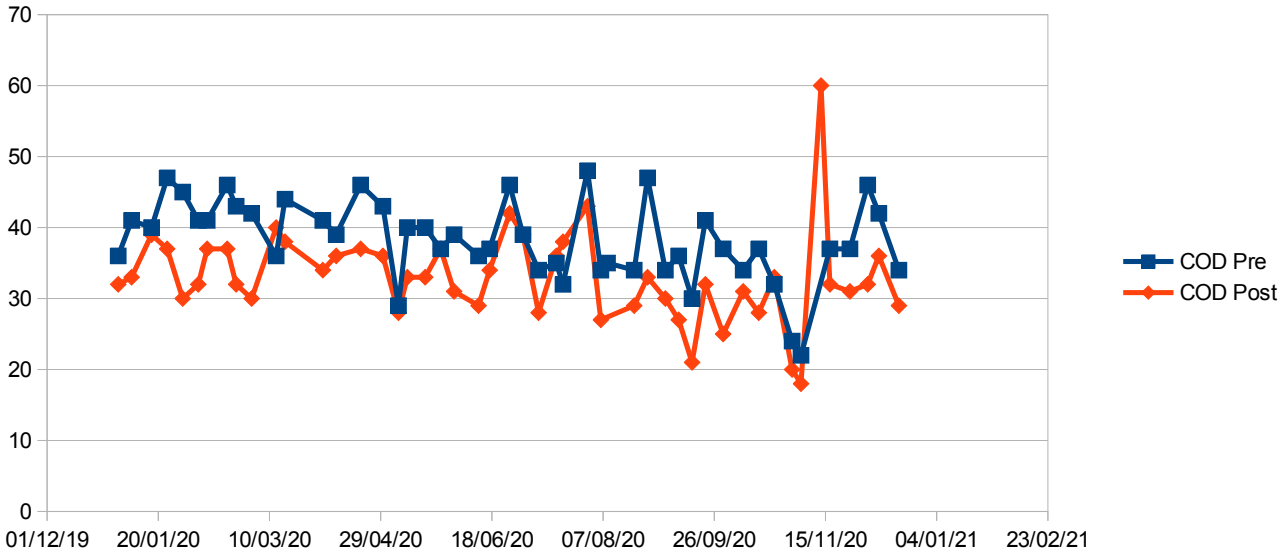
Graph 10. BOD Pre and Post Comparison



Key 0 – 16 mg/L O2

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

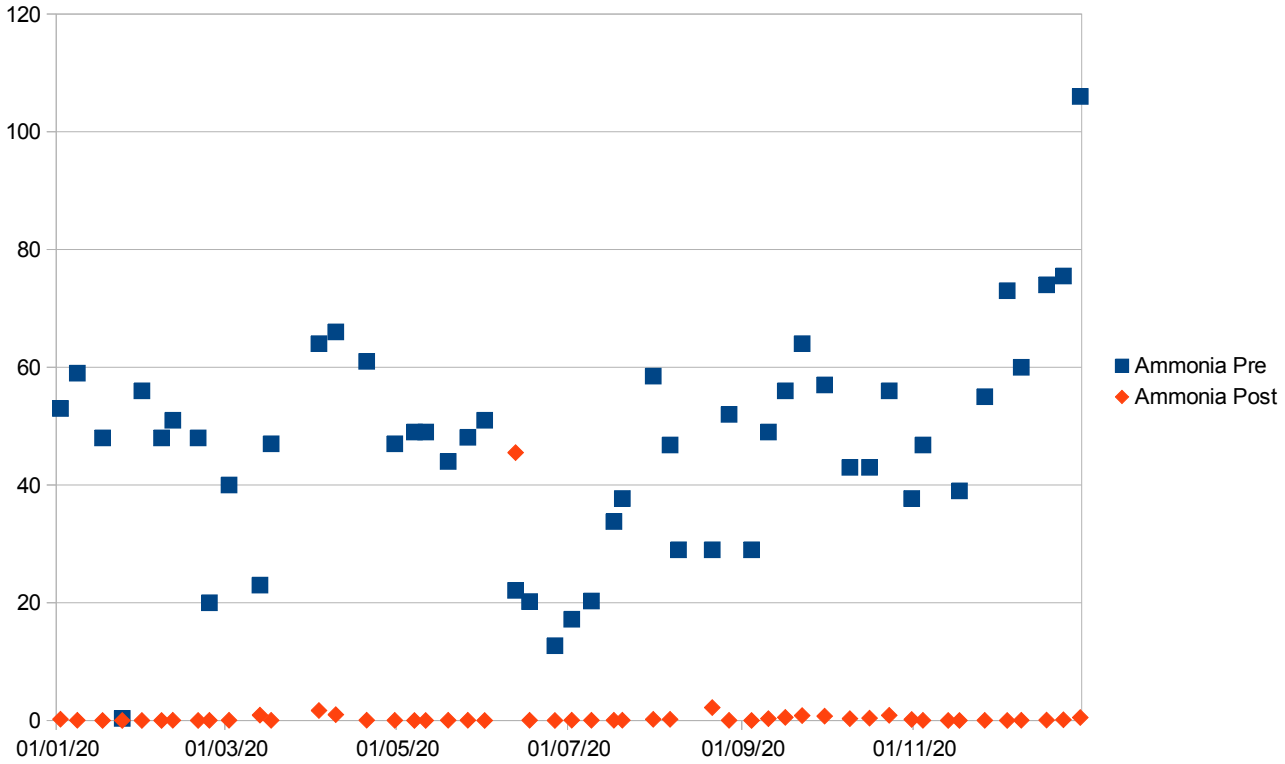
Graph 11. COD Pre and Post Comparison



Key 0 – 70 COD mg/LO2

The chemical oxygen demand (COD) levels remained consistent through the year except for a spike in COD during November that is due to the plant recovery process that is further explained in the conclusions.

