



Stephen Parry
Chief Executive
Gore District Council
PO Box 8
Gore, 9740

Land and Water Science
61 Leet Street
Invercargill, 9810

3 December 2018

Dear Stephen

RE: Weekly NH₃ Monitoring Report 01 – 30 November 2018

In April 2018 Gore District Council (GDC) engaged Land and Water Science to conduct continuous monitoring of ammonia (NH₃) gas emissions from the Mataura Mill dross storage site (121 Kana Street, Mataura). GDC require emission values to comply with consent conditions that specify a limit of 5 ppm NH₃ discharged to air. In November 2017, Photonic Innovations (PI) installed two NH₃ Sensors for comparison of the indoor and outdoor ammonia levels. The outdoor sensor has been out of service since 18 March 2018. PI have since rectified connectivity issues and the sensor has been re-installed. Measurements are reported for both the outdoor and indoor sensors for the month of November.

Weekly summaries of the indoor and outdoor emission results from monitoring between 01 November and 30 November are presented in this report. During this period the maximum NH₃ concentration detected by the indoor sensor was 10.9 ppm (Figure 1 and Table 1) and 7.8 ppm for the outdoor sensor (Figure 2 and Table 2). Mean and median NH₃ concentrations during this period were 4.2 and 3.6 ppm for the indoor sensor 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 NH₃ concentration is expected during the spring and summer months due to higher air temperatures.

Daily (diurnal) variation in NH₃ concentration shows a consistent pattern in the data. Specifically, NH₃ 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 NH₃ concentration for this reporting period is displayed in Figure 1 and Figure 2.

Table 1. Summary statistics for the indoor NH₃ sensor, 01 November – 30 November 2018. NH₃ measured in parts per million (ppm).

Date	01 -04 Nov	05 - 11 Nov	12 - 18 Nov	19 - 25 Nov	26 - 30 Nov
Mean	2.3	3.3	4.2	3.6	3.5
Standard deviation	0.9	1.2	1.8	1.9	1.3
Median	2.1	2.9	3.6	2.9	3.1
Minimum	0.9	1.4	1.9	1.0	1.2
Maximum	5.0	7.5	10.9	10.0	9.2

Table 2. Summary statistics for the outdoor NH₃ sensor, 01 November – 30 November 2018. NH₃ measured in parts per million (ppm).

Date	01 -04 Nov	05 - 11 Nov	12 - 18 Nov	19 - 25 Nov	26 - 30 Nov
Mean	0.7	0.6	0.7	0.7	0.7
Standard deviation	0.2	0.2	0.3	0.3	0.3
Median	0.6	0.6	0.6	0.6	0.7
Minimum	0.3	0.3	0.3	0.3	0.3
Maximum	1.9	2.7	7.8	6.0	3.4

01 - 04 November 2018

During this day, maximum indoor concentration was 5.0 ppm for this period. Mean and median values were 2.3 and 2.1 ppm respectively. The outdoor NH₃ concentration levels showed consistent variation for most of the day with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 1.9 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

05 – 11 November 2018

During this week, indoor NH₃ concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 7.5 ppm for this period. Mean and median values were 3.3 and 2.9 ppm. The outdoor NH₃ concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 2.7 ppm for this period. Mean and Median values were 0.6 ppm.

12 – 18 November 2018

During this week, indoor NH₃ concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 10.9 ppm for this period. Mean and median values were 4.2 and 3.6 ppm. The outdoor NH₃ concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 7.8 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

19 – 25 November 2018

During this week, indoor NH₃ concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 10.0 ppm for this period. Mean and median values

were 3.6 and 2.9 ppm. The outdoor NH₃ concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 6.0 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

26 – 30 November 2018

During this week, indoor NH₃ concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 9.2 ppm for this period. Mean and median values were 3.5 and 3.1 ppm. The outdoor NH₃ concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 3.4 ppm for this period. Mean and Median values were 0.7 ppm.

