Land and Water Science
61c Leet Street
Invercargill, 9810

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

4th February 2020

Dear Stephen

RE: NH_3 Monitoring Report 01 – 31 January 2020

Background

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 March 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.

January Summary

Weekly summaries of the indoor and outdoor emission results from monitoring between 01 January and 31 January are presented in this report. During this period the maximum NH_3 concentration detected by the indoor sensor was 11.2 ppm (Figure 1 and Table 1) and 6.0 ppm for the outdoor sensor (Figure 2 and Table 2). Mean and median NH_3 concentrations during this period were 4.7 and 4.2 ppm for the indoor sensor and were 0.7 and 0.6 ppm for the outdoor sensor. The maximum ammonia concentration for both sensors exceeded the consented amount of 5.0 ppm on numerous occasions.

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 January – 31 January 2020. NH_3 measured in parts per million (ppm).

Date	01-07 Jan	08-14 Jan	15-21 Jan	22-28 Jan	29-31 Jan
Mean	3.2	2.1	3.4	4.7	3.8
Std Dev	1.3	0.7	1.4	1.5	0.9
Median	3.3	2.0	3.0	4.2	3.9
Minimum	0.9	0.8	1.3	2.5	1.5
Maximum	7.5	4.6	8.5	11.2	6.6

Table 2. Summary statistics for the outdoor NH_3 sensor, 01 January – 31 January 2020. NH_3 measured in parts per million (ppm).

Date	01-07 Jan	08-14 Jan	15-21 Jan	22-28 Jan	29-31 Jan
Mean	0.7	0.7	0.7	0.8	0.7
Std Dev	0.4	0.3	0.3	0.2	0.5
Median	0.6	0.6	0.6	0.7	0.6
Minimum	0.4	0.3	0.3	0.3	0.3
Maximum	4.9	4.0	4.2	3.1	6.0

01 - 07 Jan 2020

During this week, the indoor NH_3 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 3.2 and 3.3 ppm respectively. 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 4.9 ppm for this period. Outdoor mean and median values were 0.7 and 0.6 ppm respectively.

08 – 14 Jan 2020

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 4.6 ppm for this period. Mean and median values were 2.1 and 2.0 ppm respectively. 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 4.0 ppm for this period. Outdoor mean and median values were 0.7 and 0.6 ppm respectively.

15 – 21 Jan 2020

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 8.5 ppm for this period. Mean and median values were 3.4 and 3.0 ppm respectively. 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 4.2 ppm for this period. Mean and median values were 0.7 ppm and 0.6 ppm respectively.

22 – 28 Jan 2020

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 11.2 ppm for this period. Mean and median values were 4.7 and 4.2 ppm respectively. 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 3.1 ppm for this period. Mean and median values were 0.8 and 0.7 ppm respectively.

29 – 31 Jan 2020

During this week, indoor NH_3 concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 6.6 ppm for this period. Mean and median values were 3.8 and 3.9 ppm respectively. 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 6.0 ppm for this period. Mean and median values were 0.7 and 0.6 ppm respectively.

Summary

During the monitoring period (01 – 31 January) indoor NH_3 concentrations reached a maximum of 11.2 ppm, while mean and median concentrations were both 4.7 and 4.2 ppm respectively. Outdoor concentrations were a maximum of 6.0 ppm, while mean and median concentrations were 0.7 and 0.6 ppm respectively. Elevated NH_3 concentrations were detected by the outdoor sensor when air temperatures were high and atmospheric conditions calm preventing the NH_3 from dissipating. The indoor and outdoor sensor exceeded the consent conditions of 5.0 ppm during the month of January. These values are consistent with warmer summer temperatures. Overall, temperature continues to be the most dominant control over NH_3 concentration. **Any personnel needing to enter the building should check the monitoring sensor prior to entering and open doors to vent building before working.**

Kind regards

Richard Dean
Consultant Engineer
Land and Water Science Ltd

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@photonicinnovations.com and use the **password:** Pa5%w0rd