Graph 12. Ammonia Pre and Post Comparison



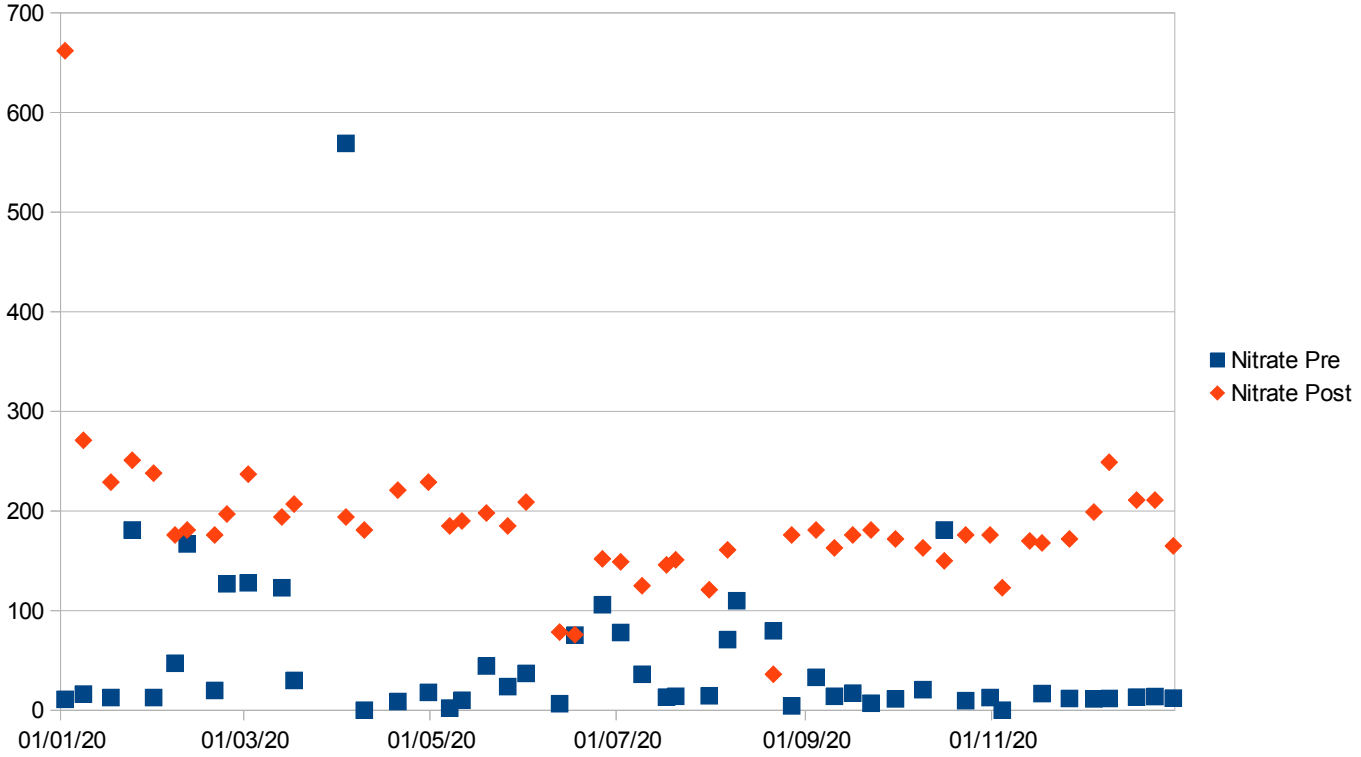
Key 0 – 120 mg/L NH4

There was one event during the year which caused the Ammonia to breach the permitted 4mg/L NH4.

The value was exceptionally high and the corresponding data for nitrite and nitrate levels show normal levels indicating an anomalous reading with regard to the ammonia level. The ammonia level is higher in concentration than the well water giving further evidence of an anomalous reading. A possibility is that some organic material entered the sample container and was able to breakdown in the hot weather period prior to analysis.

The rest of the year saw the discharge kept under the allowable limit, this was achieved by careful management of the retention time of the treatment water.

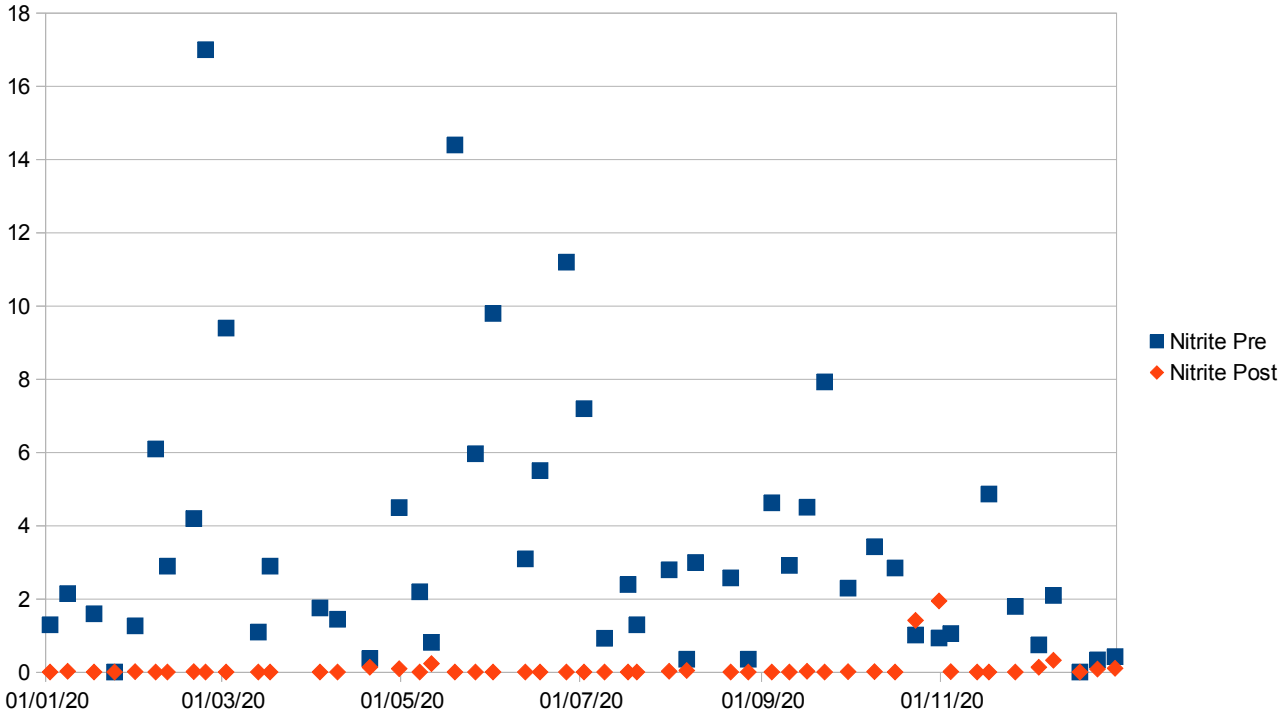
Graph 13. Nitrate Pre and Post Comparison



Key 0 – 700 mg/L NO3

The treatment process utilizes bacteria (Nitrosomonas and nitrosolobus for example) to oxidize ammonia to nitrite. The second stage utilises another group of bacteria (Nitrobacter 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. Some elevated levels of nitrate are seen in the pre-treatment and the beginning of the year the discharge nitrate levels were observed to be higher than normal.