Summary

During the five-week monitoring period (01 – 30 November) indoor NH₃ concentrations reached a maximum of 10.9 ppm, while mean and median concentrations were 4.2 and 3.6 ppm. These values are consistent with that expected in the current warming weather conditions and there are signs of increased NH₃ gas activity during this period. Outdoor concentrations reached a maximum of 7.8 ppm, while mean and median concentrations were both 0.7 ppm. Outdoor NH₃ concentrations are significantly dampened by higher rates of dilution relative to those occurring indoor. The higher values of NH₃ concentrations were recorded on days with higher maximum temperatures. Based on this data, temperature appears to be the most dominant control over NH₃ concentration.

Kind regards,



Jessie Lindsay
Environmental and GIS Scientist
Land and Water Science



Dr Clint Rissmann
Director
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@photonicinnoventions.com and use the password: Pa5%w0rd

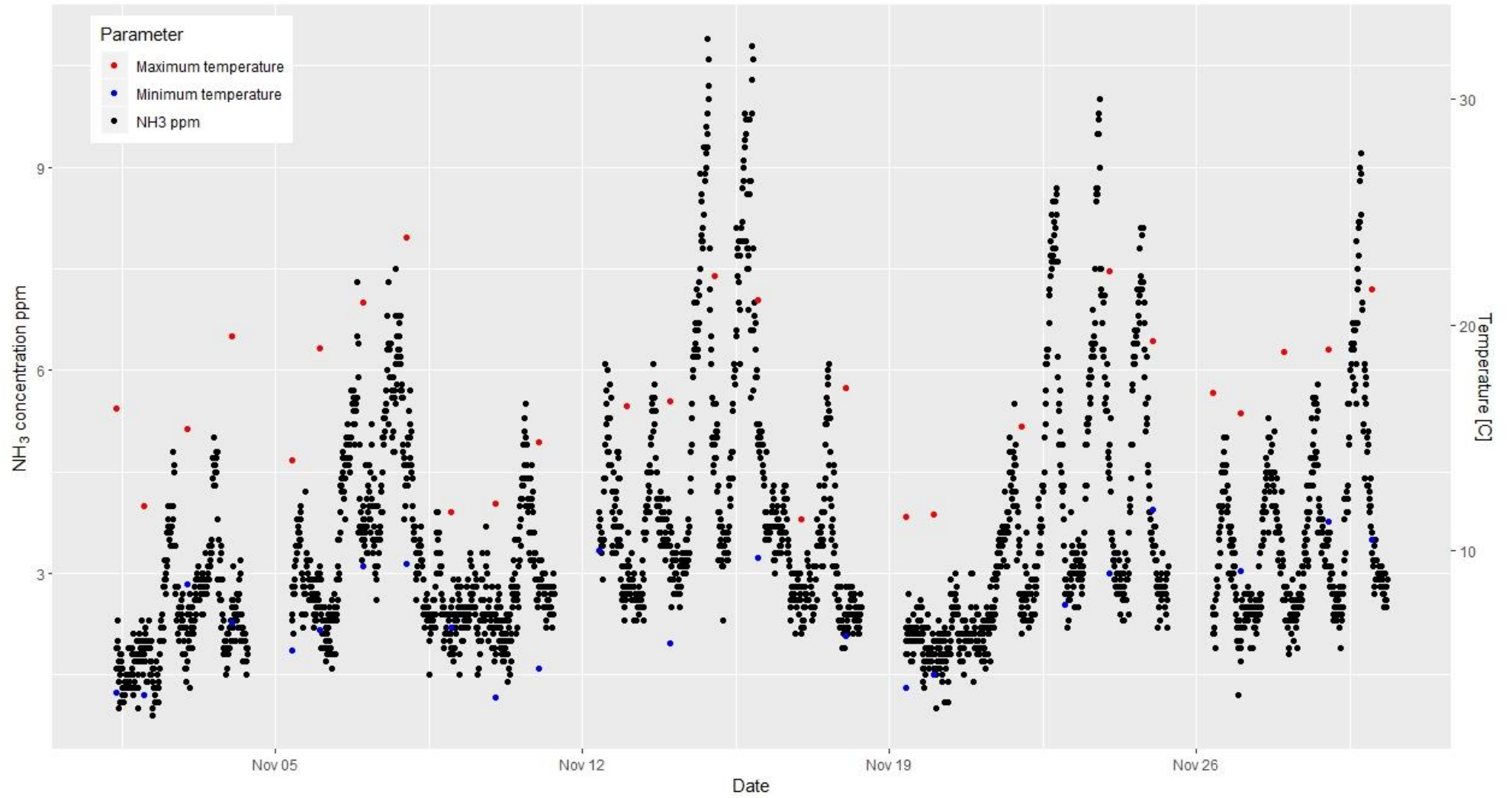


Figure 1: Continuous indoor NH₃ concentration, maximum daily temperature

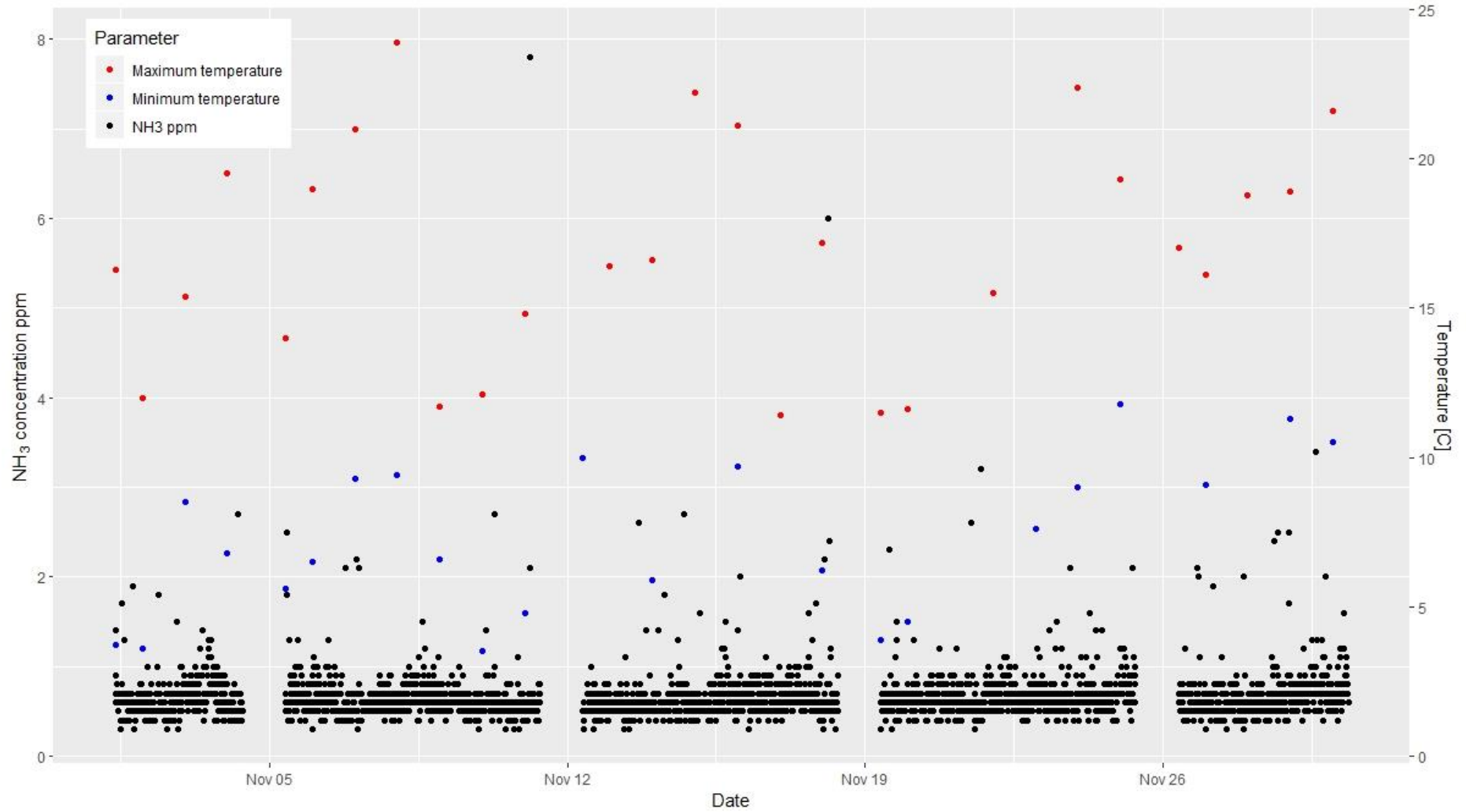


Figure 2: Continuous outdoor NH₃ concentration, maximum daily temperature