

Ref: 17130
November 2017
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Gore District Council



RE: Weekly NH₃ Monitoring Report

In October 2017, GDC engaged e3scientific ltd to scope and assess the ammonia (NH₃) gas emissions from the Mataura Mill dross storage site as they seek to comply with their consent conditions that specify a limit of 5 ppm NH₃ discharged to air. In November Photonic Innovations (PI) installed two NH₃ Sensors for comparison of the indoor and outdoor ammonia levels. Below we present a summary of the initial results from hourly monitoring. Figures 1-3 provide a record of the weekly observations from the Mataura Mill monitoring sensors. We note that while the indoor sensor picks up a modest amount of NH₃ (up to 16 ppm) the mean and median concentrations for the initial 3 weeks of monitoring are 6.1 and 5.8 ppm, respectively. There is a strong diurnal variation in the indoor NH₃ concentrations as the day warms up. The outdoor sensor remains below the limit of detection (2 ppm) over the 3-week period, with PI visiting the site to confirm the validity of the outputs from the outdoor sensor in the week of the 4th of December. On the basis that the outdoor sensor is performing to specifications there have been no exceedances in the outdoor NH₃-concentrations as per consent conditions from the 8-26 November 2017. At this early stage there appears to be a relatively strong correlation between air temperature and NH₃ concentration recorded by the indoor air sensor – specifically NH₃ concentration peaks with air temperature.

1 Week 1: 8-12 November 2017

The first week of monitoring shows some disturbed signals in the initial data record for the outdoor sensor, with a maximum value of 3 ppm, while the indoor sensor was not online. Subsequently all reading has been below the detection limit (c. 2 ppm) of the sensor. This may reflect instrument lag associated with the heating of the measurement cell to operational temperatures. PI will be re-evaluating the signal of the outdoor sensor the week of the 4th of December in terms of operational performance.

Table 1. Outdoor Sensor, Summary statistics for Week 1 (8-12 November 2017). AT - Ambient Temperature, AH - Ambient Humidity – NH₃ measured in parts per million.

WEEK 8-12/11/2017	AT (°C)	AH (%)	NH ₃ _OUT
Mean	16.5	48.8	0.6
Standard error	0.1	0.3	0.07
Median	16.3	48.9	0
Mode	15.9	51.5	0
Minimum	14.5	42.5	0
Maximum	18.9	54.4	2.9
Confidence level (95.0%)	0.21	0.63	0.14

2 Week 2: 13-19 November 2017

In the second week of monitoring the outdoor monitor continued to show no or low detection of ammonia. The indoor sensor came online part way through the week and began recordings readings as high as 10 ppm.

Table 2. Both Sensors, Summary statistics for Week 2 (13-19 November 2017).

WEEK 2 (13-18/11/2017)	AT (°C)	AH (%)	NH ₃ _OUT	NH ₃ _IND
Mean	18.5	46.9	0	5.1
Standard error	0.13	0.23	0	0.18
Median	18.7	47.1	0	4.8
Mode	20.7	44.8	0	4.4
Range	6.9	15	0	7.9
Minimum	14.6	39.7	0	2.5
Maximum	21.6	54.8	0	10.4
Confidence level (95.0%)	0.27	0.4	0	0.3

Where NH₃_OUT = outdoor sensor; NH₃_IND = indoor sensor.

3 Week 3: 20-26 November 2017

In week three both sensors are recording, and no change has been seen in the outdoor sensor. The indoor sensor continues read a fluctuation in ammonia as the days warm up, with a concentration peak around 4 pm.

Table 3. Summary statistics for Week 3 (20-26 November 2017).