Graph 14. Nitrite Pre and Post Comparison

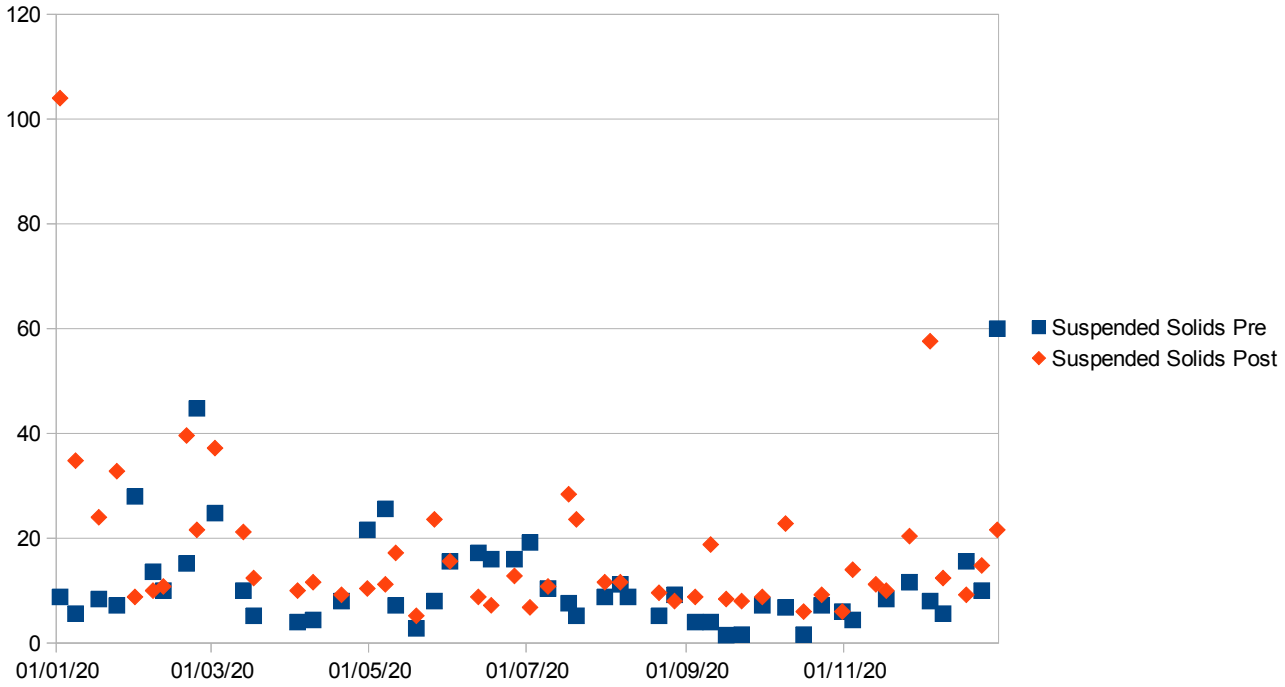


Key 0 – 18 mg/L NO2

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.

Only during the plant recovery process did the nitrate levels increase, showing an inability to treat the water due to the deliberate de-oxygenation procedure as further explained in the conclusions.

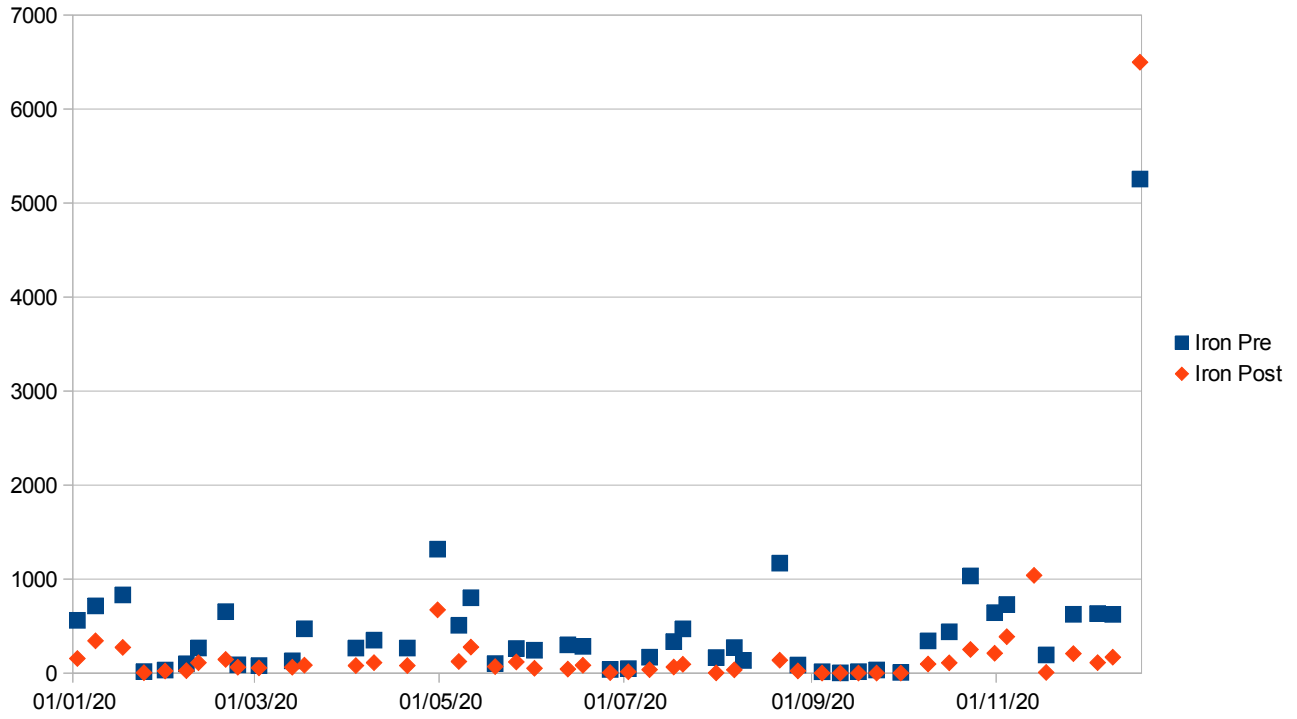
Graph 15. Suspended Solids Pre and Post Comparison



Key 0 – 120 mg/L

There were a few instances of the 30mg/L permitted level being breached. The breach in November occurred during the plant recovery process. During January through to March there were a series of power cuts and this resulted in the pumps coming back online at full throughput resulting in media being washed through the system.