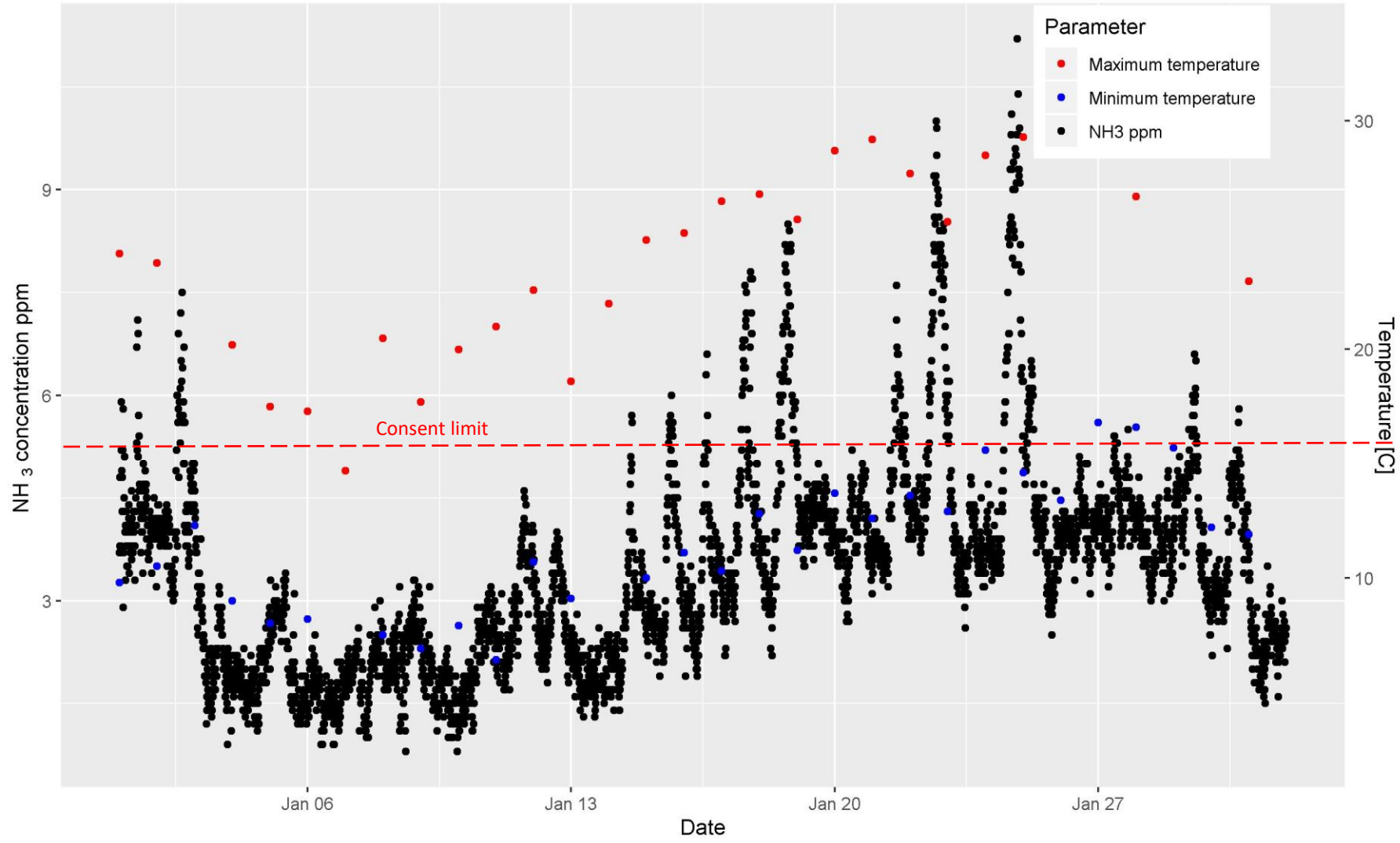

Figure 1: Continuous indoor NH_3 concentration and maximum daily temperature.

