Land and Water Science
90 Layard Street
Invercargill, 9810

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

3rd December 2020

Dear Stephen

RE: NH_3 Monitoring Report 1st November to 30th November 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 May 2018. GDC require emission values to comply with consent conditions that specify a limit of 5 ppm NH_3 discharged to air.

In May 2017, Photonic Innovations (PI) installed two NH_3 sensors for comparison of the indoor and outdoor ammonia levels. Measurements were recorded continuously and reported as a 5-minute average for both the outdoor and indoor sensors. A dashboard to access this data is available in real time at **http://35.213.230.53/d/CPQFoUvGz/gore-district-council?orgId=1&refresh=1m**

November Summary

Weekly summaries of outdoor and indoor emission results from monitoring between 1 November and 30 November are presented in this report. During this period, the maximum NH_3 concentration detected by the outdoor sensor was 6.6 ppm (Figure 1 and Table 1). Maximum mean and median NH_3 concentrations during this period were 0.51 ppm and 0.4 ppm for the outdoor sensor. The maximum ammonia concentration remained below the consented amount of 5.0 ppm throughout November except for three exceedances following warm and calm days. Maximum mean and median NH_3 concentrations for the indoor sensor during this period were 2.57 ppm and 2.4 ppm.

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.

Table 1. Summary statistics for the Outdoor NH_3 sensor, 1 November – 30 November 2020. NH_3 measured in parts per million (ppm).

Date	1 Nov	2-8 Nov	9-15 Nov	16-22 Nov	23-29 Nov	30 Nov
Mean	0.39	0.51	0.50	0.47	0.46	0.45
Std Dev	0.10	0.47	0.42	0.35	0.32	0.29
Median	0.4	0.4	0.4	0.4	0.4	0.4
Minimum	0.2	0.2	0.2	0.2	0.1	0.2
Maximum	0.9	6.6	5.2	4.8	5.9	2.5

Table 2. Summary statistics for the Indoor NH_3 sensor, 1 November – 30 November 2020. NH_3 measured in parts per million (ppm).

Date	1 Nov	2-8 Nov	9-15 Nov	16-22 Nov	23-29 Nov	30 Nov
Mean	2.23	2.27	2.43	2.57	2.49	2.27
Std Dev	0.31	0.82	1.32	0.91	1.06	0.52
Median	2.3	2	2.4	2.4	2.3	2.2
Minimum	1.5	0.6	0*	0.6	1	1.3
Maximum	2.9	4.6	5.7	5.5	7.8	4.2

**The indoor sensor seemed to record zero values for a small period of time for an unknown reason*

1 – 8 November 2020 (8 days)

Outdoor NH_3 concentration levels mirrored air temperatures with some higher concentrations consistent with warmer temperatures near the end of the week. The maximum outdoor concentration was 6.6 ppm for this period. Outdoor mean and median values were 0.39 and 0.4 ppm respectively.

Indoor NH_3 concentration levels recorded a mean of 2.23 ppm and a median of 2.3 ppm. The maximum indoor concentration was 4.6 ppm for this period which are comparable to October values.

9 – 15 November 2020

Outdoor NH_3 concentration levels were relatively steady for most of the week due to fairly static air temperatures with some higher concentrations consistent with warmer temperatures. The maximum outdoor concentration was 5.2 ppm for this period. Mean and median values were 0.5 ppm and 0.4 ppm respectively.

Indoor NH_3 concentration levels recorded a mean of 2.43 ppm and a median of 2.4 ppm. The maximum indoor concentration was 5.7 ppm for this period.

16 – 22 November 2020

Outdoor NH_3 concentration levels were relatively steady for most of the week due to declining air temperatures. The maximum outdoor concentration was 4.8 ppm for this period. Mean and median values were both 0.47 and 0.4 ppm respectively.

Indoor NH_3 concentration levels recorded a mean of 2.57 ppm and a median of 2.4 ppm. The maximum indoor concentration was 5.5 ppm for this period.

23 – 30 November 2020 (8 days)

Outdoor NH_3 concentration levels contained some higher concentrations consistent with warmer air temperatures. The maximum outdoor concentration was 5.9 ppm for this period. Mean and median values were 0.46 and 0.4 ppm respectively.

Indoor NH_3 concentration levels recorded a mean of 2.27 ppm and a median of 2.2 ppm. The maximum indoor concentration was 7.8 ppm for this period after air temperatures climbing during the week.