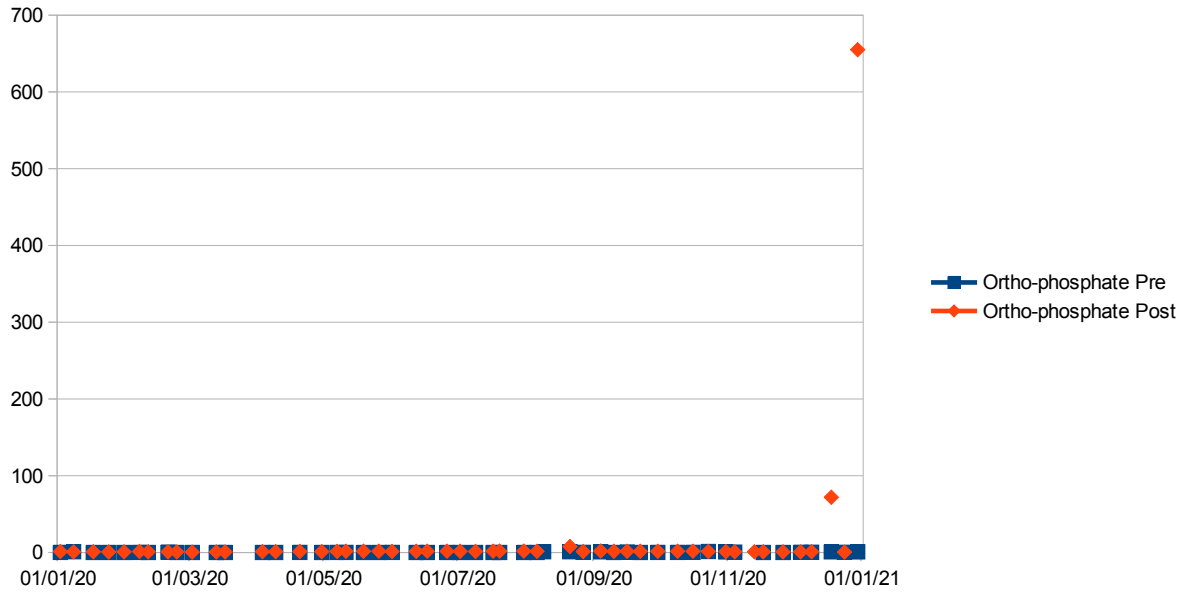
Graph 16. Iron Pre and Post Comparison



Key 0 – 7000 ug/L

The iron is found to be present in the sediment sludge that is found on the media balls and also within various settling tanks. During power cuts and cleaning processes this sediment can become disturbed and cloud the water. If a discharge (post) sample is taken during this time or shortly afterwards then elevated iron levels will be observed as may be the case with the three discharge samples found to be over 1000 ug/L. The discharge consent is 0.75 mg/L or 750 ug/L The substantial spike in iron at the end of the year seems to indicate an influx of iron rich water from the landfill. There is also a big spike in ammonia from landfill during this time, further indicating an event within the landfill or within the landfill water catchment.

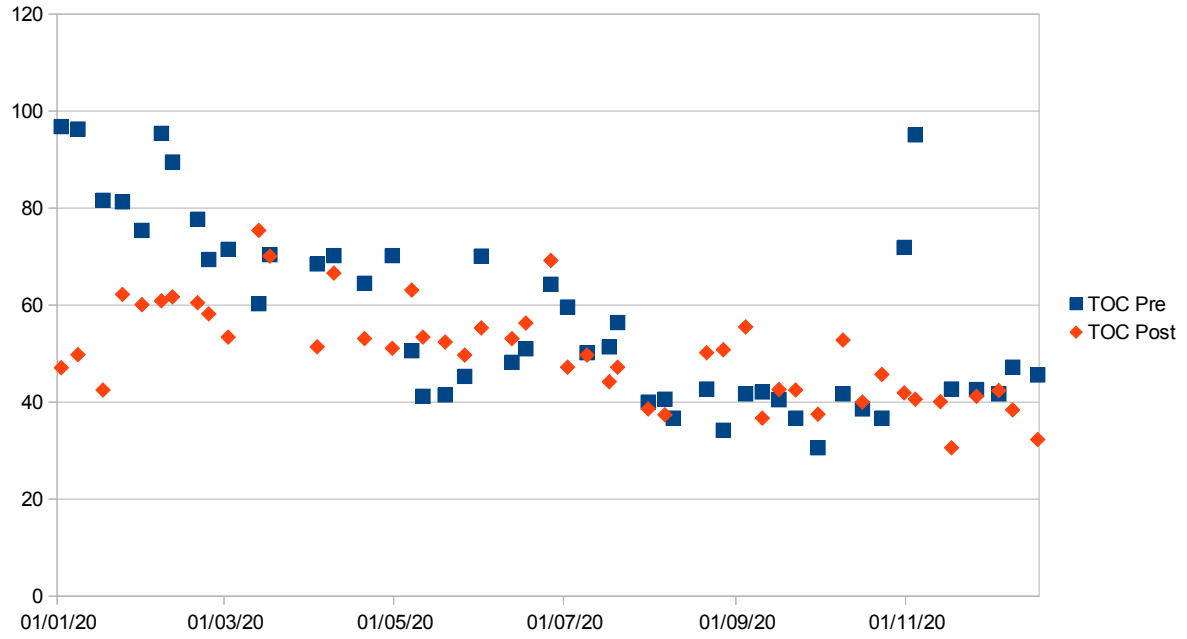
Graph 17. Orthophosphate



Key 0 -700 mg/L P

The orthophosphate levels remained constant through the year except for an exceptional spike in levels in December. This spike corresponds with a spike in iron and ammonia levels.

Graph 18. TOC, Total Organic Carbon



Key 0 – 120 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. The spike observed in October, for example, appears high, but is still less than the levels seen in the January.

5.0 CONCLUSION

The year of 2020 at Nantycaws leachate treatment plant started off well. The summer was very warm for a long time and by August we started to observe problems. From the notable events we record; *05/08/20 Big rise in ammonia at discharge. Pumps dialled back.* This was the beginning of a couple of months of problems and challenges.

As can be observed in graph 2 that depicts the total discharge from the main treatment plant, the pump rates had to be set ever lower to keep the ammonia levels at acceptable levels. A couple of power cuts and blower faults resulted in unacceptable treatment levels and during these events the discharge was diverted to the lagoon until the correct treatment levels returned.

When the power fails on site, the pump control panel reverts to its standard settings and with regard to the well pump throughput, this is maximum. During the problematic months the pumps were at minimum throughput, therefore high throughputs from power cuts resulted in almost no treatment in the tanks, hence the high ammonia levels.

A lot of work was carried out to ascertain the overall issue. The findings were that during the hot weather an inundation of life forms accumulated in the tanks and due to the lack of food they reverted to consuming the media on the treatment balls.

The treatment balls reside in the tanks and provide a substrate for what is essentially soil, referred to as sludge, and upon this sludge resides the bacteria genera that are responsible for the oxidisation of ammonia to nitrite and from then to nitrate. With the treatment balls nearly void of sludge we had very little treatment. Only upon sampling the treatment balls from the base of the tanks did we observe the manifold life forms present.

The surface tanks were deoxygenated one at a time to drive off the life forms and sludge was manually transferred to the tanks from the various settlement tanks. This resulted in a successful return to normal operation. This deoxygenation event caused anomalous values in suspended solids and COD for example.

