

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

8th January 2020

Dear Stephen

RE: NH₃ Monitoring Report 01 – 31 December 2019

Background

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) from April 2018. GDC require emission values to comply with consent conditions that specify a limit of 5 ppm NH₃ discharged to air. In March 2017, Photonic Innovations (PI) installed two NH₃ 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.

December Summary

Weekly summaries of the indoor and outdoor emission results from monitoring between 01 December and 31 December are presented in this report. During this period the maximum NH₃ concentration detected by the indoor sensor was 9.5 ppm (Figure 1 and Table 1) and 6.3 ppm for the outdoor sensor (Figure 2 and Table 2). Mean and median NH₃ concentrations during this period were 3.3 and 3.1 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 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 October – 31 October 2019. NH₃ measured in parts per million (ppm).

Date	01-07 Dec	08-14 Dec	15-21 Dec	22-28 Dec	29-31 Dec
Mean	3.7	3.5	2.7	2.9	3.7
Std Dev	0.9	1.4	0.8	0.9	1.3
Median	3.6	3.2	2.6	2.8	3.1
Minimum	1.8	0.8	0.3	1	1.6
Maximum	6.4	9.5	6.6	7.1	8.3

Table 2. Summary statistics for the outdoor NH₃ sensor, 01 October – 31 October 2019. NH₃ measured in parts per million (ppm).

Date	01-07 Dec	08-14 Dec	15-21 Dec	22-28 Dec	29-31 Dec
Mean	0.7	0.8	0.7	0.7	0.8
Std Dev	0.4	0.5	0.3	0.4	0.2
Median	0.6	0.7	0.7	0.6	0.7
Minimum	0.3	0.3	0.3	0.3	0.4
Maximum	5	6.3	4.4	5.9	2.7

01 - 07 Dec 2019

During this week, the indoor NH₃ concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 6.4 ppm for this period. Mean and median values were 3.7 and 3.6 ppm respectively. The outdoor NH₃ concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 5.0 ppm for this period. Outdoor mean and median values were 0.7 and 0.6 ppm respectively.

08 – 14 Dec 2019

During this week, indoor NH₃ 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 3.5 and 3.2 ppm respectively. The outdoor NH₃ concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 6.3 ppm for this period. Outdoor mean and median values were 0.8 and 0.7 ppm respectively.

15 – 21 Dec 2019

During this week, indoor NH₃ 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 2.7 and 2.6 ppm respectively. The outdoor NH₃ concentration levels showed consistent variation for most of the week with higher concentrations consistent with warmer temperatures. Maximum outdoor concentration was 4.4 ppm for this period. Mean and median values were both 0.7 ppm.

22 – 28 Dec 2019

During this week, indoor NH₃ concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 7.1 ppm for this period. Mean and median values were 2.9 and 2.8 ppm respectively. The outdoor NH₃ 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 respectively.

29 – 31 Dec 2019

During this week, indoor NH₃ concentration showed consistent diurnal variation for most of the week. Maximum indoor concentration was 8.3 ppm for this period. Mean and median values were 3.7 and 3.1 ppm respectively. 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 0.8 and 0.7 ppm respectively.

Summary

During the monitoring period (01 – 31 December) indoor NH₃ concentrations reached a maximum of 9.5 ppm, while mean and median concentrations were both 3.3 and 3.1 ppm respectively. Outdoor concentrations were a maximum of 6.3 ppm, while mean and median concentrations were 0.7 and 0.6 ppm respectively. Elevated NH₃ concentrations were detected by the outdoor sensor when minimum temperatures were below or near zero indicating the likelihood of very still atmospheric conditions, such as frost or fog, preventing the NH₃ from dissipating. The indoor and outdoor sensor exceeded the consent conditions of 5.0 ppm during the month of December. These values are consistent with warmer summer temperatures. Overall, temperature continues to be the most dominant control over NH₃ concentration.

