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Chief Executive  
Gore District Council  
PO Box 8  
Gore, 9740

1<sup>st</sup> April 2021

Dear Stephen

**RE: NH<sub>3</sub> Monitoring Report 1<sup>st</sup> March to 31<sup>st</sup> March 2021**

**Background**

Gore District Council (GDC) engaged Land and Water Science to conduct continuous monitoring of ammonia (NH<sub>3</sub>) 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<sub>3</sub> discharged to air.

In May 2017, Photonic Innovations (PI) installed two NH<sub>3</sub> 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>.

**March Summary**

Weekly summaries of outdoor and indoor emission results from monitoring between 1 March and 31 March 2021 are presented in this report. During this period, the maximum NH<sub>3</sub> concentration detected by the outdoor sensor was 12.50 ppm (Figure 1 and Table 1). Maximum mean and median NH<sub>3</sub> concentrations during this period were 0.67 ppm and 0.50 ppm for the outdoor sensor. There were 9 exceedances over the limit of the consented maximum ammonia concentration (5.00 ppm) of which two had exceeded 10 ppm. Maximum mean, and median NH<sub>3</sub> concentrations for the indoor sensor during this period were 4.29 ppm, and 3.90 ppm, respectively.

Daily (diurnal) variation in NH<sub>3</sub> concentration shows a consistent pattern in the data. Specifically, NH<sub>3</sub> 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. Calm days also impact the maximum NH<sub>3</sub> concentrations due to the absence of air movement near the area being monitoring. The correlation between air temperature and NH<sub>3</sub> concentration for this reporting period is displayed in Figure 1.

Table 1. Summary statistics for the Outdoor NH<sub>3</sub> sensor, 1 March – 31 March 2021. NH<sub>3</sub> measured in parts per million (ppm).

Date	1-7 March	8-14 March	15-21 March	22-28 March	29-31 March
Mean	0.67	0.61	0.60	0.57	0.58
Std Dev	0.63	0.75	0.71	0.81	0.51
Median	0.50	0.40	0.40	0.40	0.50
Minimum	0.20	0.20	0.10	0.10	0.20
Maximum	6.40	7.40	6.80	12.50	6.1

Table 2. Summary statistics for the Indoor NH<sub>3</sub> sensor, 1 March – 31 March 2021. NH<sub>3</sub> measured in parts per million (ppm).

Date	1-7 March	8-14 March	15-21 March	22-28 March	29-31 March
Mean	4.29	2.75	2.34	3.58	3.64
Std Dev	1.55	0.74	0.63	1.15	0.92
Median	3.90	2.70	2.20	3.30	3.50
Minimum	1.00	0.90	0.90	1.20	1.50
Maximum	9.50	4.90	4.90	6.80	9.50

### 1 – 7 March 2021

Outdoor NH<sub>3</sub> concentration levels were at moderate level with an increase in concentrations consistent with warmer temperatures (Fig. 1). The maximum outdoor concentration was 6.40 ppm for this period. Outdoor mean and median values were 0.67 and 0.5 ppm, respectively.

Indoor NH<sub>3</sub> concentration levels recorded a mean of 4.29 ppm and a median of 3.90 ppm. The maximum indoor concentration was 9.50 ppm for this period.

### 8 – 14 March 2021

Outdoor NH<sub>3</sub> concentration levels were relatively high in the middle of the week and decreased at the end of the week in consistent with the decreasing air temperature. The maximum outdoor concentration was highest (7.40 ppm) during the month. Mean and median values were 0.60 ppm and 0.40 ppm, respectively.

Indoor NH<sub>3</sub> concentration levels recorded a mean of 2.75 ppm and a median of 2.70 ppm. The maximum indoor concentration was 4.90 ppm for this period.

### 15 – 21 March 2021

Outdoor NH<sub>3</sub> concentration levels were relatively low until near the end of the week when slightly elevated NH<sub>3</sub> were recorded in agreement with increasing air temperatures. The maximum outdoor concentration was 6.80 ppm for this period. Mean and median values were 0.60 and 0.40 ppm, respectively.

Indoor NH<sub>3</sub> concentration levels recorded a mean of 2.34 ppm and a median of 2.20 ppm. The maximum indoor concentration was 4.90 ppm for this period.

## 22 – 28 March 2021

Outdoor NH<sub>3</sub> concentration levels were slightly stable at moderate concentrations, but the two exceeding-10ppm cases detected in this period were in response to increasing air temperatures and calmer conditions. The maximum outdoor concentration was 12.50 ppm for this period. Mean and median values were 0.57 and 0.40 ppm, respectively.