During the time of reduced treatment the well water was sent to the lagoon via the overflow system. This resulted in the ammonia level of the lagoon to increase from around 9 mg/L up to 30 mg/L This then had a knock on effect on the SAF2 treatment system that was unable to treat the lagoon water to a satisfactory level for discharge. The SAF2 water therefore had to be passed back to the lagoon. This led to unsatisfactory lagoon depth levels so the SAF2 waters were partially diverted to the main well for treatment by the main plant and the main plant was then set at a higher throughput in order to reduce the volume of water in the lagoon. The lagoon was bought to a satisfactory depth by December.

A pro-active scheme of plant, pump, motor maintenance and cleaning is in progress to reduce the likely occurrence of failures, but the pumps operate under duress 24/7 and often it is seen that failures occur in unison due to similar installation times. This pro-active strategy was implemented last year and overall performance of the plant has improved, with a stock of critical spares, such as a replacement blower kept offsite and backup pumps kept onsite.

No remedial, improvement or maintenance works beyond those currently being undertaken have been identified as necessary to ensure the ongoing running of the facility to maintain compliance with the environmental permit.

The plant as of January 2021 is running at optimum capability with satisfactory lagoon depth and ammonia level and the SAF2 unit is treating the lagoon water extremely well and the main plant is successfully treating on average 80m^3 of landfill effluent a day.

APPENDIX A

Raw Data

NYC field data		POST					SAF2					LAGOON					WELL					FRENCH DRAIN			
DATE	NOTES	NH4	'C	PH	Turb	M3	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb
01/01/20																									
02/01/20			0.2	11.1	7.62	15	307138	0.2	8.4	7.59			8	8.9	7.6		>10		12.1	6.97			0.3	8.5	6.76
03/01/20			0.3	10.7	7.49	17	307219	0.2	7.7	7.55															
04/01/20																									
05/01/20																									
06/01/20			0.1	10.6	7.53	14	307465	0.1	8	7.62			5	8.2	7.35		>10		11.5	6.59			0.1	8.3	6.82
07/01/20			0.6	11.5	7.56		307557	0.2	8.7	7.6															
08/01/20			0.2	11.8	7.58		307641	0.1	8.4	7.66															
09/01/20			0.2	11.2	7.63	17	307718	0.1	8.6	7.67															
10/01/20	Power cut. Pump rates at max. reset to 2 mins		7	10.6	7.55	14	307858	0.1	7.5	7.71															
11/01/20			0.2																						
12/01/20																									
13/01/20			0.3	9.9	7.72	14	308019	0.2	8.1	7.8			5	8.1	7.25		>10		11.7	7			0	8.1	6.59
14/01/20			0.2	9.6	7.66	17	308073	0.1	7.7	7.67															
15/01/20			0.1	9.9	7.66	19	308139	0.2	7.8	7.6							>10		10.9	7.27					
16/01/20			0.8	8.7	7.6		308195	0.2	10.5	7.69															
17/01/20			0.2	9.1	7.69	17	308240	1	7.1	7.53															
18/01/20																									
19/01/20																									
20/01/20			0.2	6.7	7.73	30	308411	3	5	7.52															
21/01/20			0.2	6.4	7.71	21	308466	4	3.3	7.7			10	5.5	7.24		>10		10.6	7.28			0	5.1	7.27
22/01/20			0.3	8.7	7.53	17	308522	4	5.7	7.46															
23/01/20			0.2	9.8	7.66	17	308581	4	6.4	7.43							>10		11.6	7.06					
24/01/20			0.8	9.5	7.57	17	308668	1	6	7.45															
25/01/20																									
26/01/20																									
27/01/20			0.8	10.1	7.52	17	308931	1	7.4	7.64															
28/01/20	Power cut. Pump rates at max. reset to 2 mins. Post water t		10	8.7	7.54	19	309051	1	5.7	7.81															
29/01/20	Post water still lo lagoon		6	9.6	7.61		309103	1	5	7.47															
30/01/20	Post back to discharge		0.1	10.5	7.55	17	309160	1	7.5	7.43															
31/01/20			0.1	10	7.53	19	309222	1	8	7.38			10	9.1	7.29		>10		12.4	7.23			0	8.9	7.25
01/02/20																									
02/02/20																									
03/02/20	Phos changed		0.1	10	7.67		309389	0.8	8.6	7.5															
04/02/20			0.1	9.2	7.7		309446	0.8	7.1	7.46							>10		10.5	7.45					
05/02/20			0.2	8.4	7.77		309502	0.8	5.7	7.36															
06/02/20			0.2	7.9	7.74	19	309559	0.4	5.3	7.66															
07/02/20			0.1	8.6	7.74	15	309619	0.6	5.8	7.72			10	5.8	7.43		>10		11.1	7.14			0	6.5	7.33
08/02/20																									
09/02/20																									
10/02/20			0.1	9	7.67	17	309787	0.6	7.2	7.5															
11/02/20			0.1	8	7.68	23	309844	1	5.4	7.51			10	5.3	7.42		>10		9.8	7.37			0	6.4	7.3
12/02/20			0.1	8.5	7.58	15	309901	3	4.6	7.54															
13/02/20			0.2	8.3	7.74	17	309958	3	6.4	7.46															
14/02/20	RCD in sludge return panel replaced		0.3	9.2	7.8	19	310022	0.8	7.5	7.74															
15/02/20																									
16/02/20																									
17/02/20			0.3	9.5	7.69	19	310275	0.1	7.5	7.76															
18/02/20			0.4	10.3	7.46		310381	0.1	7.5	7.54															
19/02/20			0.2	9.6	7.69	19	310458	0.2	7.1	7.84															
20/02/20			0.2	10.6	7.65	19	310539	0.2	7	7.69			8	7.7	7.6		>10		10.7	7.18			0	7.4	7.3
21/02/20			0.2	10.4	7.43	19	310648	0.1	7.5	7.72															
22/02/20																									
23/02/20																									
24/02/20	Phos changed		0.1	11.1	7.97	21	310897	0.2	9.2	7.74		>10		9.4	7.52		>10		12	6.95			0.4	8.9	7.3
25/02/20			0.2	9.9	7.63		310974	0.2	7.3	7.62															
26/02/20	Pumps at 3 mins		0.4	9.2	7.53		311075	0.2	6.9	7.64															
27/02/20			0.4	10	7.53		311168	0.2	6.9	7.63															
28/02/20			0.2	9.9	7.56	14	311245	0.4	7.4	7.62							>10		11.5	6.84					
29/02/20		POST					SAF2					LAGOON					WELL					FRENCH DRAIN			
01/03/20	NOTES	NH4	'C	PH	Turb	M3	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb
02/03/20			0.6	8.8	7.61	17	311494	0.4	6.7	7.57			8	7.1	7.47		>10		11.5	7.4			0	7	7.21
03/03/20			0.1	8.4	7.64	19	311550	0.2	5.9	7.66															
04/03/20			0.2	9.6	7.61		311621	0.6	6.8	7.49															
05/03/20			0.2	9.7	7.56	19	311670	1	7.4	7.54															
06/03/20			0.2	9.5	7.59	17	311727	0.3	7	7.54															
07/03/20																									
08/03/20																									
09/03/20			1	9.9	7.5	14	311941	0.1	8.2	7.59															
10/03/20			0.2	11.3	7.68	22	312040	0.1	9.3	7.73			9	10.3	7.32		>10		12	7.18			0.3	9.4	7.39
11/03/20			0.2	11.5	7.76		312130	0.1	9.1	7.8															
12/03/20			0.2	10.7	7.63		312210	0.1	8.6	7.73															
13/03/20			0.2	10.8	7.63		312292	0.2	10	7.67															
14/03/20																									
15/03/20																									
16/03/20			0.2	9.6	7.7	20	312541	0.2	8.5	7.76			10	8.2	7.35		>10		12.1	7.27			0	7.6	7.37
17/03/20			0.4	11.1	7.68	15	312627	0.2	9	7.7															
18/03/20			0.3	11.3	7.68		312729	0.2	9.3	7.74															
19/03/20			0.2	10.2	7.68		312805	0.2	8.2	7.79															
20/03/20			0.1	9.9	7.73	21	312882	0.4	8.5	7.81							>10		11.2	7.42					
21/03/20																									
22/03/20																									
23/03/20			0.4	10	7.72	25	313136	0.4	7.9	7.79															