Kind regards



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Consultant Engineer
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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

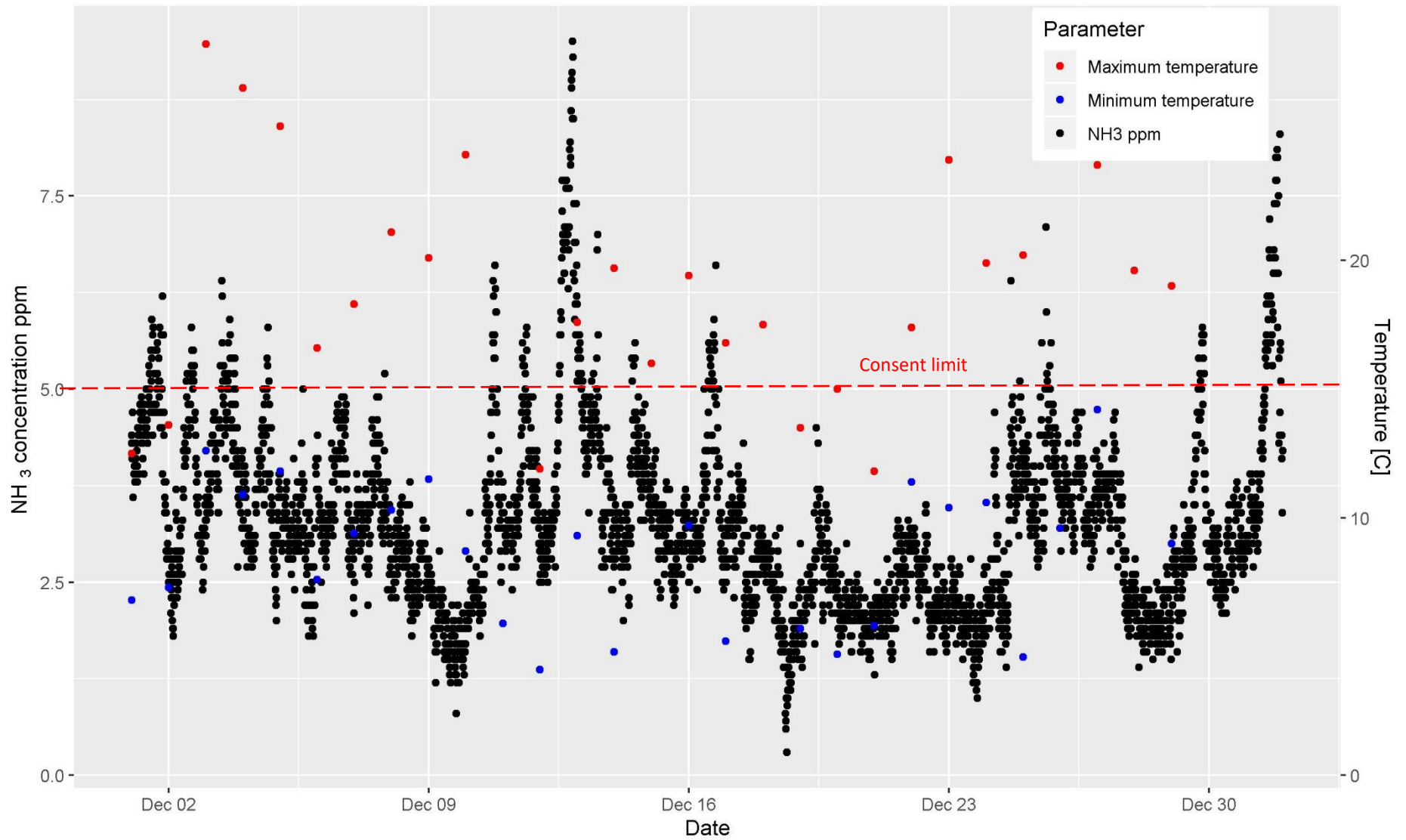


Figure 1: Continuous indoor NH₃ concentration and maximum daily temperature.