WEEK 3 (20-26/11/2017)	AT (°C)	AH (%)	NH3_OUT	NH3_IND
Mean	20.9	52.1	0	6.7
Standard error	0.12	0.2	0	0.18
Median	20.7	51.9	0	6.1
Mode	20.3	#N/A	0	4.5
Range	5.7	11.8	0	10.7
Minimum	18.5	47	0	3.8
Maximum	24.3	58.9	0	14.5
Confidence level(95.0%)	0.24	0.39	0	0.36

N.B

If you have any questions regarding the information provided in this letter, please contact Simon Bloomberg on 0274 526 941 or via email at simon.bloomberg@e3scientific.co.nz



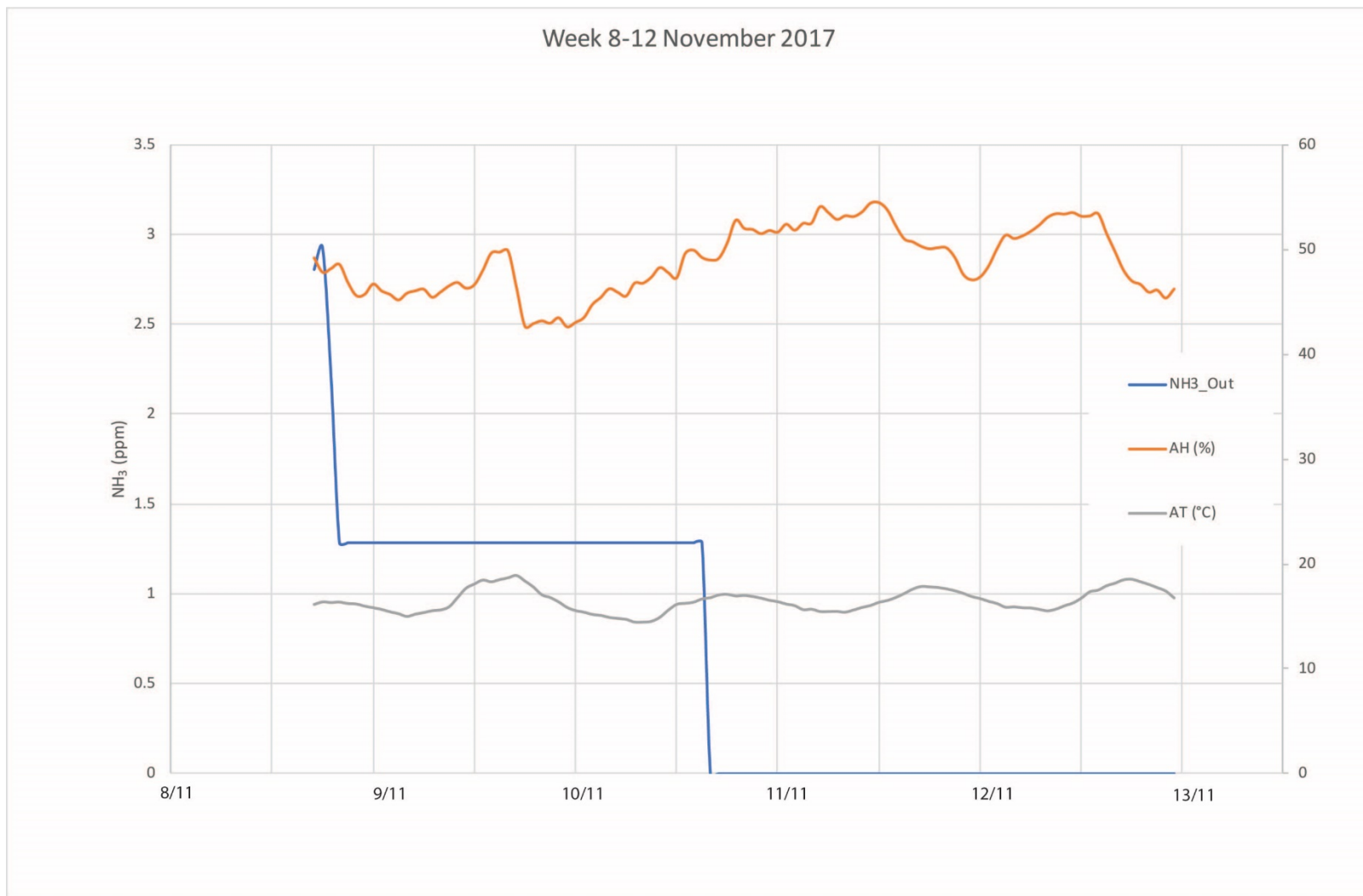


Figure 1. Week 1 of monitoring (8-12 November 2017). Note the initially elevated readings of ammonia quickly fall off as the sensor settles in.

