Report number: 2018/23
Project Number: 18003

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Land and Water Science
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3 September 2018

Dear Stephen

RE: Weekly NH_3 Monitoring Report 01 – 31 August 2018

In April 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). GDC require emission values to comply with consent conditions that specify a limit of 5 ppm NH_3 discharged to air. In November 2017, Photonic Innovations (PI) installed two NH_3 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 August.

Weekly summaries of the indoor and outdoor emission results from monitoring between 01 August and 31 August are presented in this report. During this period the maximum NH_3 concentration detected by the indoor sensor was 6.3 ppm (Figure 1 and Table 1) and 9.2 ppm for the outdoor sensor (Figure 2 and Table 2). Mean and median NH_3 concentrations during this period were also 2.9 ppm for the indoor sensor and 0.8 ppm for the outdoor sensor. The maximum temperature 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, 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 NH_3 sensor, 01 August – 31 August 2018. NH_3 measured in parts per million (ppm).

Date	01- 05 August	06 - 12 August	13 - 19 August	20 - 26 August	27 - 31 August
Mean	2.8	2.3	2.8	2.6	2.9
Standard deviation	0.7	0.6	0.7	0.7	0.9
Median	2.7	2.2	2.8	2.5	2.8
Minimum	1	0.7	1.3	0.7	1.2
Maximum	5.2	4.4	5.4	5	6.3

Table 2. Summary statistics for the outdoor NH_3 sensor, 01 August – 31 August 2018. NH_3 measured in parts per million (ppm).

Date	01- 05 August	06 - 12 August	13 - 19 August	20 - 26 August	27 - 31 August
Mean	0.7	0.7	0.7	0.8	0.8
Standard deviation	0.3	0.5	0.6	0.5	0.5
Median	0.6	0.6	0.7	0.7	0.7
Minimum	0.3	0.2	0.3	0.3	0.3
Maximum	4.6	5.9	9.2	6	5.6

01 – 05 August 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 5.2 ppm for this period. Mean and median values were 2.8 and 2.7 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 4.6 ppm for this period. Mean and Median values were 0.7 ppm and 0.6 ppm.

06 – 12 August 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 4.4 ppm for this period. Mean and median values were 2.3 and 2.2 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 5.9 ppm for this period. Mean and Median values were 0.7 and 0.6 ppm.

13 – 19 August 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 5.4 ppm for this period. Mean and median values were both 2.8 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 9.2 ppm for this period. Mean and Median values were both 0.7 ppm.

20 – 26 August 2018

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 2.6 and 2.5 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 ppm for this period. Mean and Median values were 0.8 and 0.7 ppm.

27 – 31 August 2018

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 6.3 ppm for this period. Mean and median values were 2.9 and 2.8 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 5.6 ppm for this period. Mean and Median values were 0.8 and 0.7 ppm.

Summary

During the five-week monitoring period (01 – 31 August) indoor NH_3 concentrations were a maximum of 6.3 ppm, while mean and median concentrations were 2.9 and 2.8 ppm. These values are consistent with that expected in the current warming weather conditions and there are signs of increased NH_3 gas activity during this period. Outdoor concentrations were a maximum of 9.2 ppm, while mean and median concentrations were 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 appears to be the most dominant control over NH_3 concentration.

Kind regards,

Jessie Lindsay
Environmental and GIS Scientist
Land and Water Science

For public access to the real-time data go to: ***http://35.189.3.224:3000/login***
Log in email: gcc@photonicinnovations.com and use the **password:** Pa5%w0rd