Indoor NH<sub>3</sub> concentration levels recorded a mean of 3.58 ppm and a median of 3.30 ppm. The maximum indoor concentration was 6.80 ppm for this period.

## 28 – 31 March 2021

Outdoor NH<sub>3</sub> concentration levels were relatively high in consistent with warmer temperatures. The maximum outdoor concentration was 6.10 ppm for this period. Outdoor mean and median values were 0.58 and 0.50 ppm, respectively.

Indoor NH<sub>3</sub> concentration levels recorded a mean of 3.64 ppm and a median of 3.50 ppm. The maximum indoor concentration was 9.50 ppm for this period after air temperatures climbed during the week.

## Summary

During the monitoring period (1 March – 31 March 2021) the Outdoor NH<sub>3</sub> concentrations reached a maximum of 12.50 ppm, while maximum mean and median concentrations were 0.67 and 0.50 ppm, respectively. The outdoor sensor exceeded the consent condition of 5.00 ppm on 9 occasions in March during days that experienced warm and calm conditions. Overall, temperature continues to be the most dominant control over NH<sub>3</sub> concentration. It is recommended to always check the indoor sensor readings prior to any personnel entering the building.

Kind regards



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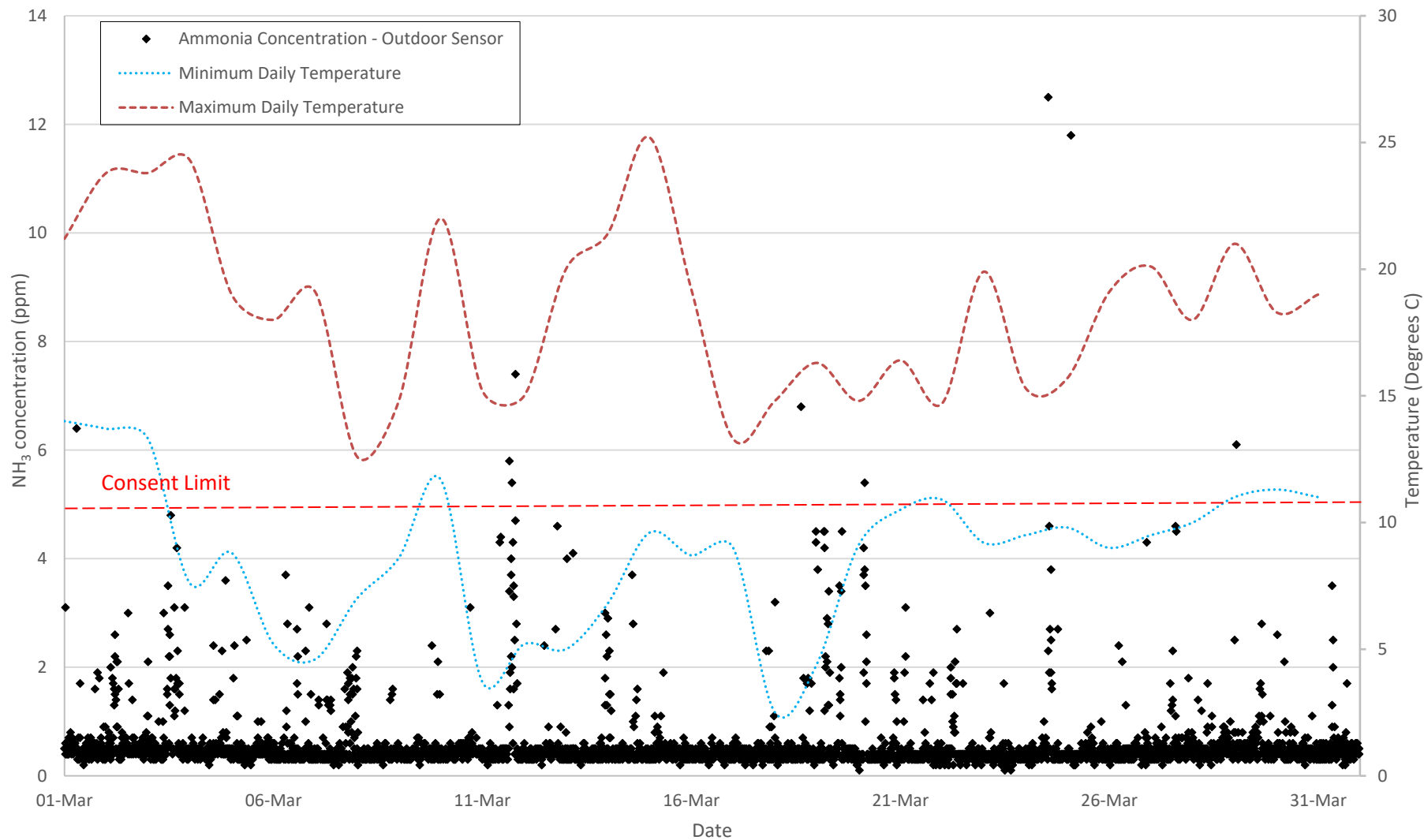