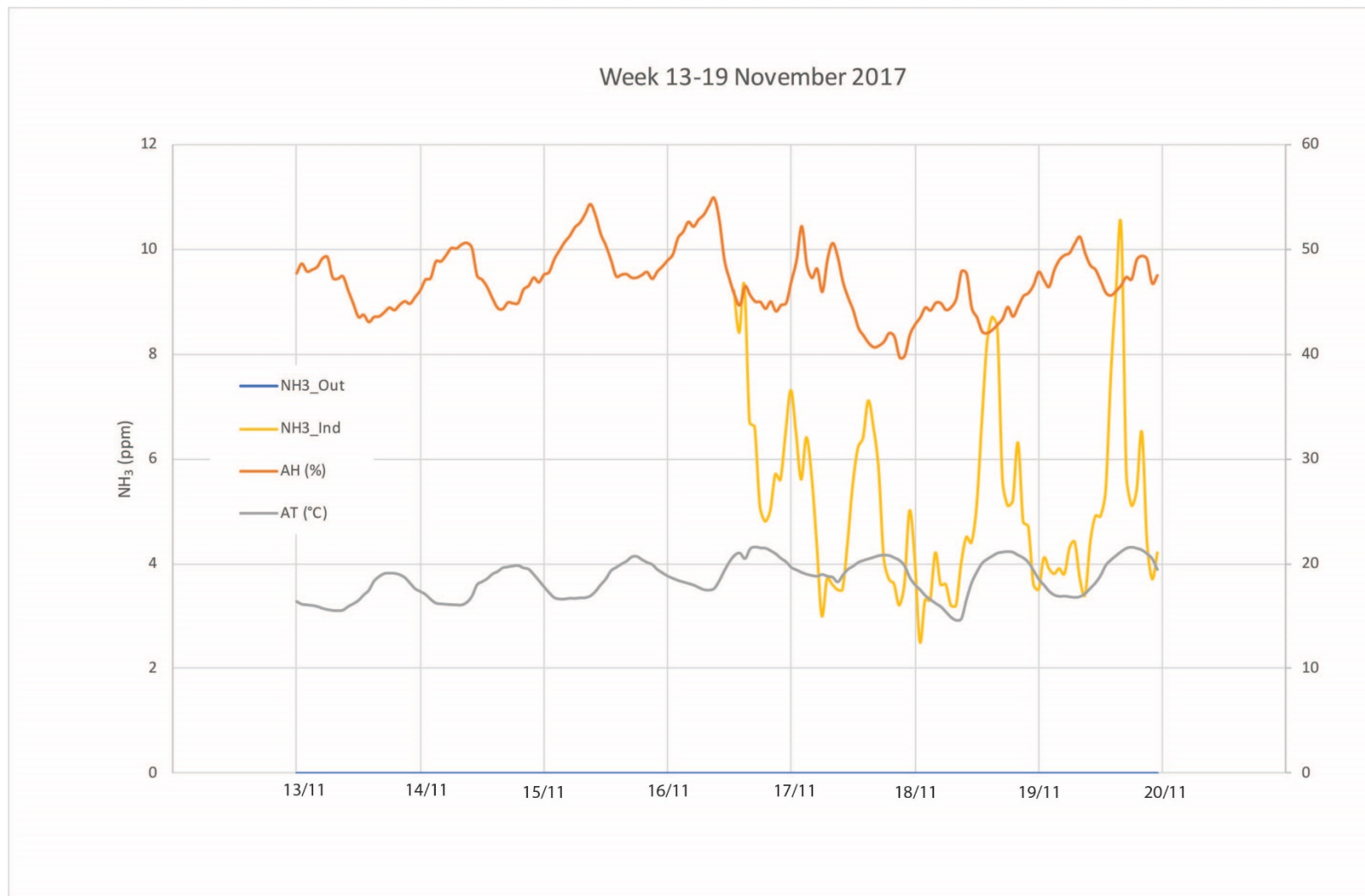


Figure 2. Week 2 of monitoring (13-19 November 2017). The outdoor sensor remains at 0ppm NH₃ while the indoor sensor comes online on the 16th of November and begins to pick up modest amounts of NH₃.