		POST					SAF2					LAGOON					WELL					FRENCH DRAIN			
	NOTES	NH4	'C	PH	Turb	M3	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb
18/04/20																									
19/04/20																									
20/04/20			0.12	12.1	8.01	13	315450	0.11	10.9	8.1		8.3	12.1	7.37			72	14.2	7.31			0.07	10.5	7.82
21/04/20			0.24	12.7	7.9	13	315537	0.4	11.6	8.04															
22/04/20			0.11	14.9	7.85	15	315631	0.06	13.9	8.04															
23/04/20			0.1	13.4	7.89		315697	0.11	12.8	7.94							30	14.6	7.45					
24/04/20			0.18	15.8	7.82	12	315795	0.24	14.9	8.17							47	15.6	7.15					
25/04/20																									
26/04/20																									
27/04/20	Saf 2 pipe fault. UV damage		0.2	14.7	8.05		316040	0.3	12.7	8.12															
28/04/20			0.15	12.7	7.85	10	316107	0.06	12	8.27															
29/04/20			0.2	12.7	8.08	11	316202	0.09	12.4	8.18							34	13.7	7.27					
30/04/20			0.26	11.4	7.93	13	316266	0.11	10.2	8.02															
01/05/20			0.24	12.7	7.92	12	316366	0.21	11.8	8.13															
02/05/20																									
03/05/20																									
04/05/20			0.08	14	8.01	17	316608	0.07	13.2	8.11															
05/05/20			0.13	12.6	8.03	13	316674	0.11	10.9	8.13															
06/05/20			0.12	12	7.97	17	316758	0.11	12.2	8.16		9	12.2	7.47			45	14.9	7.54			0.06	11.3	7.9
07/05/20			0.17	15.1	8.03	11	316852	0.15	15	8.12															
08/05/20	BH																								
09/05/20																									
10/05/20																									
11/05/20			0.25	11.3	8.15	13	317229	0.08	10.4	8.28		2	12.2	7.33			45	12.1	7.68			0.41	11.2	7.62
12/05/20			0.13	12.6	7.85		317349	0.08	12.1	8.28															
13/05/20			0.15	12.6	7.93		317450	0.07	12	8.31															
14/05/20			0.15	13.5	8.03		317555	0.04	13.4	8.28															
15/05/20			0.15	12.1	7.92		317638	0.14	10.9	8.23							60	13.2	7.54					
16/05/20																									
17/05/20																									
18/05/20	Blower 4 offline. Bearing or motor		0.13	13.3	7.95	13	317876	0.14	11.7	8.18															
19/05/20	Blower 4 offline.		0.25	13.4	7.8	13	317956	0.09	12	8.2															
20/05/20	Blower 4 offline.		0.5	15.2	7.8	11	318051	0.21	15	8.26		3.6	16.8	7.5			56	16.1	7.16			0.32	13.2	7.67
21/05/20	Blower 4 replacement fitted		0.73	16.2	7.6	10	318151	0.18	14.6	8.19															
22/05/20			0.17	14.9	8.06	15	318210	0.11	12.8	8.28															
23/05/20																									
24/05/20																									
25/05/20	BH																								
26/05/20			0.43	14.6	8.1	17	318530	0.11	14.4	8.28															
27/05/20			0.16	16.6	8	14	318626	0.09	18.6	8.26		1.5	18	7.75			93	16.3	7.36			0.26	14.5	7.72
28/05/20			0.09	17.2	8.09		318703	0.09	16.4	8.27															
29/05/20			0.09	15.5	8.09	19	318771	0.25	15.4	8.28															
30/05/20																									
31/05/20																									
01/06/20			0.12	16	8.17	17	319014	0.06	16.3	8.39		3.3	15.7	7.68			74	16.8	7.41			0.3	13.6	8.13
02/06/20			0.08	17.08	8.04	15	319108	0.14	18.5	8.44															
03/06/20			0.19	16.2	8.16	19	319189	0.11	15.6	8.41							49	14.5	7.43					
04/06/20			0.27	14.6	8.04		319268	0.05	14.5	8.39															
05/06/20	Saf 2 pipe fault. UV damage		0.6	14.9	7.98	14	319359	0.14	14.8	8.36															
06/06/20																									
07/06/20																									
08/06/20			0.3	13.2	8	12	319585	0.19	13.4	8.21															
09/06/20			0.18	12.9	8.08	12	319664	0.11	12.6	8.33															
10/06/20			0.05	14.8	8.1		319762	0.03	14.1	8.38															
11/06/20			0.17	14.7	8.08		319846	0.23	14.2	8.39															
12/06/20			0.16	14.5	8.11	12	319911	0.23	16.3	8.31		6.64	18.3	7.89			46	16.5	7.31			0.15	14.4	8.03
13/06/20																									
14/06/20																									
15/06/20			0.12	15.2	8.16	13	320158	0.07	14.2	8.39															
16/06/20			0.1	15.8	8.16	11	320245	0.11	15.1	8.36															
17/06/20			0.11	16.5	8.15	11	320341	0.13	16	8.4		4.1	16.8	7.83			52	14.9	7.57			0.03	13.4	7.74
18/06/20			0.1	15.7	8.14		320409	0.17	14.8	8.42															
19/06/20			0.09	14.4	8.26	13	320493	0.11	14.2	8.39															
20/06/20																									
21/06/20																									
22/06/20	Power cut. Pump rates at max. reset to 3 mins		0.17	14.5	8.15	17	320856	0.04	15.2	8.42															
23/06/20			0.24	20.3	8.31	12	320962	0.12	18.7	8.43															
24/06/20			0.21	17.9	8.23	12	321039	0.16	18.9	8.46		47	21.9	7.49			61	17.9	7.41			0.15	16.2	7.45
25/06/20			0.28	14.5	8.15	11	321129	0.09	19.6	8.49															
26/06/20			0.08	17.2	8.21	11	321195	0.12	16	8.51							43	14.8	7.57					
27/06/20																									
28/06/20																									
29/06/20			0.13	14.7	8.27	11	321466	0.05	14.6	8.53		4.65	15	7.71			43	13.7	7.67			0.01	13.4	7.92
30/06/20			0.13	15.1	8.18		321553	0.3	15.8	8.45															
01/07/20			0.07	15.3	8.17		321632	0.05	16.6	8.41															
02/07/20			0.12	15.4	8.22		321712	0.03	16.6	8.37															
03/07/20			0.06	15.1	8.25		321803	0.02	15.1	8.44															
04/07/20																									
05/07/20																									
06/07/20	Rationing of palintest supplies due to pandemic related supp		0.11	15.3	8.28	12	322062		18.6	8.49															
07/07/20			0.21	15.1	8.31	11	322143		14.9	8.48															
08/07/20			0.17	16.1	8.31	12	322234	0.09	15.4	8.48															
09/07/20			0.12	15.7	8.29	12	322317	0.02	15.9	8.47		1.88	16.1	8.14				15.8	7.73			0.03	14.6	7.2
10/07/20			0.16	15.7	8.3	12	327413		16.2	8.46															
11/07/20																									

