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Land and Water Science
61 Leet Street
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Stephen Parry
Chief Executive
Gore District Council
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1st March 2019

Dear Stephen

RE: NH_3 Monitoring Report 01 – 28 February 2018

Gore District Council (GDC) engaged Land and Water Science to conduct continuous monitoring of ammonia (NH_3) gas emissions from the Mataura Mill dross storage site (121 Kana Street, Mataura) from April 2018. GDC require emission values to comply with consent conditions that specify a limit of 5 ppm NH_3 discharged to air. In February 2017, Photonic Innovations (PI) installed two NH_3 sensors for comparison of the indoor and outdoor ammonia levels. Measurements are recorded continuously and reported as a 5-minute average for both the outdoor and indoor sensors. The outdoor sensor was out of service from mid-March 2018 until the end September 2018.

Weekly summaries of the indoor and outdoor emission results from monitoring between 01 February and 28 February are presented in this report. During this period the maximum NH_3 concentration detected by the indoor sensor was 12.7 ppm (Figure 1 and Table 1) and 6.4 ppm for the outdoor sensor (Figure 2 and Table 2). Mean and median NH_3 concentrations during this period were 7.3 and 7.2 ppm for the indoor sensor and 0.8 and 0.7 ppm for the outdoor sensor. The maximum ammonia concentration for both the indoor and outdoor sensors exceeded the consented amount of 5 ppm. An increase in NH_3 concentration is expected during the spring and summer months due to higher air temperatures.

Daily (diurnal) variation in NH_3 concentration shows a consistent pattern in the data. Specifically, NH_3 concentration is strongly correlated with air temperature, reaching maximum values as air temperatures peak during the day and minimum values at night when air temperatures are at their lowest. Although diurnal variation is evident in the data, average air temperature is a greater control over the absolute concentration with maximum concentrations recorded during the warmest months of the year and minimum concentrations recorded during the coolest months of the year. The correlation between air temperature and NH_3 concentration for this reporting period is displayed in Figure 1 and Figure 2.

Table 1. Summary statistics for the indoor NH_3 sensor, 01 February – 28 February 2018. NH_3 measured in parts per million (ppm).

Date	01-02 Feb	03 - 09 Feb	10 - 16 Feb	17 - 22 Feb	24 - 28 Feb
Mean	3.1	5.1	7.3	5.4	3.7
Standard deviation	0.6	1.7	2.4	1.6	1.3
Median	3.0	5.2	7.2	5.2	3.6
Minimum	2.2	1.3	1.8	2.2	1.4
Maximum	5.0	9.5	12.7	9.8	7.6

Table 2. Summary statistics for the outdoor NH_3 sensor, 01 February – 28 February 2018. NH_3 measured in parts per million (ppm).

Date	01-02 Feb	03 - 09 Feb	10 - 16 Feb	17 - 22 Feb	24 - 28 Feb
Mean	0.8	0.7	0.8	0.8	0.7
Standard deviation	0.7	0.6	0.5	0.5	0.5
Median	0.6	0.6	0.7	0.7	0.6
Minimum	0.4	0.3	0.3	0.3	0.3
Maximum	5.5	6.4	5.5	5.4	5.7

01 – 02 February 2019

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 5.0 ppm for this period. Mean and median values were 3.1 and 3.0 ppm. The outdoor NH_3 concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 5.5 ppm for this period. Mean and Median values were 0.8 and 0.6 ppm.

03 – 09 February 2019

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 9.5 ppm for this period. Mean and median values were 5.1 and 5.2 ppm. The outdoor NH_3 concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 6.4 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

10 – 16 February 2019

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 12.7 ppm for this period. Mean and median values were 7.3 and 7.2 ppm. The outdoor NH_3 concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 5.5 ppm for this period. Mean and Median values were 0.8 and 0.7 ppm.

17 – 22 February 2019

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 9.8 ppm for this period. Mean and median values were 5.4 and 5.2 ppm. The outdoor NH_3 concentration levels showed consistent variation for

most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 5.4 ppm for this period. Mean and Median values were 0.8 and 0.7 ppm.