Summary

During the monitoring period (1 Nov – 30 Nov) Outdoor NH_3 concentrations reached a maximum of 6.6 ppm, while maximum mean and median concentrations were 0.5 and 0.4 ppm respectively. The outdoor sensor remained below the consent conditions of 5.0 ppm for the majority of November with three exceedances during days that experienced warm and calm conditions. Overall, temperature continues to be the most dominant control over NH_3 concentration.

Kind regards

Dianne Elliotte
AquaTech Environmental Data Collection Ltd

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

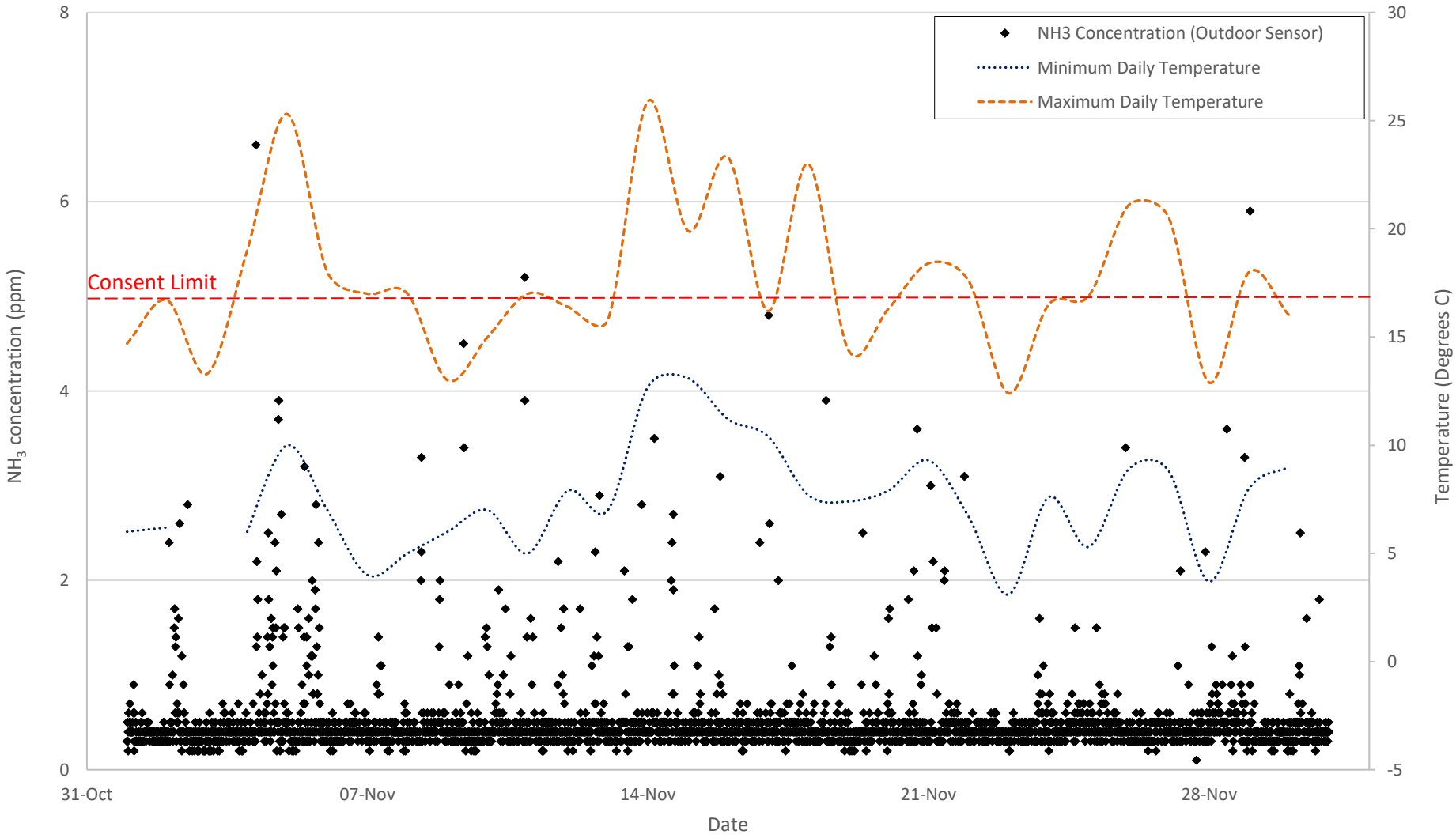

Figure 1: Continuous outdoor NH_3 concentration, minimum and maximum daily temperature. Temperature data is sourced from NIWA climate station AWS Gore 5778.

