Photo of Curran Bog. Source: DAERA NIEA

Atmospheric ammonia assessments on six designates sites in Northern Ireland

Report 2: June 2020 – May 2022

Tang Y.S., Williams M., Carnell, E.J., Stephens A.C.M., Iwanicka A., Duarte F., van Dijk N., Espina-Martin P., Pearson C., O'Reilly Á., McCourt A., Fox T. and Dragosits U.

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UKCEH reference	07102
UKCEH contact details	U Dragosits UKCEH, Bush Estate, Penicuik, Midlothian EH26 0QB t: 0131 445 4343 e: ud@ceh.ac.uk
Authors	Tang Y.S., Williams M., Carnell E., Stephens A.C.M., Iwanicka A., Duarte F., van Dijk N., Espina-Martin P., Pearson C., O'Reilly Á., McCourt A., Fox T. and Dragosits U.
Approved by	U Dragosits
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1. Executive Summary

1.1 Objectives

- Atmospheric ammonia (NH_3) gas concentrations were monitored on six designated sites of international and national importance (Special Areas of Conservation, SAC and Areas of Special Scientific Interest (ASSI)) across Northern Ireland, to assess threats from atmospheric nitrogen inputs.
- The monitoring strategy at each designated site aims to capture the high spatial variability of NH_3 and any associated atmospheric concentration gradients away from sources, where the highest concentrations (and local sources) may be and where the largest ecosystem impacts are likely to occur.
- The sites were also part of the Collaborative Action for the Natura Network (CANN) Programme (2017-2021). A SAC management plan was also developed which outlines key conservation measures to move the sites towards favourable conservation status.
- The measurement data will provide supporting evidence to develop site-specific mitigation strategies, if necessary and appropriate.
- Areas of a designated site that are closest to and downwind of emission sources (e.g. intensive livestock units) will be exposed to the highest NH3 concentrations and therefore most at risk from adverse effects of atmospheric nitrogen input to sensitive vegetation.
- This report presents monthly NH_3 measurements from two complete years of monitoring, between June 2020 and May 2022.

1.2 Annual mean NH_3 concentrations

- A total of 37 NH_3 monitoring points were established, with between 4 and 9 monitoring points on each of the six designated sites, depending on the size and complexity of each site.
- Monitoring was carried out at monthly intervals, with continuous time-integrated measurements made with passive UKCEH ALPHA® samplers. Since passive samplers do not require electricity, they are easily deployed without impacting on the site.
- Monthly measurements were aggregated to estimate annual average concentrations for the assessment of critical levels exceedance (annual thresholds). The monthly monitoring periods also enabled the construction of seasonal profiles across the sites, which is helpful for identifying peak emission periods as well as likely source types (for example, slurry spreading activities during spring).

- The current "critical levels" (CLe), of 1 µg NH_3 m^{-3} and 3 µg NH_3 m^{-3} (annual mean concentrations) were adopted in 2007 for the protection of lichens-bryophytes and other vegetation (higher plants), respectively.
- During Year 2, Slieve Beagh was again the cleanest site, with annual mean concentrations at the majority of monitoring points falling just below the 1 µg m^{-3} CLe for protection of lichens and bryophytes (monitoring sites with less than 75% data capture excluded). Annual mean NH_3 concentrations at all other sites exceeded this threshold, with considerable exceedances noted at Curran Bog, Garry Bog, Peatlands Park and the most exposed parts of Turmennan and Moneygal.
- Only two monitoring points clearly exceeded the CLe of annual mean NH_3 concentrations of 3 µg NH_3 m^{-3} for the protection of all other sensitive vegetation (higher plants). These were Curran Bog Site 1 (annual means = 7.5 and 7.8 µg NH_3 m^{-3} for Year 1 and 2, respectively) and Peatlands Park Site 7 (annual means = 4.0 and 3.4 µg NH_3 m^{-3} for Year 1 and 2, respectively). Both monitoring sites are in close proximity of livestock housing and related emitting activities. In addition, two further sites at Curran Bog (Sites 2 and 3) also nearly reached ~3 µg NH_3 m^{-3} during Year 2, an increase from 2.5-2.7 µg NH_3 m^{-3} for Year 1 to >2.8 µg NH_3 m^{-3} in Year 2.

1.3 Seasonal variability in NH_3 concentrations

- Seasonal trends at all sites show the lowest concentrations in winter and highest concentrations in spring and autumn, coinciding with the usual periods of ammonia-emitting agricultural activities, in particular livestock slurry/manure applications to fields in the area.

- Many sites showed further large peaks in June 2020 and June 2021, which may be related to early-summer slurry spreading after silage cuts, likely in combination with warm weather. During June 2020 and July 2021, unusually high temperatures were recorded, with many days above 20°C (max 26°C on 25/06/2020 and several days above 27°C in the second half of July 2021).

2. Introduction

Monthly atmospheric ammonia (NH_3) gas measurements were conducted at six internationally important designated sites (Special Areas of Conservation, SAC) across Northern Ireland (Figure 1), to assess threats from atmospheric nitrogen input to sensitive habitats and protected features. The study sites and the number of ammonia monitoring points on each site are detailed below:

Study site	Number of NH_3 monitoring points
Curran Bog SAC	5
Garry Bog SAC	6
Moneygal Bog SAC	4
Peatlands Park SAC	9
Slieve Beagh SAC	7
Turmennan SAC	6

Full details on the rationale for site monitoring strategies have been provided in an earlier report by Thomas et al. (2019). Year 1 NH_3 concentration data (June 2020 to May 2021) have also been reported in Tang et al. (2022). The focus of this report is to present an analysis of the Year 2 data (June 2021 to May 2022) and compare with Year 1 data.

Figure 1: Map showing the locations of the six Special Areas of Conservation (SAC) sites in Northern Ireland where local NH_3 monitoring networks were installed in June 2020.

3. Method

3.1 Monitoring Sites

The selection of the individual monitoring locations at each SAC was based on NH_3 concentration data from the most recent national atmospheric modelling available at the time (2017 data), at a 1 km by 1 km grid resolution. Aerial and satellite imagery from Google Earth were also extensively used to screen for potential local NH_3 emission sources and expected concentration gradients (Thomas et al., 2019), and then fine-tuned with local on-the-ground information from Ulster Wildlife, to take account of e.g., accessibility of sampling sites on the designated sites.

3.1.1 Curran Bog

Curran Bog SAC is situated in an intensive agricultural area, dominated by cattle farming (dairy and beef). The SAC is in close proximity to many livestock houses and slurry/manure stores, primarily to the west of the site and at the south-eastern corner. The northern and north-eastern boundaries of the SAC are bordered by wooded areas which may provide buffer zones from agricultural emission sources to the north and northeast.

Latitude	54.800
Longitude	-6.643
Area (ha)	183.5
Designation	Active raised bog (25.48 ha), Degraded raised bogs still capable of natural regeneration (126.86 ha)
Site character	Bogs, Marshes, Water fringed vegetation, Fens (82.6%) Humid grassland, Mesophile grassland (0.5%) Broad-leaved deciduous woodland (16.9%)
Notes	Several large farms and/or visible slurry stores/lagoons within 2km Three Industrial Emissions Directive (IED) farms within 5km
Links to previous/current monitoring	Ballynahone Bog (8 ALPHA sites since September 2014, an NO_2 concentration sampler (since June 2021) and a wet deposition sampler (also since May 2021)) is located close (1.5km) to Curran Bog, to the north/northeast. There has been further landscape scale monitoring with 9 ALPHA samplers within a 5 km radius of Ballynahone Bog from early 2019 until May 2022 and one DELTA sampler on the bog itself as part of DAERA's NI-wide network of NH_3 concentration samplers from March 2019 (run by AFBI & UKCEH), which gives a wider understanding of concentrations in the wider area including Curran Bog.

3.1.2 Garry Bog

Garry Bog SAC is situated in a busy agricultural landscape with predominantly cattle farming (specifically dairy farming, but also beef farming), with the SAC in close proximity to many livestock houses and slurry/manure stores, especially to the west and south. The northern and eastern boundaries of the SAC are bordered by forested areas which are expected to provide a buffer zone from agricultural emission sources.