24 – 28 February 2019

During these two days, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 7.6 ppm for this period. Mean and median values were 3.7 and 3.6 ppm. The outdoor NH_3 concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 5.7 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

Summary

During the monitoring period (01 – 28 February) indoor NH_3 concentrations reached a maximum of 12.7 ppm, while mean and median concentrations were 7.3 and 7.2 ppm. These values are consistent with that expected of warmer weather conditions. Outdoor concentrations were a maximum of 6.4 ppm, while mean and median concentrations were at 0.8 and 0.7 ppm. The higher values of NH_3 concentrations were recorded on days with higher maximum temperatures. Based on this data, temperature continues to be the most dominant control over NH_3 concentration.

Kind regards

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Land and Water Science Ltd

Dr Lisa Pearson
Lead Earth and Environmental Scientist
Land and Water Science Ltd

For public access to the real-time data go to: ***http://35.189.3.224:3000/login***
Log in email: gcc@photonicinFebations.com and use the **password:** Pa5%w

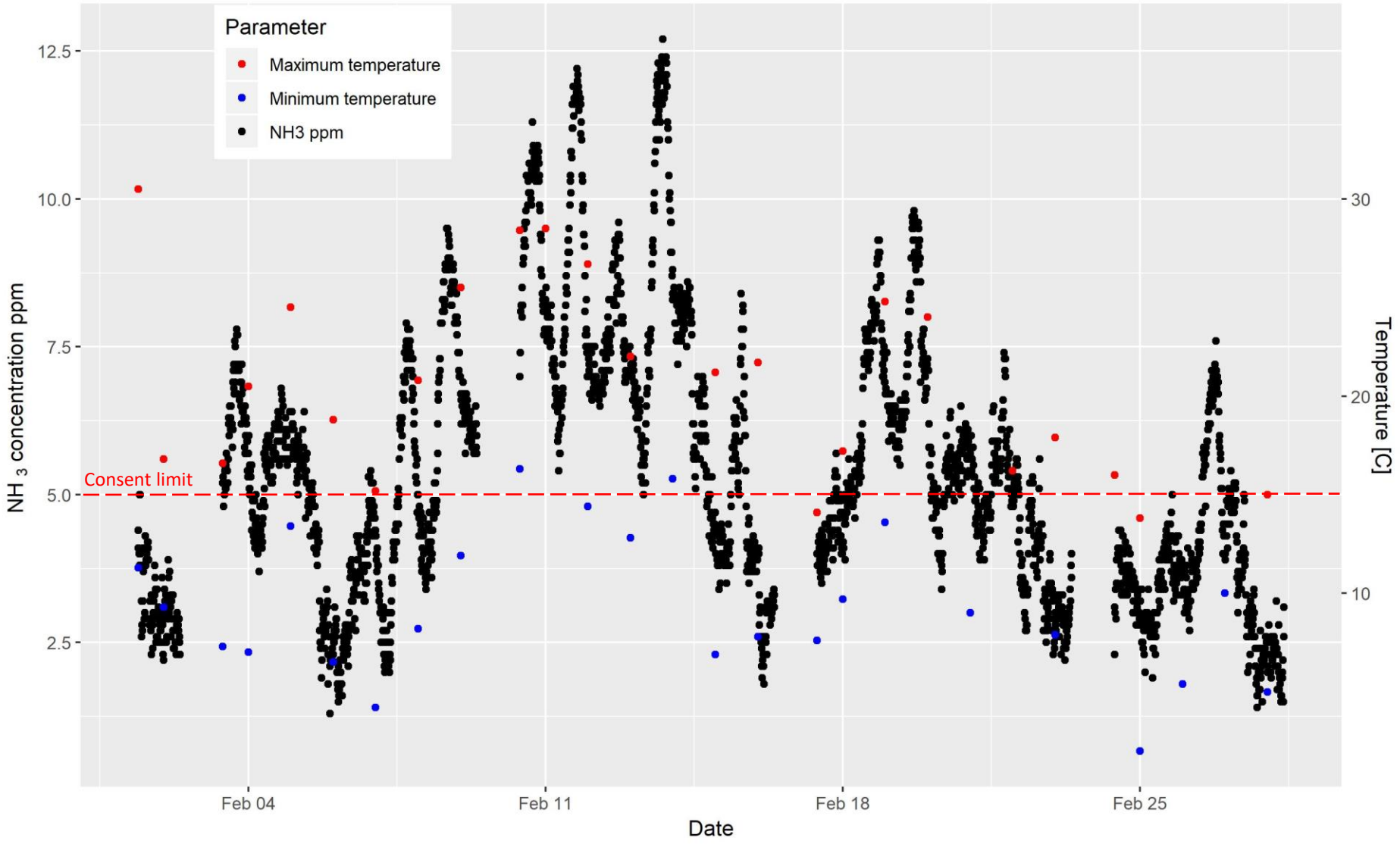

Figure 1: Continuous indoor NH_3 concentration and maximum daily temperature.