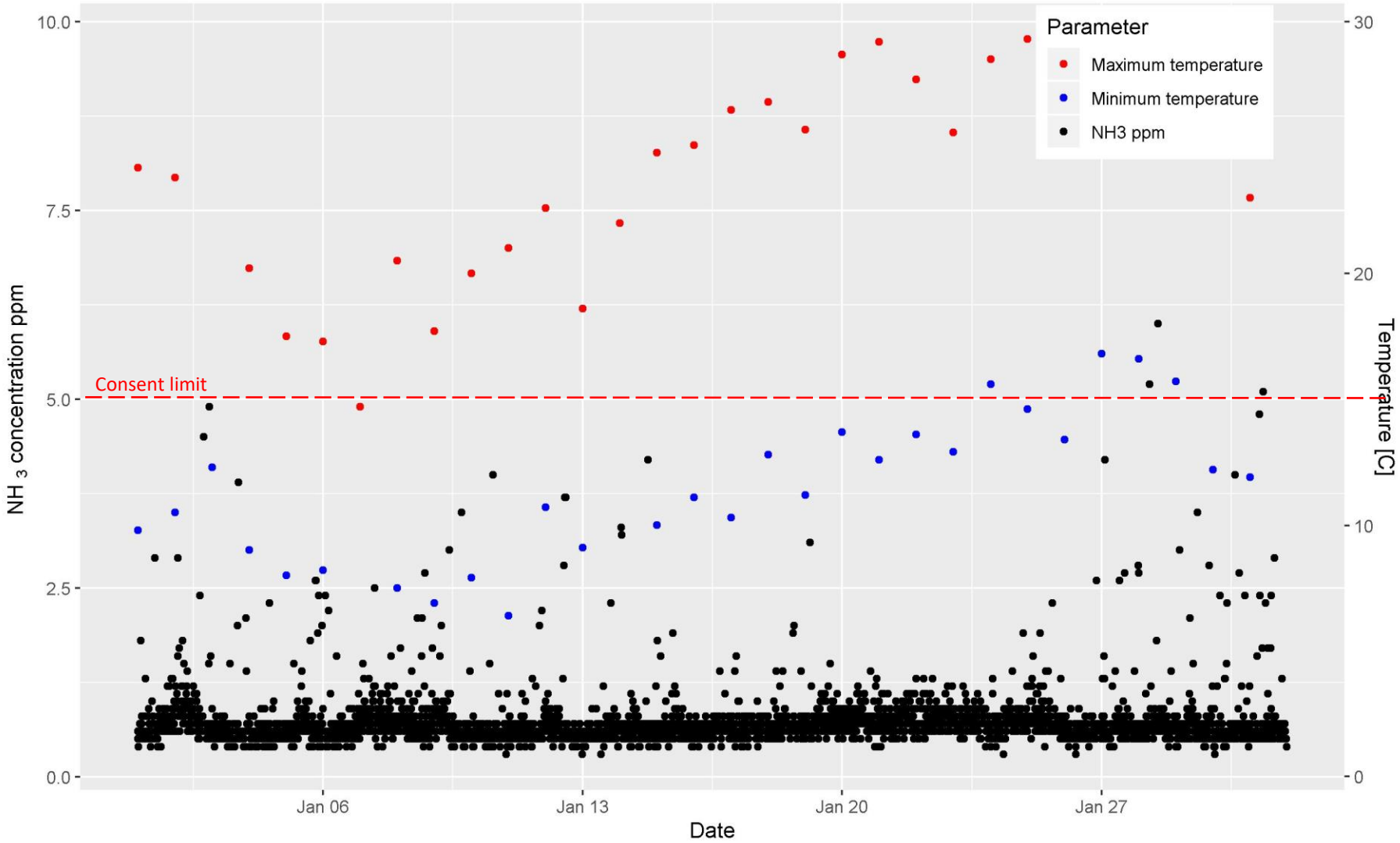

Figure 2: Continuous outdoor NH_3 concentration and maximum daily temperature.