Latitude	55.108
Longitude	-6.530
Area (ha)	154.9
Designation	Active raised bog (142.7 ha)
Site character	Bogs, Marshes, Water fringed vegetation, Fens (100%)
Notes	Several large farms or visible slurry stores/lagoons within 2km; 1 IED farm within 2km, 2 further IED farms within 5km
Links to previous/current monitoring	Within 10km: AFBI27-D (NI-wide network of NH_3 concentration samplers, started Mar 2019, by AFBI & UKCEH); UKA00401 Coleraine (UK National Ammonia Monitoring Network site, https://uk-air.defra.gov.uk/networks/site-info?uka_id=UKA00401)

3.1.3 Moneygal Bog

Moneygal Bog SAC is situated in an agricultural landscape with predominantly mixed dairy and beef cattle farming, with the north-eastern boundary forming the border with the Republic of Ireland. There are several livestock farms in the vicinity of the site, with the closest farms being located to the south/southwest. The north-western boundary and smaller areas to the NE and SE are bordered by forested areas which provide buffer zones from agricultural emission sources.

Latitude	54.742
Longitude	-7. 630
Area (ha)	156.2
Designation	Active raised bog (142.7 ha)
Site character	Bogs, Marshes, Water fringed vegetation, Fens (89%) Humid grassland, Mesophile grassland (2%) Coniferous woodland (9%)
Notes	No IED farms within 5km Small farms within 2km
Links to previous/current monitoring	AFBI06-A within 10 km (new NI-wide network of NH_3 concentration samplers, set up Mar 2019, by AFBI & UKCEH)

3.1.4 Peatlands Park

Peatlands Park SAC is located in an intensive farming landscape (predominantly beef & dairy cattle, with one IED farm within 2 km of the western boundary). There are parts of the site that border farmland directly, while other areas of the site are more protected with adjacent woodland and cut over bog features which provide a buffer against nearby emission sources.

Latitude	54.488
Longitude	-6.599
Area (ha)	207.5
Designation	Active raised bog (21.8 ha), Degraded raised bog (117.2 ha), Bog woodland (6.1 ha), Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (42.5 ha)
Site character	Inland water bodies (Standing water, Running water) (4%) Bogs, Marshes, Water fringed vegetation, Fens (72%) Broad-leaved deciduous woodland (24%)
Notes	1 IED farm within 2km, 2 within 5km
Links to previous/current monitoring	Within 10km: AFBI11-A (new NI-wide network of NH_3 concentration samplers, set up Mar 2019, by AFBI & UKCEH). Peatlands Park ex-Sniffer site '03-'04 Model assessment undertaken under the EMIND project

3.1.5 Slieve Beagh

In contrast to the mainly lowland bog/fen type sites included in this study, Slieve Beagh SAC is a large upland site situated in an agricultural landscape dominated by mixed dairy and beef cattle farming nearby and with a cluster of IED farms to the north (4 - 6 km distance). There are not many farms close to the site boundary and most of the site is bordered by less intensively used land (including woodland), providing a buffer zone from agricultural emission sources. The south-western corner of the site forms the border with the Republic of Ireland (RoI), with much less detailed data availability for the purposes of this study, resulting in increased uncertainty in the model output data for this site. There are several known poultry farms in the RoI part of the wider landscape surrounding the site, but these are not near the site boundary.

Latitude	54.348
Longitude	-7.194
Area (ha)	1,888.2
Designation	Active blanket bog (1112 ha), Natural dystrophic lakes and ponds (est. 15.3 ha), European dry heaths (80 ha)
Site character	Inland water bodies (Standing water, Running water) (1%) Bogs, Marshes, Water fringed vegetation, Fens (85%) Heath, Scrub, Maquis and Garrigue, Phygrana (14%)

Notes	1 IED farm within 2km, 1 further IED farm within 5km and several additional IED farms northeast (within 10km) 3 small animal houses within 2km
Links to previous/current monitoring	AFBI04-A within 10 km (new NI-wide network of NH_3 concentration samplers, set up Mar 2019, by AFBI & UKCEH)

3.1.6 Turmennan

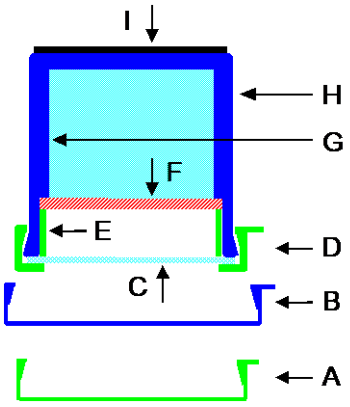
Turmennan SAC is located in a very intensive mixed farming landscape (with one IED farm less than 2 km to the NE). Parts of the site border farmland directly, especially to the east, whereas others (south-western side) are buffered by adjacent woodland and other semi-natural features.

Latitude	54.379
Longitude	-5.714
Area (ha)	14.8
Designation	Transition mires and quaking bogs (4.6 ha)
Site character	Inland water bodies (Standing water, Running water) (0.4%) Bogs, Marshes, Water fringed vegetation, Fens (50.1%) Dry grassland, Steppes (18.5%) Broad-leaved deciduous woodland (31%)
Notes	Few small farms evenly spread in 2km buffer. 1 IED Farm within 2km, 2 within 5km
Links to previous/current monitoring	Within 2km: AFBI21-A; within 10km: AFBI13-A (new NI-wide network of NH_3 concentration samplers, set up Mar 2019, by AFBI & UKCEH). Selected site for analysis in the EMIND project (Carnell and Dragosits, 2017).

3.2 Ammonia Monitoring Method

3.2.1 UKCEH ALPHA® Samplers

Atmospheric NH_3 gas concentrations were measured using the UKCEH high sensitivity ALPHA® passive sampler, shown in Figure 2 (Tang et al., 2001). Monitoring (ongoing for a third year) has been carried out at a monthly frequency from June 2020, with continuous time-integrated sampling over each period. This is cost-efficient for providing annual mean concentrations for comparisons with the UNECE critical levels of NH_3 concentrations, with sufficient resolution to analyse seasonal patterns in the monthly data.



A Replacement solid cap
B Top protective cap
C 5 µm PTFE membrane (27 mm diameter)
D Cap with hole for membrane
E Support ring (6 mm height)
F Filter paper
G Internal ridge to support filter paper
H Extended body for ease of handling
I Velcro for attachment to holder

Figure 2: Outline diagram of a single UKCEH ALPHA® sampler.

3.2.2 Preparation of samplers

ALPHA® samplers are prepared in accordance with standard UKCEH protocols (Tang et al. 2019), using filter circles impregnated with 6 mg of citric acid. Replicate samplers (three) are prepared for each measurement and placed inside a sealed container, together with replacement solid caps that are used to replace the membrane and membrane caps at the end of sampling.

3.2.3 Exposure of samplers

ALPHA® samplers are attached with Velcro to an aerodynamically shaped support (upturned plant saucer) on a post at approx. 1.5 m height above ground or vegetation. The sampling height of 1.5 m above ground follows the standard protocol used in the UK's National Ammonia Monitoring Network (NAMN), providing a representative NH_3 concentration in the atmosphere. Plastic bird spikes were mounted on the top of the support to deter birds from perching. Replicate (three) samples are used for each measurement to provide an estimate of measurement precision and uncertainty for the air concentration of NH_3.

ALPHA® sampling sites were set up by members of staff from Ulster Wildlife, NIEA and Monaghan County Council, under guidance from experienced personnel at UKCEH. Following site establishment and commencement of the first monitoring period, sites have been visited on a monthly basis by trained personnel to carry out the required monthly changeover of samples. A recording card is used by the site operator to record dates and times of the sample changes at each site, together with relevant local information (e.g., agricultural activities taking place in the vicinity, such as slurry spreading, during the preceding month or at the time of visit).

3.2.4 Chemical analysis

Exposed samples are stored in a cold room at 4°C until analysis. Citric acid-impregnated filter circles from the exposed ALPHA® samplers are extracted into deionised water and analysed for aqueous ammonium (NH_4^+) on a SEAL Flow Injection Colorimetry system at the UKCEH Edinburgh analytical chemistry facility. The SEAL analytical method and SOP for determination of aqueous ammonium used at UKCEH Edinburgh is the same as that implemented by the UKAS accredited laboratory at UKCEH Lancaster for the UK National Ammonia Monitoring Network

(Conolly et al., 2016) and an ALPHA® ammonia monitoring network in Northern Ireland funded by DAERA (Tang et al., 2021).