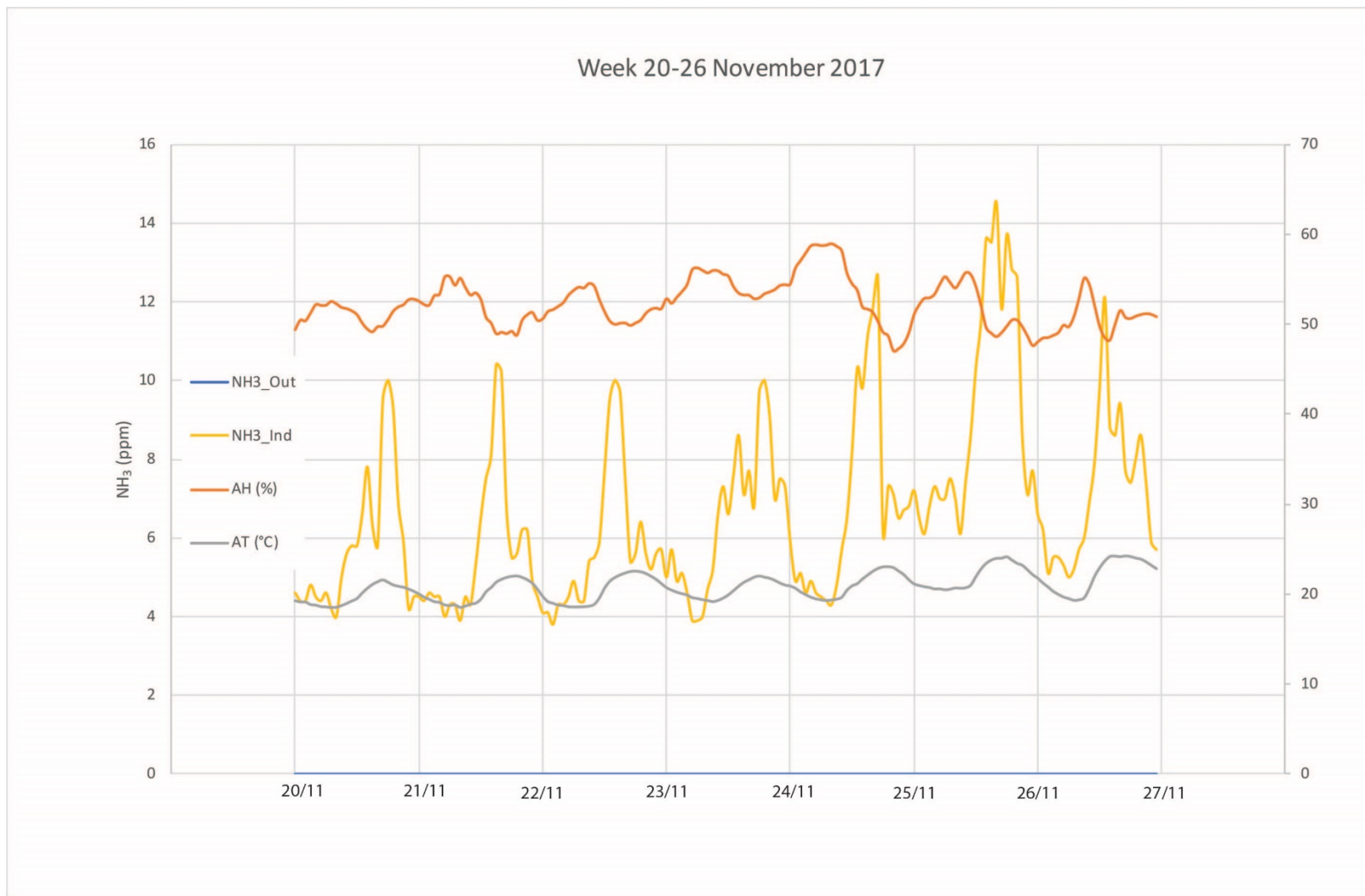


Figure 3. Week 3 of monitoring (20-26 November 2017). This week the indoor sensor shows no concentration of NH₃ above the limit of detection while the indoor sensor shows some elevated NH₃ during a warm day on the 25th of November.