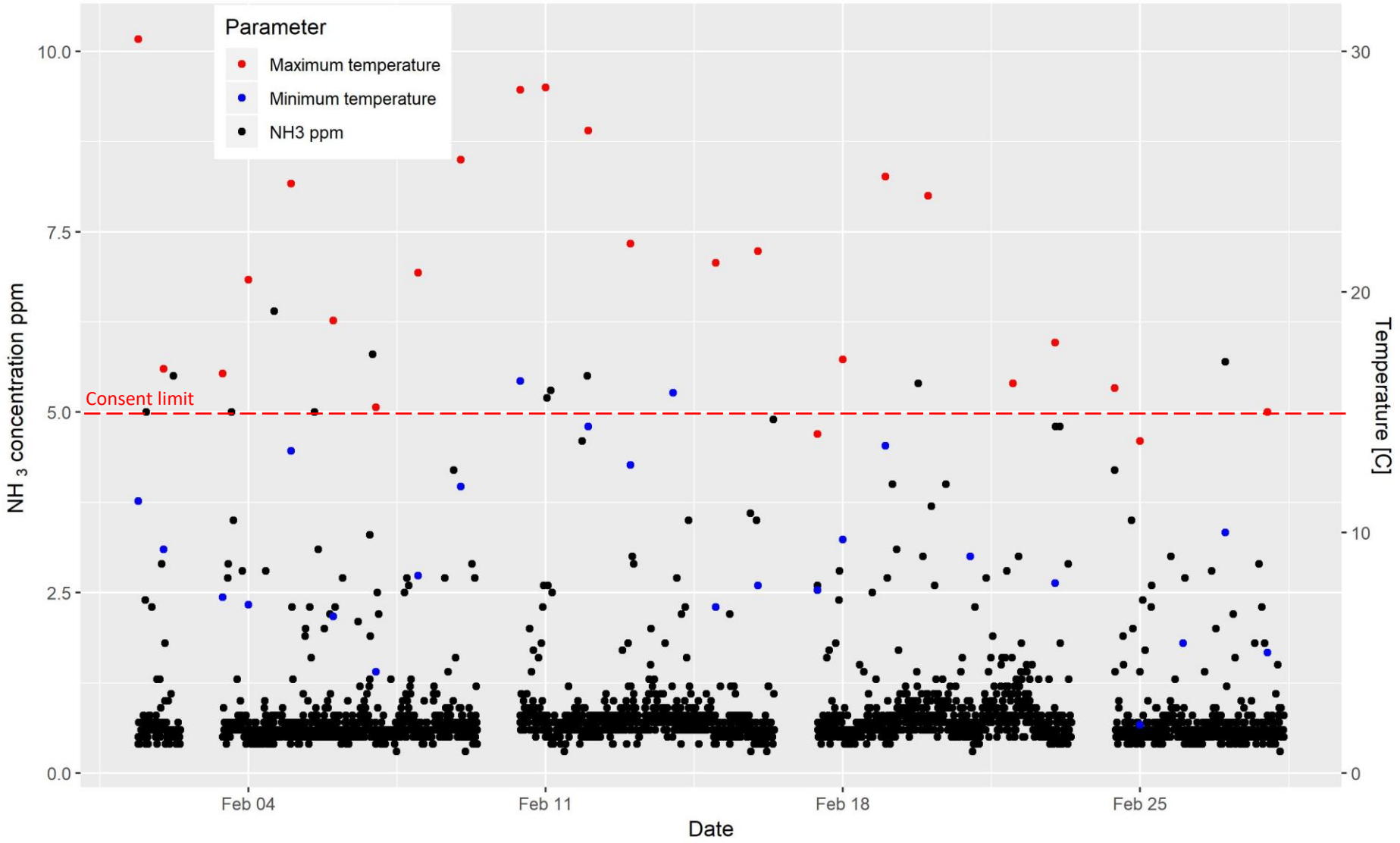

Figure 2: Continuous outdoor NH_3 concentration and maximum daily temperature.