3.2.5 Calculation of air concentrations

The air concentration (χ_a) of NH_3 gas (µg NH_3 m^{-3}) is determined according to Eq. 1:

$$c_a = \frac{Q}{V} \quad (1)$$

The amount of NH_3 collected (*Q, µg*) on an ALPHA® sampler due to air sampling is given by Eq. 2:

$$Q = (Ce - Cb) * v * (\frac{17}{18}) \quad (2)$$

- *C_e is the liquid concentration of an exposed sample (µg NH_4^+ ml^{-1}),*
- *c_b is the liquid concentration of a blank sample (µg NH_4^+ ml^{-1}) and*
- *v is the liquid volume of the extraction solution (ml).*
- *multiplied by $\frac{17}{18}$ to convert from NH_4^+ (measured in liquid extract) to NH_3*

V is the estimated volume of air sampled by ALPHA® sampler over the exposure period (*V*, m^3), which may be determined by Eq. 3:

$$V = UR_{NH_3} * t \quad (3)$$

- *UR_{NH3} is the field calibrated uptake rate of ALPHA® sampler for UKCEH Edinburgh laboratory = 0.003241315 m^3 hr^{-1} (e.g., Martin et al., 2019)*
- *t is sampling duration (hours).*

3.2.6 QAQC

The accuracy of the SEAL analytical method for determination of ammonium (NH_4^+) in aqueous solution is assured by participation in international laboratory proficiency schemes (EMEP and GAW). The replicate ALPHA® samplers used for each measurement (triplicate samplers in this study) should, when performing well, agree to within 15 % (coefficient of variation, CV). Large discrepancies are most likely due to contamination of samples, or other factors that affect the performance of the samplers. The average reproducibility of replicate samples in the field has been better than 10 % (CV) and the detection limit (3 σ of blanks) was 0.03 µg m^3 for a monthly exposure period, indicating that the sites are operating very well.

4. Results and Discussion

4.1 Curran Bog

Four sites (CB1 – CB4) were established along a SW-NE transect from the western edge of the bog, where the closest farms with livestock houses and manure/slurry storage are located (Figure 3). A further sampling point (Site 5) was placed at a more easterly location.

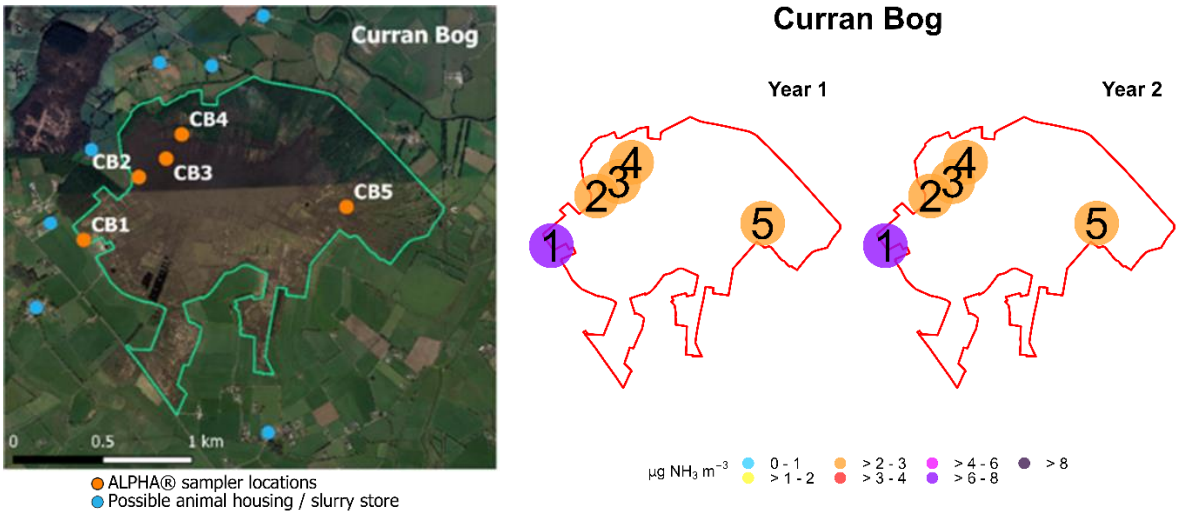


Figure 3: (LEFT) Map of Curran Bog, showing locations of the five monitoring points (CB1 – CB5) and proximity of farms (blue circles) as potential NH_3 sources. The farms are identified using satellite/aerial imagery and may or may not be active. (RIGHT) Map of annual average NH_3 concentrations at Curran Bog (June 2020 - May 2021, June 2021 – May 2022).

Site CB1, located on the western boundary of the SAC, provided the highest annual mean NH_3 concentrations in both Year 1 and Year 2 of monitoring (annual mean Year 1 = 7.5 µg NH_3 m^{-3}, range = 2.5 – 24.0 µg NH_3 m^{-3}; annual mean Year 2 = 7.8 µg NH_3 m^{-3}, range = 4.0 – 12.6 µg NH_3 m^{-3}) (Figure 3,Table 2). This is consistent with its location on the identified in the landscape (Figure 3).

NH_3 concentrations along the SW-NE transect (Sites 1 – 4) decreased with distance from Site 1, with a near 4-fold decrease at Site 4 at the end of the transect during both years (Year 1 annual mean = 2.0 µg NH_3 m^{-3}, range = 1.3 – 2.9 µg NH_3 m^{-3}; Year 2 annual mean = 2.7 µg NH_3 m^{-3}, range = 1.0-4.4 µg NH_3 m^{-3}) (Figure 4, Tables 1-4).The measurements therefore support model predictions (Figure 3) which suggest that there is a concentration gradient across the site, with the highest concentrations on the western boundary in closest proximity to emission sources.

Note: Period with sample exposure > 1 month (calendar month) = Dec 2020 – Jan 2021 (2 months)

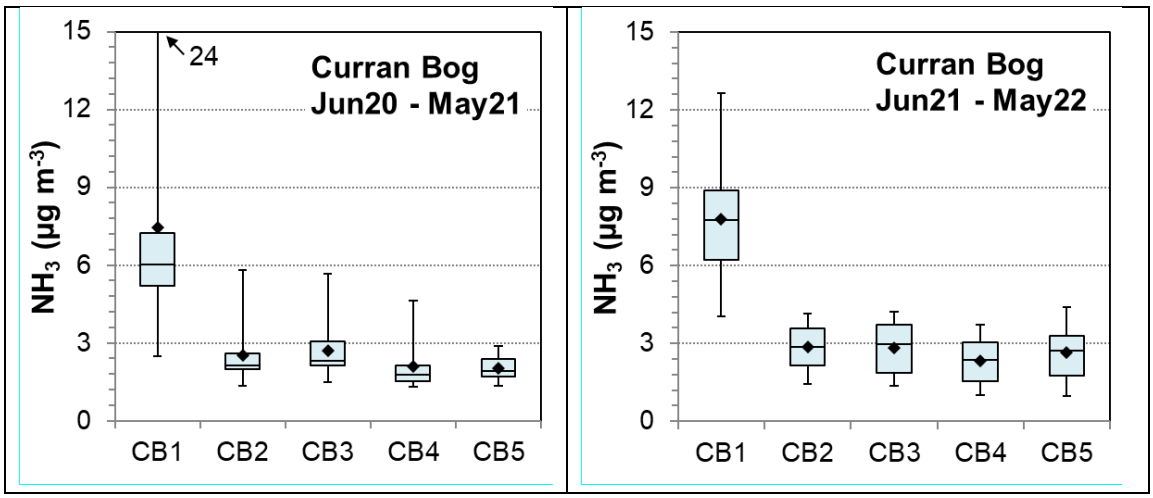


Figure 4: Boxplot comparing annual mean and median NH_3 concentrations measured at Curran Bog. Whiskers show the minimum and maximum of monitored monthly concentrations at each site. (LEFT) Project Year 1, and (RIGHT) Project Year 2. Changes in monitored mean concentrations during Year 2 at the 4 sites (CB1 – CB4: annual mean ± SD, *n* = 12) along the SW-NE transect across Curran Bog, showing an exponential decline in concentrations, with distance from the south-western edge of the reserve.

Modelled annual average NH_3 concentrations across the grid squares covering Curran Bog are in the range of 2.3 - 3.2 µg NH_3 m^{-3}, based on FRAME NH_3 concentration model output for the emission year 2017 (Figure 5, Table 3).