06/08/20	Calibrated ph probe		0.14	15.9	7.11	10	324409	0.21	16.4	7.12							80	16	7.11					
07/08/20	Settlement tank pumped dry		0.16	17.1	7.37	10	324462	0.17	18.9	7.51														
08/08/20																								
09/08/20																								
10/08/20	Multiple power cuts. Pumps set to 1min		0.11	17.8	7.47		324627	0.21	18.9	7.16														
11/08/20	Pumps set back to 3 min		0.05	18	7.14		324654	0.2	19.7	7.31														
12/08/20	Pumps back to 1min		2.1	19.1	7.17		324742	0.27	20.7	7.46							50	18.6	7.13					
13/08/20	Blower 3 tripped		0.9	19.5	7.4		324768	0.15	20.4	7.14														
14/08/20	Post far too high and put to lagoon		15	18.2	7.22	10	324887	0.27	19.6	7.57		0.98	19.7	7.08			65	17.8	7.13			0.15	7.3	6.91
15/08/20			0.17	17.4	7.03	11																		
16/08/20																								
17/08/20			0.3	18.4	7.31	10	324969	2	18	7.27							55	16.1	7.08					
18/08/20	Observation. Main treatment at min. Lagoon conc NH4 increased. Saf2 working harder		0.25	19.2	7.16	10	324996	3.2	19.3	7.17		10	20.1	7.03										
19/08/20			0.17	18.4	7.26	12	325052	2.4	18.3	7.16														
20/08/20			0.26	18.2	7.17	12	325101	2.7	18.4	7.12							61	15.9	7.15					
21/08/20			0.21	16.8	7.27	13	325143	1.2	17.5	7.13		22	16.8	7.08			82	15.8	7.25					
22/08/20		POST					SAF2					LAGOON					WELL					FRENCH DRAIN			
23/08/20	NOTES	NH4	'C	PH	Turb	M3	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb
24/08/20			0.21	15.7	7.05	11	325305	0.81	16.1	7.12							68	15.6	7.07					
25/08/20			0.7	15.3	7.25	12	325360	1.6	16.4	7.17														
26/08/20			0.3	15.3	7.12	13	325415	0.76	15.9	7.14		10	16	7.11			76	15.5	7.28			0.19	16.4	7.05
27/08/20			0.56	15.6	7.14	11	325483	2.1	16.3	7.16														
28/08/20			0.19	15.7	7.13		325534	2.7	16.5	7.16														
29/08/20																								
30/08/20																								
31/08/20	BH																							
01/09/20			0.26	15.7	7.52		325751	3.1	15.3	7.14														
02/09/20	Saf 2 high and to lagoon		0.5	15.3	7.17		325808	3.9	15.1	7.23														
03/09/20			0.15	16.3	7.21		325866	3.6	16.8	7.15														
04/09/20			0.09	15.1	7.25		325913	2.5	14.6	7.17		6.2	14.6	7.18				14.5	7.22			0.01	14.3	7.02
05/09/20																								
06/09/20																								
07/09/20			0.21	15.2	7.28	11	326084	1.7	14.9	7.27							64	14.8	7.33					
08/09/20			0.27	15.9	7.31	10	326139	2.1	15.4	7.53														
09/09/20			0.24	15.4	7.32	10	326180	2.4	15.2	7.42														
10/09/20			0.24	12.6	7.33	10	326234	2	13.3	7.46		24	14	7.31			57	14.4	7.17			0.22	15.1	7.3
11/09/20			0.18	14.2	7.7	13	326288	1.7	13.6	7.3														
12/09/20																								
13/09/20																								
14/09/20			0.18	16.2	7.33	10	326458	0.38	17.2	7.58														
15/09/20			0.14	17.3	7.32		326551	0.34	17	7.7														
16/09/20			0.06	15.6	7.45	10	326560	0.4	16.2	7.45		12.9	16.3	7.39			84	15.8	7.23			0.35	17	7.19
17/09/20			0.2	15.7	7.56	10	326612	0.27	15.2	7.51														
18/09/20			0.2	17	7.64	13	326677	0.37	16.7	7.62							68	15.6	7.21					
19/09/20		POST					SAF2					LAGOON					WELL					FRENCH DRAIN			
20/09/20		NH4	'C	PH	Turb	M3	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb
21/09/20			0.27	15.6	7.67	10	326828	2	16.4	7.95														
22/09/20			0.24	15.1	7.57	10	326883	1.4	14.6	7.64		7.8	14.3	7.62			50	14.5	7.26			0.13	15.7	7.48
23/09/20			0.32	14.9	7.53		326937	1.3	13.6	7.63														
24/09/20	Pumps down to 1 due to high nh4		2.2	12.8	7.56	10	327005	1.9	11.6	7.65							101	12.2	7.47					
25/09/20	Lack of material on the media balls noticed		0.21	12.5	7.8		327031	3	12.5	7.7														
26/09/20																								
27/09/20																								
28/09/20	Well float switches need replacement		0.18	11.3	7.83	10	327104	4.8	11	7.83		27	11.4	7.8			41	12.8	7.86			0.1	13	7.73
29/09/20	Well float switches replaced		0.14	12.1	7.75	10	327133	4.6	13.4	7.87							45	14.8	7.57					
30/09/20			0.24	13.2	7.85		327181	4.2	12.9	7.91														
01/10/20			0.16	11.7	7.95	15	327237	3.8	11.3	7.84														
02/10/20			0.31	12.4	7.68	10	327299	5	11.3	7.76														
03/10/20		POST					SAF2					LAGOON					WELL					FRENCH DRAIN			
04/10/20		NH4	'C	PH	Turb	M3	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb
05/10/20	Well pump 2 tripped. Reset and working		0.14	11.1	7.66	10	327452	4.8	10.8	7.78		10	11.1	7.7			43	11.2	7.67			0	12.5	7.14
06/10/20			0.1	12	7.65	11	327506	5.3	11.3	7.8														
07/10/20	Start monitoring of discharge to river		0.08	11.9	7.66		327556	5.5	11.5	7.71														
08/10/20			0.06	13.5	7.71		327620	7	12.5	7.71														
09/10/20	Saf2 macerator pump tripped and swapped for non macerator spare		0.2	12.9	7.81	10	327680	1.9	12.1	8														
10/10/20																								
11/10/20																								
12/10/20			0.09	12	7.84	10	327834	4.4	10.7	7.85		17	11.2	7.83			48	12.8	8.03			0.01	12.1	7.71
13/10/20			0.03	11.4	7.78	11	327882	2.8	9.8	7.9														
14/10/20	New saf2 pump ordered		0.15	11.2	7.93		327939	6.4	11.1	7.98														
15/10/20			0.08	9	7.84	11	327991	3.5	9.6	7.81														
16/10/20			0.11	12	7.85	11	328057	5.3	10.6	8.09														
17/10/20																								
18/10/20																								
19/10/20			0.7	12.7	7.85		328214	5.5	11.4	7.97														
20/10/20			0.09	13.2	7.8		328259	5.6	11.4	7.87														
21/10/20			0.11	14.2	7.74		328320	4.7	12.6	7.82														
22/10/20			0.08	11.8	7.79		328369	4.3	10.1	7.87														
23/10/20			0.51	12.4	7.83		328452	7.3	10.5	7.91			10.7	7.68				12.6	7.68			0.01	11.2	7.58
24/10/20																								
25/10/20																								
26/10/20	Dropping O2 levels in the treatment tanks 1 at a time to driv		0.09	11.5	7.82	11	328534	7.5	10.6	7.76														