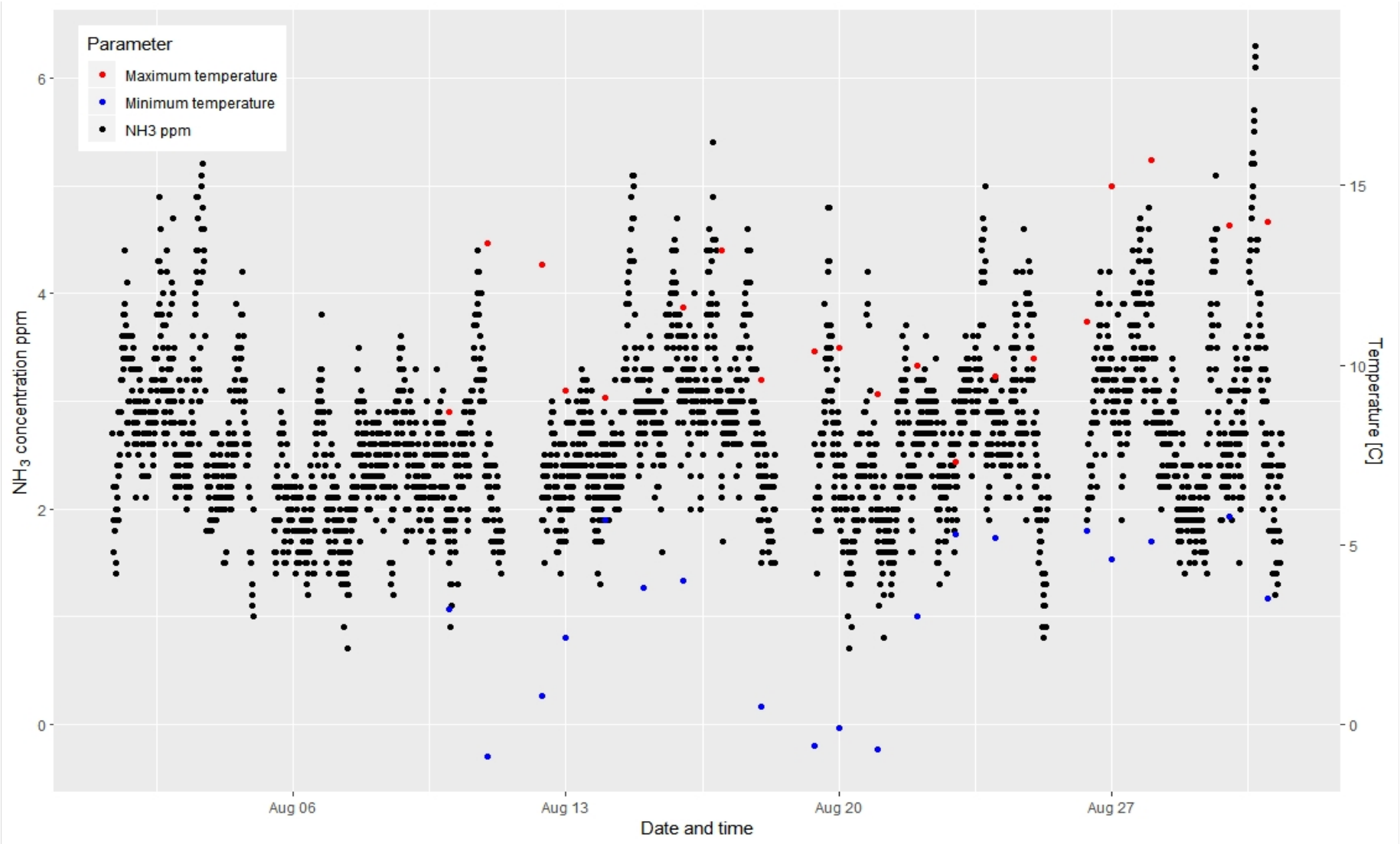

Figure 1: Continuous indoor NH_3 concentration, maximum daily temperature

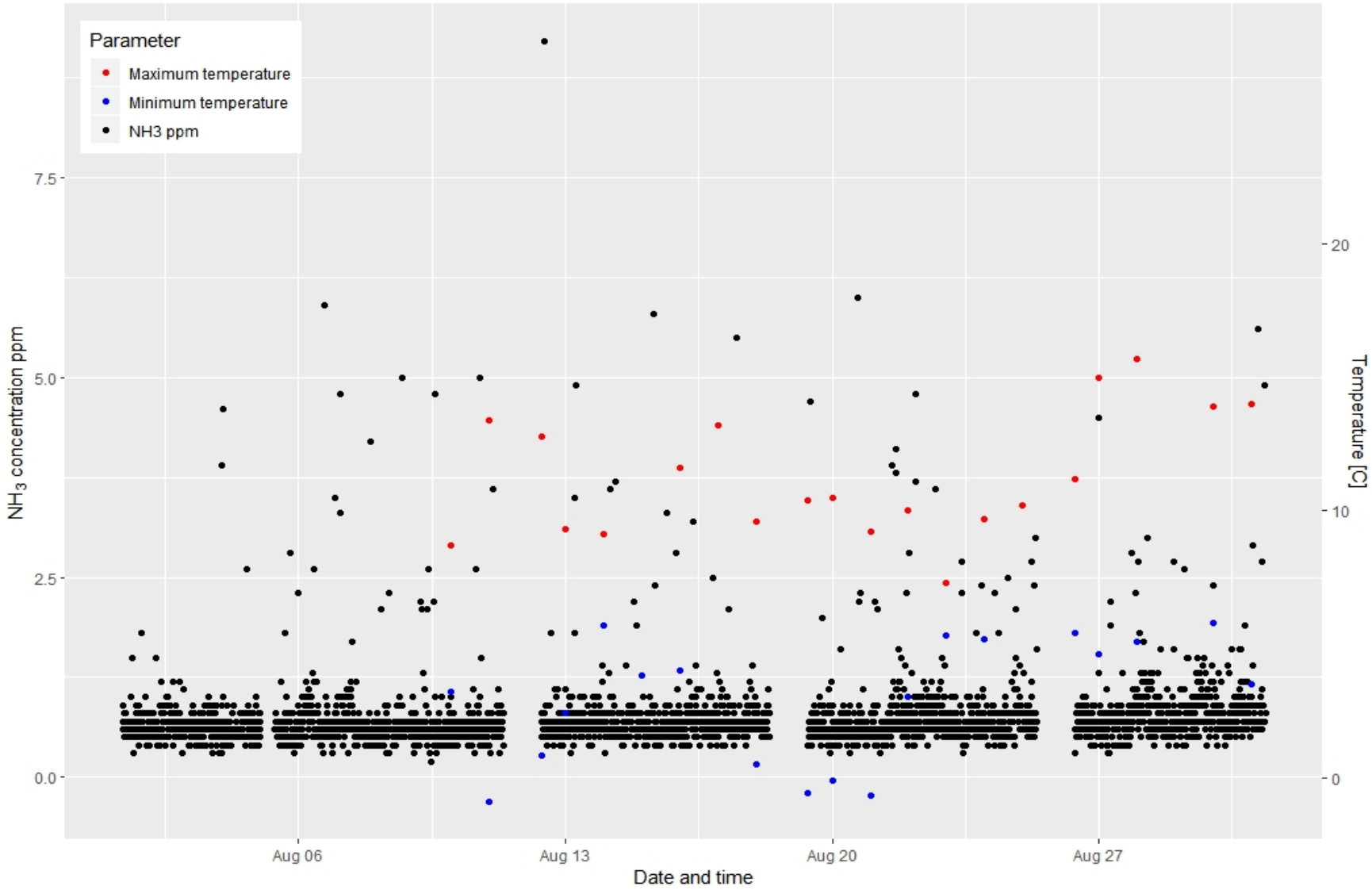

Figure 2: Continuous outdoor NH_3 concentration, maximum daily temperature