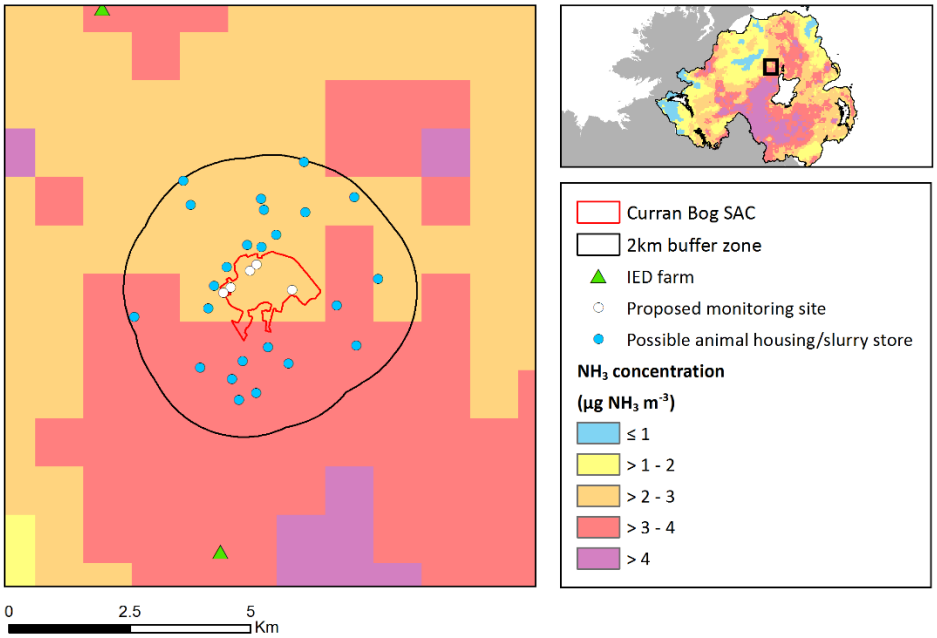


Figure 5: Modelled NH_3 concentrations at Curran Bog SAC (outlined in red) and the wider landscape at 1 km x 1km grid resolution (FRAME model output using 2017 emissions data).

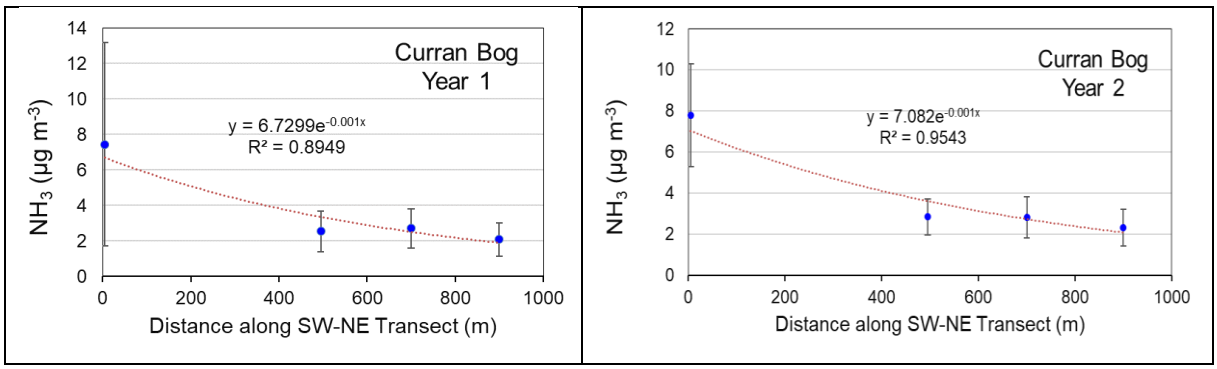


Figure 6: Changes in annual mean concentrations for (LEFT) project year 1 (Jun20 – May21) and (RIGHT) project year 2 (Jun21 – May22), at the 4 sites (CB1 – CB4: annual mean ± SD, *n* = 12) along the SW-NE transect across Curran Bog, showing exponential decline in concentrations, with distance from the south-western edge of the reserve. The concentrations are also similar between years.

The Year 1 and Year 2 annual mean measured concentrations at Site 1 (7.5 µg NH_3 m^{-3}, 7.8 µg NH_3 m^{-3}) are much larger than modelled data, which estimate concentrations of between 2.3 – 3.2 µg NH_3 m^{-3} (Figure 5, Table 3). The modelled estimate is made at a 1 km x 1 km grid square resolution and represents an area-weighted average for the grid-squares containing Curran Bog. The modelled concentrations are likely an underestimate for this particular location. This is due to the methodology required for the emission inventory maps that underlie the modelled concentrations, where emissions associated with individual farm holdings are distributed across suitable land cover in a wider area (for NI these are 5 x 5 km grid squares). Individual farm hotspots such as the enterprise located close to the site boundary are therefore being smoothed out across a wider local area. This is to satisfy data restrictions for the use of farm level data for the emission modelling, to preserve confidentiality, and results in a smoothed emission surface (i.e., data from at least 5 farms must be aggregated).

By contrast, annual mean concentrations at Sites 2 to 5 (range = 2.1 – 2.8 µg NH_3 m^{-3} in Year 1 and 2.3-2.9 µg NH_3 m^{-3} in Year 2 (Table 2, Table 4) are within the range of modelled values (Table 5). Site 1 is therefore impacted by strong local emission sources that are smoothed out in the national modelled concentration maps. Observations from the field recorded manure spreading taking place within 10 m of the Site 1 in March 2021, which accounts for the very large spike in concentrations during that month (24 µg NH_3 m^{-3}) (Figure 7). Slurry spreading in the immediate vicinity of Site 1 is also likely the reason behind the other highest concentrations recorded, e.g., September 2021 and March/April 2022.

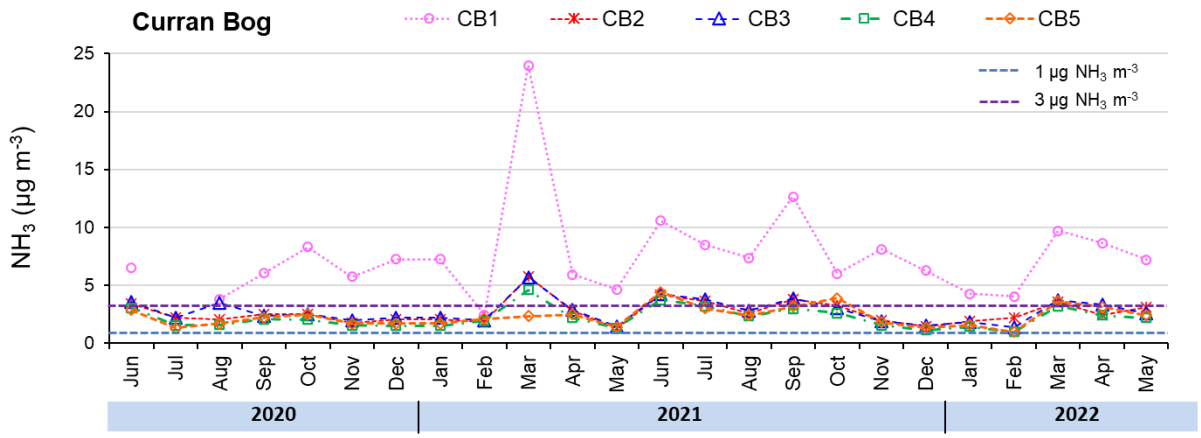


Figure 7: Monthly monitored NH_3 concentrations at the five monitoring points on Curran Bog, showing differences in the magnitude of concentrations.

Site CB1 also showed much higher concentrations than the other measurement sites at Curran Bog for all months, apart from August 2020 and February 2021 when concentrations converged with the other sites, either due to absence of local sources affecting Site CB1 or changes in wind directions in those months (Figure 7). By contrast, Sites CB2 to CB5 were fairly similar both in their seasonal profile and magnitude of concentrations. Site CB5 is furthest from emission sources and is notable for the absence of a March peak in 2021, which is present at all other sites. This suggests that Site CB5 is perhaps not affected by local sources to the same extent as other sites on the west side of the bog.