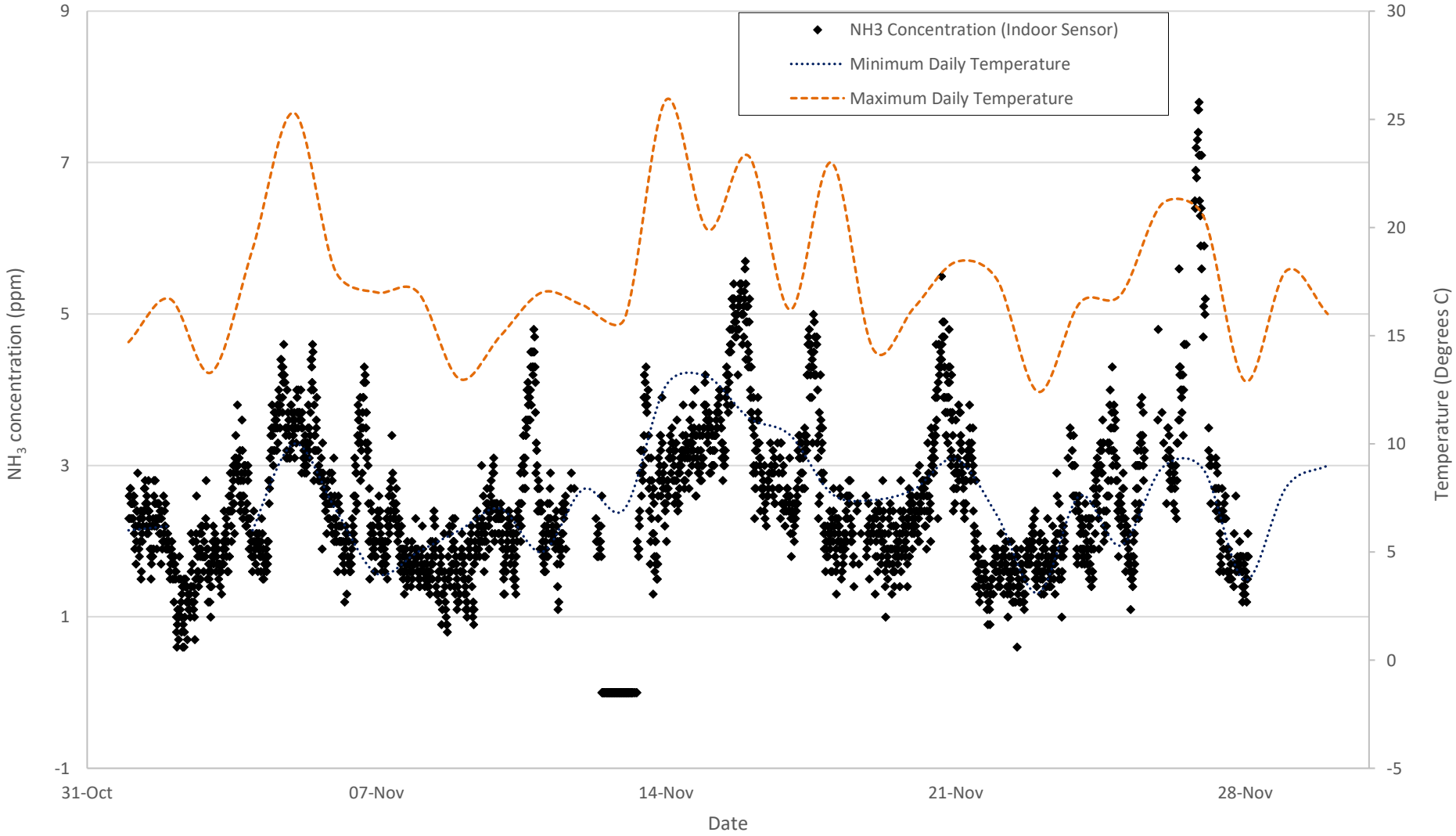

Figure 2: Continuous indoor NH_3 concentration, minimum and maximum daily temperature. Temperature data is sourced from NIWA climate station AWS Gore 5778.