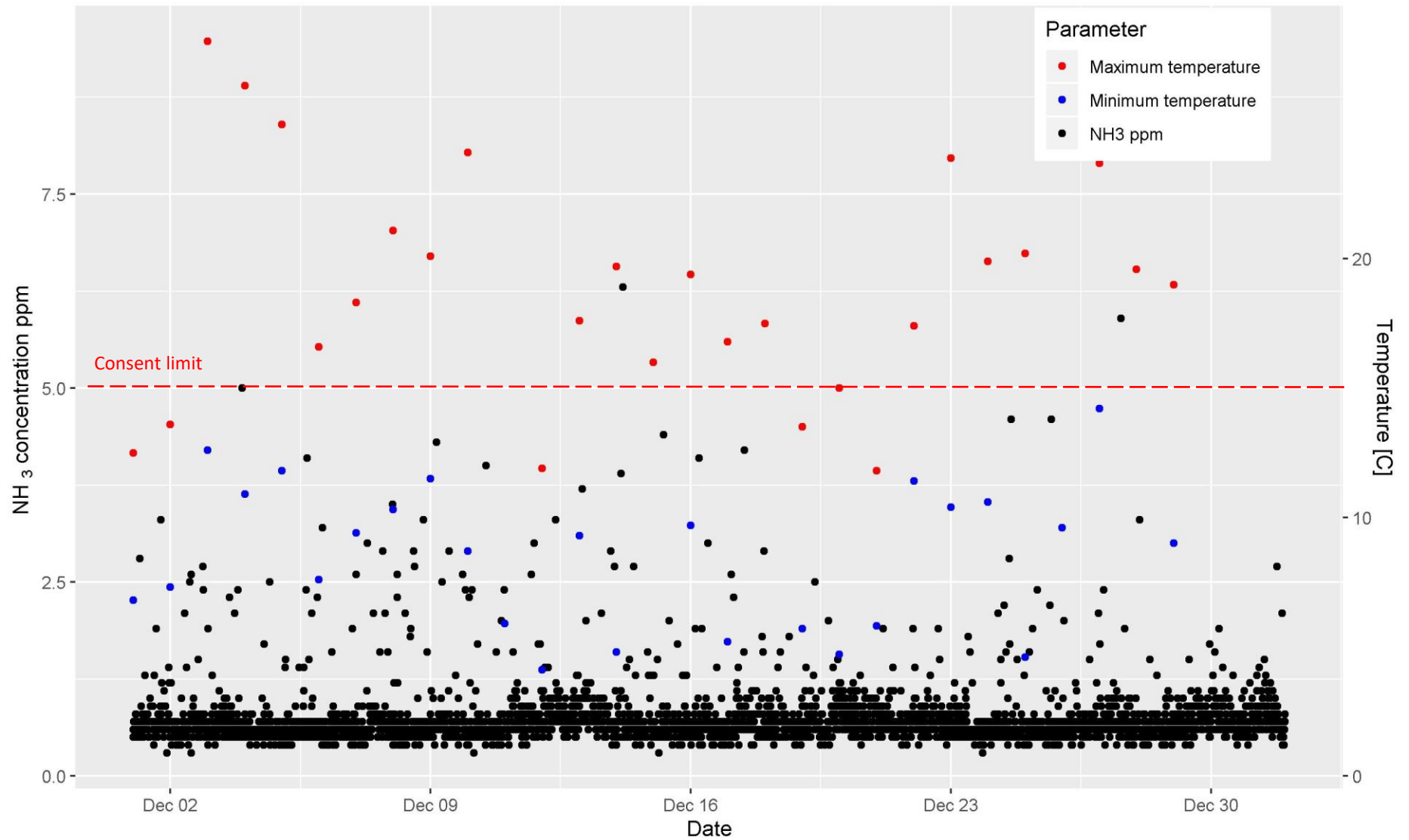


Figure 2: Continuous outdoor NH₃ concentration and maximum daily temperature.