There are also two months of interest from the first year of monthly measurements (Figure 7). These are the dip in concentrations in July 2020 (all sites) and in May 2021 (all sites except Site CB1). Ammonia concentrations in the summer months are usually larger than winter months, as ammonia volatilises from surfaces more rapidly during higher temperatures. Monthly average rainfall and temperature data for Northern Ireland showed cooler and wetter conditions than normal in those months (Figure 8), which may have contributed to the smaller concentrations observed.

During Year 2 (Jun 2021-May 2022), summer (July 2021 in particular) and autumn were much warmer than average (Figure 8), which may explain the slightly smaller dip in concentrations during the summer than expected, compared with 2020. The autumn/winter of 2021/22 had notably dry and warm months relative to average conditions (e.g., Nov 2021, Jan 2022), which again likely contributed to higher than usual ammonia concentrations. By contrast, Feb 2022 was notably wet, thereby delaying the start of activities such as slurry spreading at the end of the closed season and resulting in lower concentrations before slurry spreading picked up for the usual March peak.

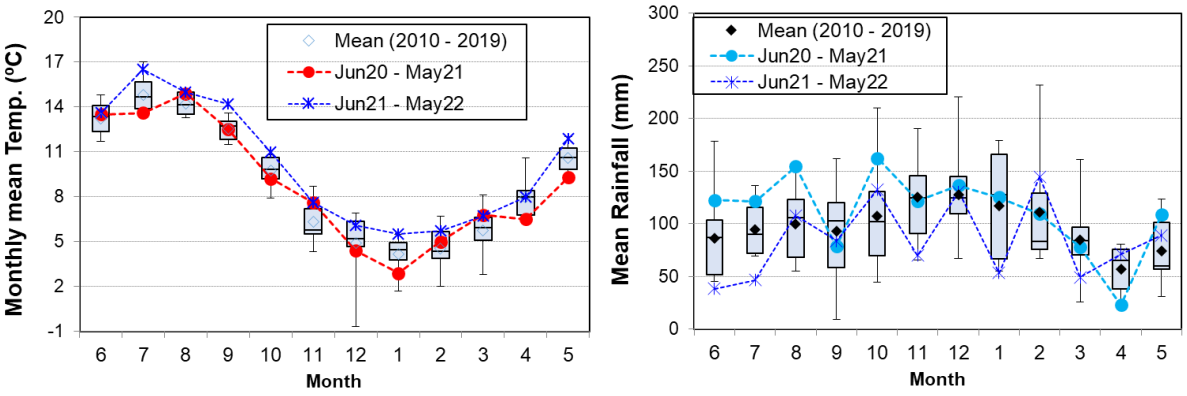


Figure 8: Comparison of mean (LEFT) monthly temperature and (RIGHT) rainfall over the course of the study period (June 2020 – May 2022) with 10-year averaged monthly data (2010 to 2019) in Northern Ireland, accessed 17/11/2022 (https://www.metoffice.gov.uk/pub/data/weather/uk/climate/ datasets/). The diamonds in the boxplots show the mean, with the grey boxes indicating the median and interquartile range, while the whiskers show the range (minimum and maximum). Please note that these are national summary data rather than data from an on-site met station.

4.2 Garry Bog

Six monitoring sites were established across Garry Bog to capture the expected concentration gradients (Figure 9, Figure 10). The three sites positioned on the southwestern edge of the bog (GB1, GB5, GB6) are in close proximity to agricultural fields and emission sources in the landscape. These are expected to be exposed to higher NH_3 concentrations than the other three sites (GB2 – GB4) that are further away from the sources (Figure 9).

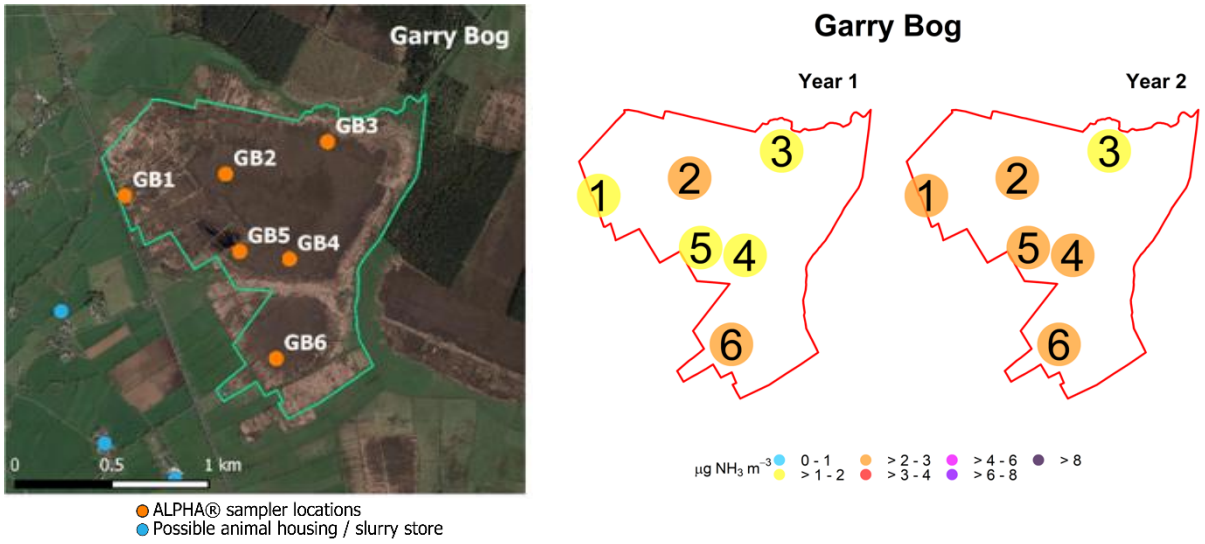


Figure 9: (LEFT) Map of Garry Bog SAC, showing locations of the six monitoring points (GB1 – GB6) and proximity of farms (blue circles) as potential NH_3 sources. The farms are identified using satellite/aerial imagery and may or may not be active. (RIGHT) Map of annual average NH_3 concentrations at Garry Bog (Year 1: June 2020-May 2021; Year 2: June 2021-May 2022).

Modelled concentrations of 1.9 – 2.4 µg NH_3 m^{-3} are estimated for the site, with the highest concentrations to the south and west of the bog (Figure 10, Table 5). The first year of monthly measurement data at Garry Bog shows relatively small concentration gradients across the site, with average annual concentrations of 1.6 - 2.4 µg NH_3 m^{-3} during Year 1 (Figure 11, Table 2) and 1.8 - 2.6 µg NH_3 m^{-3} during Year 2 (Figure 11, Table 4), in good agreement with modelled concentrations. The lowest annual mean concentrations during both years were measured at Site GB3 (Figure 11), located at the north-eastern section of the bog and furthest from sources under prevailing winds (see Figure 9). All monitoring sites' mean concentrations on Garry Bog are exceeding the critical level for its designated features of 1 µg NH_3 m^{-3}.

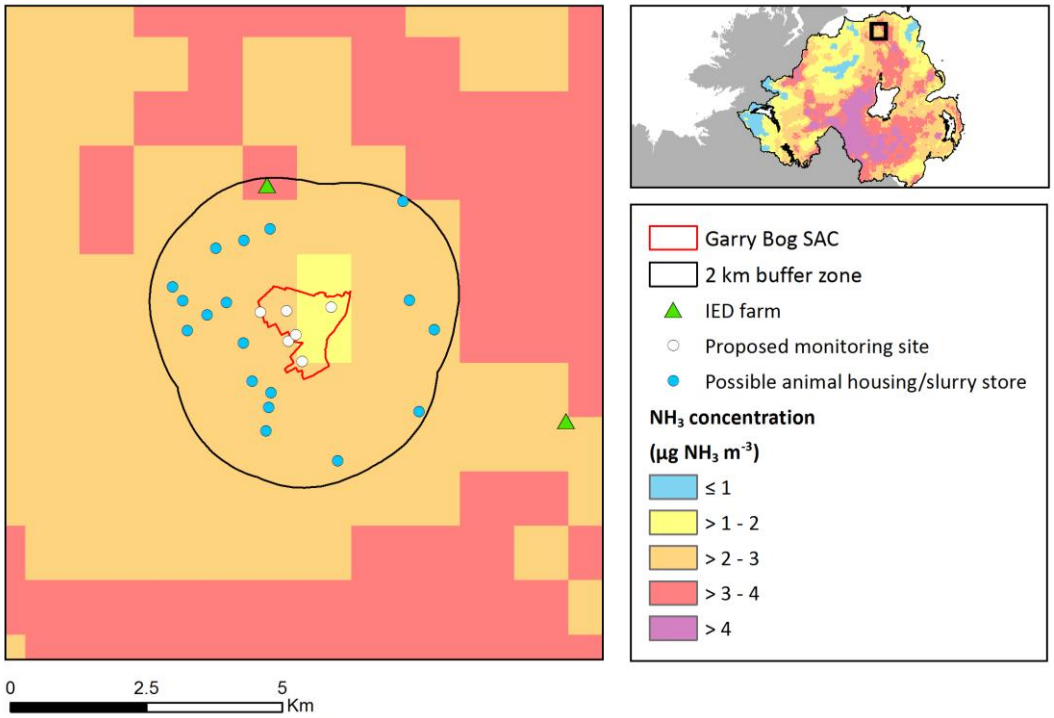


Figure 10: Modelled NH_3 concentrations for Garry Bog SAC (outlined in red) and the wider landscape at 1 km x 1 km grid resolution (FRAME model output).