		POST					SAF2					LAGOON					WELL					FRENCH DRAIN			
		NH4	'C	PH	Turb	M3	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb	Notes	NH4	'C	PH	Turb
17/11/20			0.04	12.4	7.19		329616	8	11.3	7.36															
18/11/20			0.05	12.3	7.25		329648	8.9	10.6	7.37															
19/11/20			0.05	11.1	7.24		329679	6.8	10.1	7.44															
20/11/20			0.11	11.1	7.32		329711	7.4	10.5	7.49															
21/11/20																									
22/11/20																									
23/11/20	Tank 2 blower back on and tank 3 blower off to rest it.		0.1	8.8	7.4	15	329803	7	8.4	7.51		6.1	9.6	7.41			47	12.1	7.35			0.05	10.2	7.2	
24/11/20			0.09	10.9	7.24	12	329835	8.8	9.6	7.67															
25/11/20			0.15	10.1	7.6	17	329868	8	9.2	7.57							35	11.8	7.43						
26/11/20			0.07	8.8	7.29		329903	8.7	7.4	7.54															
27/11/20			0.04	8.9	7.39		329934	7.1	7.1	7.48															
28/11/20																									
29/11/20																									
30/11/20	Power cut. Pumps back up to 5 min as a result of powercut. Blower 3 had tripped. Reset and working.		2.9	12.7	7.43		330123	9.1	9	7.53															
01/12/20			0.05	12.9	7.66	21	330140	8.5	8.8	7.77															
02/12/20	Saf2 fully to lagoon		0.04	10.4	7.47		330172	7.1	8.1	7.55															
03/12/20	Outdoor temp dropped. Reed bed likely suffering and main discharge effected as a result. Saf2 still to lagoon		0.22	9	7.46	11	330201	11.7	6.5	7.64							44	8.5	7.06						
04/12/20			0.17	7.8	7.37		330234	8.7	6.5	7.53		13	6.8	7.5			60	10	7.13			0.13	7	6.98	
05/12/20																									
06/12/20																									
07/12/20	Tank 3 back online. Saf2 50 50 reed bed and lagoon		0.11	5.4	7.25	11	330333	18	7	7.42															
08/12/20			0.16	5.9	7.4	14	330367	14	6.8	7.59															
09/12/20			0.22	6.9	7.41	17	330419	10	5.2	7.58		17	6.1	7.52			66	8.1	7.46			0.21	7.3	7.51	
10/12/20			0.08	9.8	7.3	16	330477	8.6	7.7	7.46															
11/12/20			0.12	10.2	7.32		330524	6.8	7.9	7.46															
12/12/20																									
13/12/20																									
14/12/20			0.02	10.6	7.57		330685	7.8	7.8	7.67															
15/12/20			0.04	10.6	7.5		330743	6.6	7.9	7.68															
16/12/20			0.03	10.4	7.61		330793	6.5	7.8	7.74															
17/12/20			0.29	10.3	7.78	15	330853	9.9	8.4	7.81		8.6	9	7.62			48	12	7.56			0.17	9.4	7.82	
18/12/20	Stream in flood		0.19	12.2	7.61	12	330853	9.9	10.2	7.66															
19/12/20																									
20/12/20																									
21/12/20			0.06	11.4	7.64		331125	8.7	10	7.77															
22/12/20			0.19	10	7.79	14	331180	9.4	8.6	7.86															
23/12/20			0.06	11.6	7.63		331265	7.9	9.4	7.83															
24/12/20			0.17	7	7.76	15	331321	9.2	8	7.86		23	7.8	7.75			45	10.3	7.72			0.01	7.4	7.93	
25/12/20																									
26/12/20																									
27/12/20																									
28/12/20			0.72	7.8	7.66	12	331586	7.1	6.3	7.8															
29/12/20			0.15	8	7.67	13	331638	8.5	5.6	7.78															
30/12/20			0.17	7	7.59	13	331691	6.8	5.1	7.77		12.9	7.67	5.9			32	7.66	8.7			0.22	7.6	6.3	
31/12/20			0.12	7.4	7.5	14	331746	6.6	4.9	7.69															
01/01/21																									