Figure 1: Continuous outdoor NH<sub>3</sub> concentration, minimum and maximum daily temperature. Temperature data is sourced from NIWA climate station AWS Gore 5778

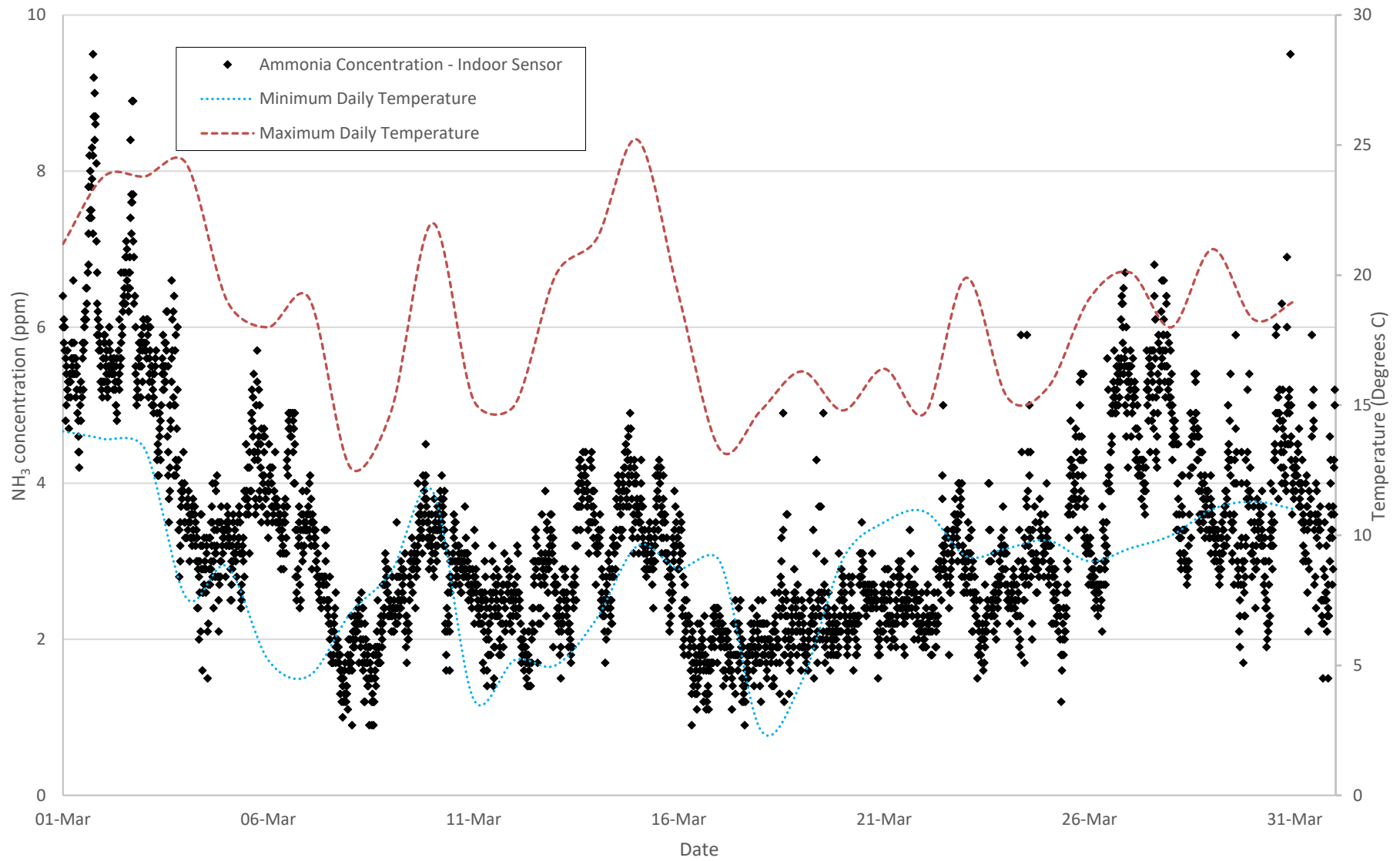


Figure 2: Continuous indoor NH<sub>3</sub> concentration, minimum and maximum daily temperature. Temperature data is sourced from NIWA climate station AWS Gore 5778.