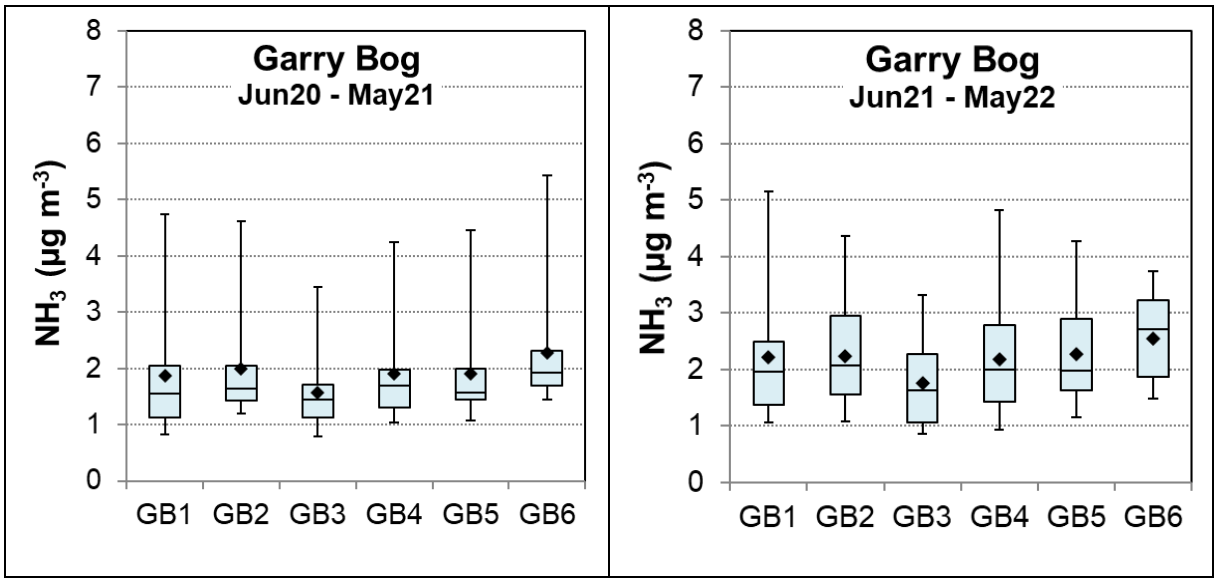


Figure 11: Boxplot comparing annual mean and median NH_3 concentrations. Whiskers show the min and max of monitored monthly concentrations.

In terms of seasonal patterns
(

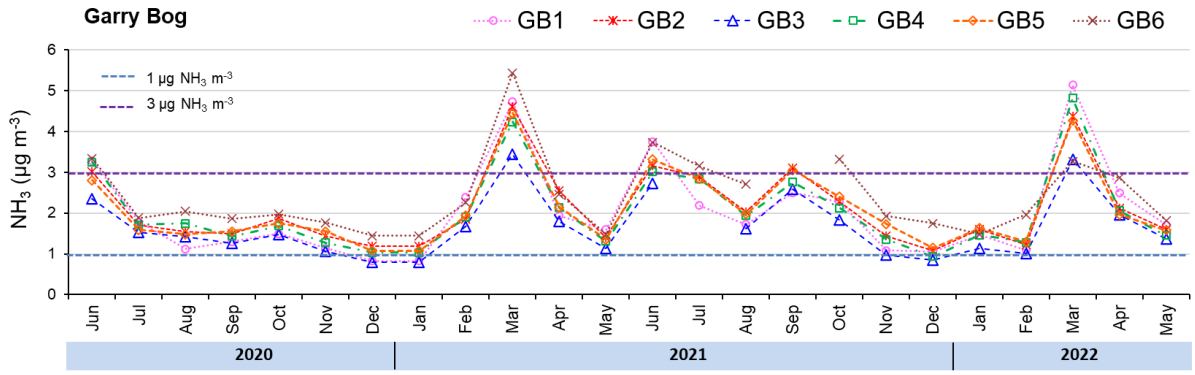


Figure 12), the main annual peaks during March 2021 and March 2022 (across all sites) coincide with the slurry spreading season. Secondary peaks in June 2020 and June and September 2021 may have been due to early-summer slurry spreading after silage cuts and autumn spreading in combination with warm weather (Figure 8). During June 2020, unusually high temperatures were recorded, with many days above 20°C (max 26°C on 25/06/2020)[1]. A similar warm period occurred during the second half of July 2021, with several days peaking around 27-28°C.[2]

The highest NH_3 concentrations are consistently seen at Site GB6, whereas Site GB3 shows the lowest concentrations for most months. For most of the year, the trends in concentrations at all six sites are similar and within approx. 1 µg NH_3 m^{-3} of each other, apart from the spring peak months (March 2021, March 2022), when the range widens to approx. 2 µg NH_3 m^{-3}
(

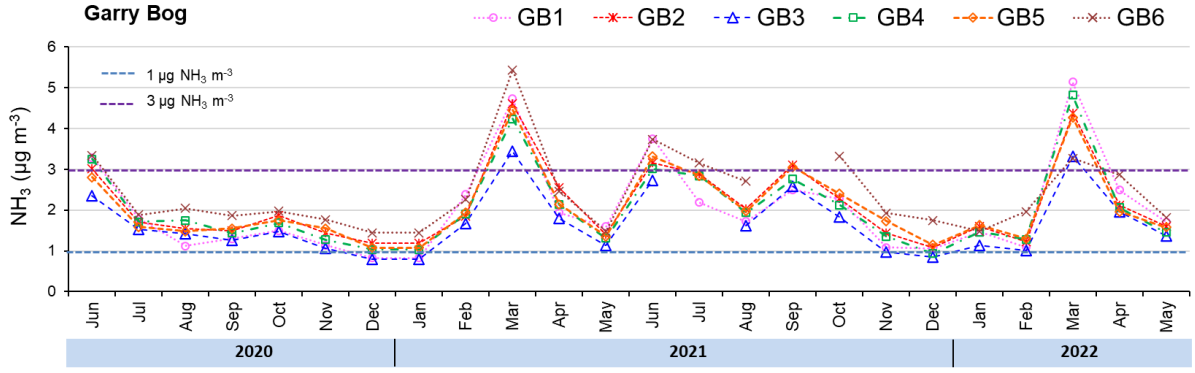


Figure 12). This may imply that the same sources influence concentrations across the bog over the course of the year, i.e., the plumes of ammonia passing over all monitoring sites are the same, with the gradient depending on proximity of each monitoring site to the main sources, and the concentrations more dilute by the time they reach the further distant monitoring sites. The concentration gradients observed

[1] https://www.timeanddate.com/weather/@2641364/historic?month=6&year=2020

[2] https://www.timeanddate.com/weather/@2641364/historic?month=7&year=2021

are consistent with the location of the main sources on the south-western edge of the SAC, near Sites GB1, GB2, GB5 and GB6.

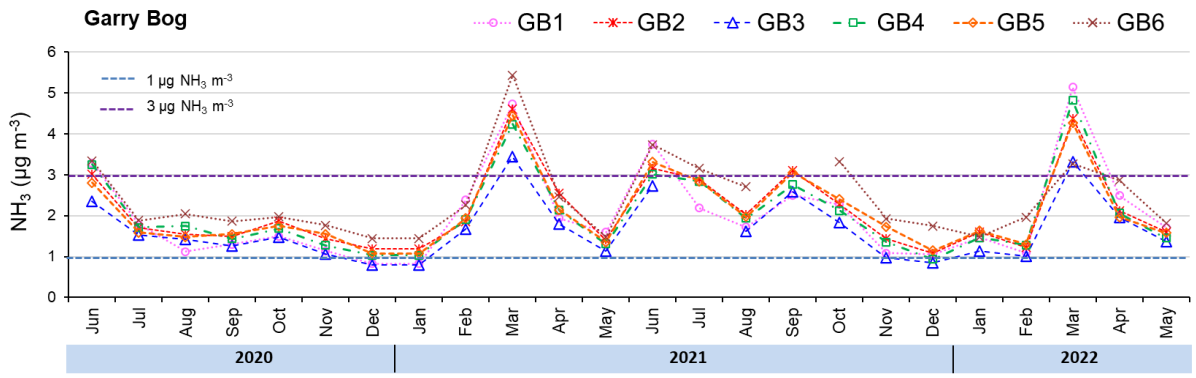


Figure 12: Seasonal cycle in NH_3 concentrations at each of six monitoring points on Garry Bog, showing similar trends between sites.

4.3 Moneygal

The four monitoring locations on Moneygal Bog are located to cover the model-estimated W/SW to E/NE gradient across the site (Figure 13**Error! Reference source not found.**). The modelled concentrations are less certain for this site, due to its close proximity to the border with the Republic of Ireland (RoI). The reasons are that the emission input data for the RoI available at the time when the sampling strategy was developed were not as recent and RoI emission maps do not contain the same categorical resolution as the UK emission data.

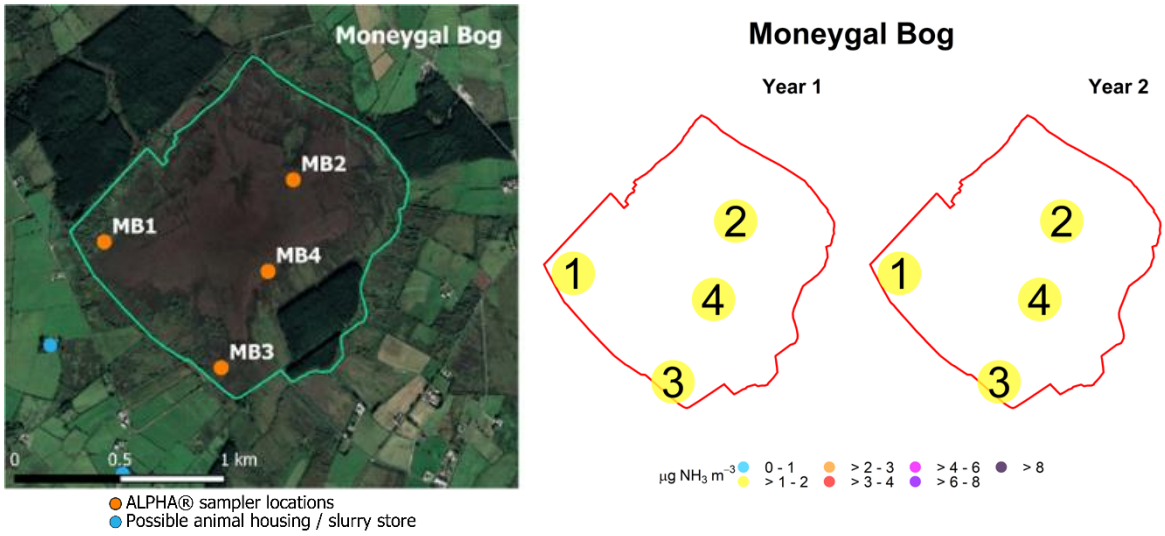


Figure 13: (LEFT) Map of Moneygal, showing locations of the four monitoring points (MB1 – MB4) and proximity of farms (blue circles) as potential NH_3 sources. The farms are identified using satellite/aerial imagery and may or may not be active. (RIGHT): Map of annual average NH_3 concentrations at Moneygal (Year 1: June 2020-May 2021; Year 2: June 2021-May 2022).

The monitoring data for Year 1 show average annual concentrations in the range of 1.1 - 1.3 µg NH_3 m^{-3} across the four measurement sites (Figure 15, Table 2), slightly exceeding the critical level of 1 µg NH_3 m^{-3} for its designated features, i.e., active raised bog. Year 2 averages are in the range of 1.3 - 1.7 µg NH_3 m^{-3}, substantially higher than during Year 1. Measured concentrations in Year 1 are smaller than modelled NH_3 concentrations of 1.7 - 2.5 µg NH_3 m^{-3} (2017), whereas Year 2 concentrations are closer to (but still mostly lower than) modelled concentrations. However, annual mean monitored concentrations at Sites M2 and M4 on the eastern side of the bog provided higher concentrations (mean = 1.3 µg NH_3 m^{-3} in Year 1 and 1.6 - 1.7 µg NH_3 m^{-3} in Year 2) than Sites M1 and M3 to the west and south (mean = 1.1 µg m^{-3} in Year 1 and 1.3 - 1.45 µg NH_3 m^{-3} in Year 2), in agreement with model predictions of highest concentrations to the east (Figure 14). The small differences in concentrations (0.2 µg NH_3 m^{-3} in Year 1) that were captured is also a testament to the high sensitivity and accuracy of the ALPHA® sampler approach.

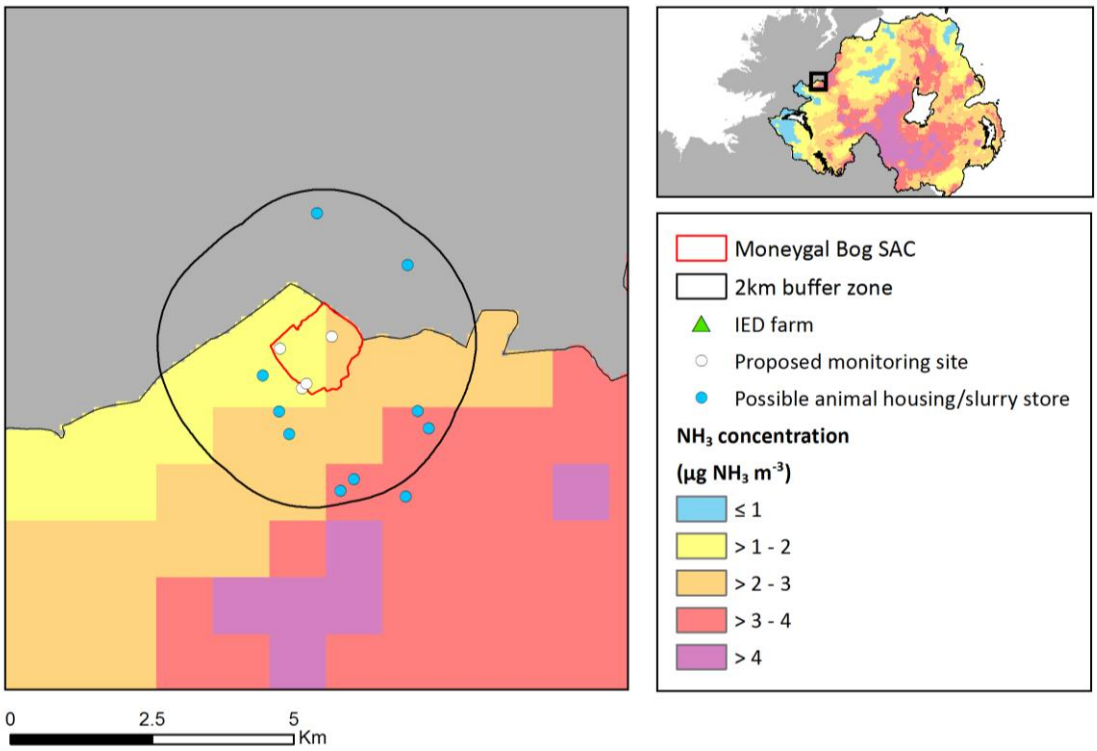


Figure 14: Modelled NH_3 concentrations for Moneygal Bog SAC (outlined in red) and the wider landscape at 1 km x 1 km grid resolution (FRAME model output).

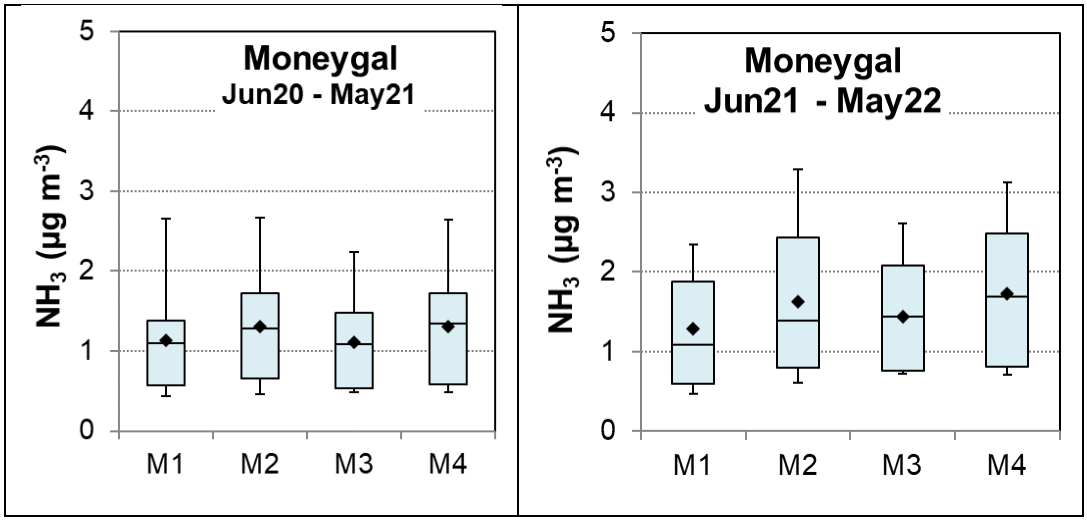


Figure 15: Boxplot comparing annual mean and median NH_3 concentrations. Whiskers show the min and max of monitored monthly concentrations.

In terms of seasonal patterns in measured monthly concentrations (Figure 16), the main peak during Year 1 was 2.2 - 2.7 µg NH_3 m^{-3} in March 2021 (across all sites) and coincides with the slurry spreading season (February to April). A secondary peak in June 2020 on the other hand is likely to be related to early-summer slurry spreading after silage cuts in combination with warm weather (Figure 8), as seems to

have been the case across Northern Ireland more widely[3]. The highest NH_3 concentrations were recorded at Sites M2 and M4 during most months, with lower measurements at Sites M1 and M3 (on western/southern side of bog, further away from individual local sources, i.e. more due to the influence of a wider range of diffuse sources across the local landscape) for most months. The overall trends in NH_3 concentrations at all four sites were similar and within less than 0.5 µg NH_3 m^{-3} of each other, suggesting that there was no substantial concentration gradient across the site, with no hotspot sources located close to the site (Figure 13). This is consistent with the site location in relation to the surrounding farming landscape.

Year 2 showed similar patterns in terms of the main spring peak (Mar 2022) related to slurry spreading emissions, and with secondary peaks of early summer land spreading (likely after silage cuts) and again in early autumn. The exceptionally warm and dry weather during July 2021 (see description in Section 4.2 Garry Bog) is expected to have contributed to higher NH_3 concentrations than in the summer of 2020 and was observed across most of the sites included in this study.

The dips in concentrations observed at all sites in Jul 2020, likely linked to cooler and wetter conditions. However, July is also a period when vegetation/crops are actively growing, and potentially actively taking up NH_3 from the atmosphere and reducing concentrations in the atmosphere. February 2021 was also a very wet month across Northern Ireland (Figure 8), which would have delayed high-emission activities such as slurry spreading, and likely explains the very high peak in March 2022, compared with the previous year's activities, where emissions started to pick up earlier, i.e. during February 2021.

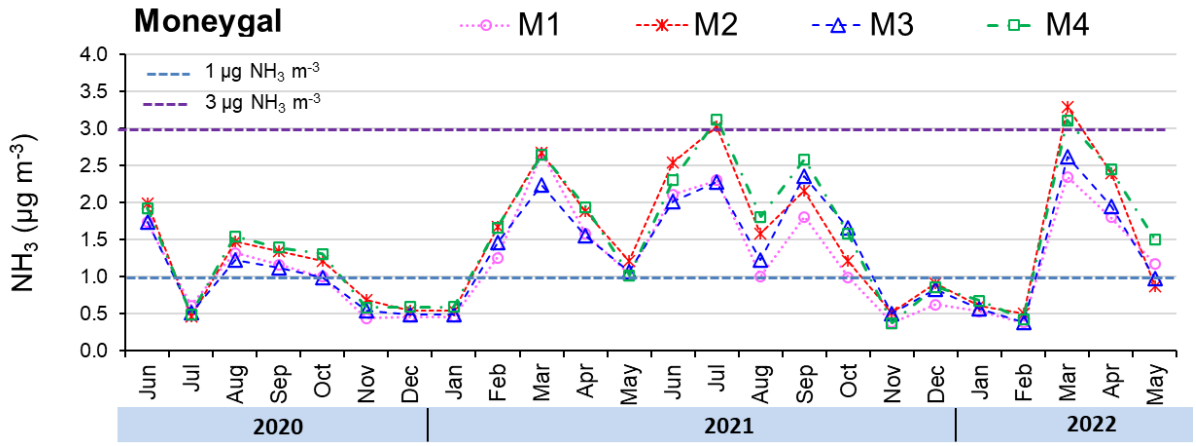


Figure 16: Seasonal cycle in NH_3 concentrations at each of four monitoring points on Moneygal, showing similar trends between sites.

[3] During June 2020, unusually high temperatures were recorded, with many days above 20°C (max 26°C on 25/06/2020). In addition there is anecdotal evidence that movement restrictions during the early Covid-19 lockdown delayed some farming activities.

https://www.timeanddate.com/weather/@2641364/historic?month=6&year=2020

4.4 Peatlands Park

Peatlands Park SAC is a larger, more complex site, and this is reflected in the larger number of monitoring sites required to enable the characterisation of NH_3 patterns and gradients across the site (9 sites PP1 – PP9) (a greater number of samplers than at other sites is important as there are several potential emission sources very close to the site boundary, whereas more central locations on the bog are expected to show lower concentrations (Figure 18)). At this site, there is also a potential for buffering of NH_3 impacts by surrounding semi-natural areas, which adds to the complexity of the expected local concentration patterns.

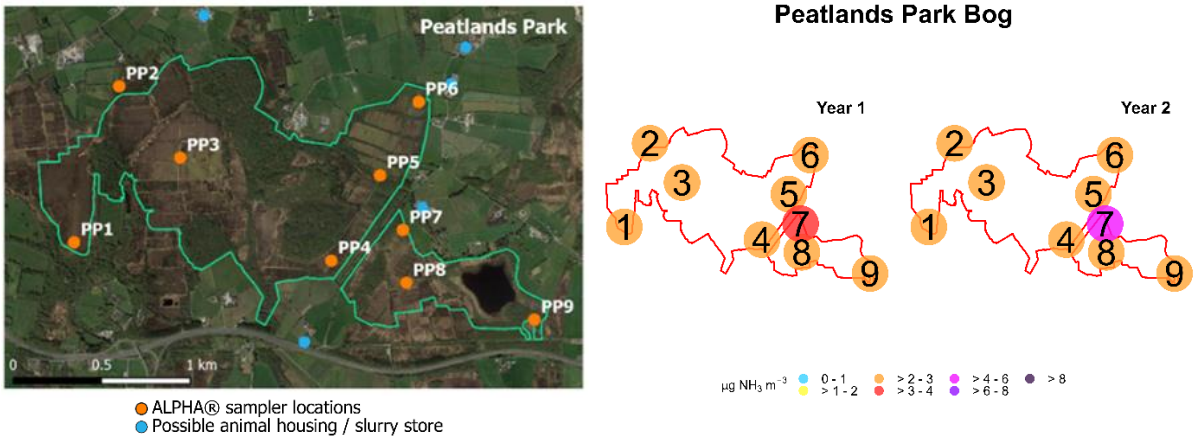


Figure 17: (LEFT) Map of Peatlands Park, showing locations of the five monitoring points (PP1 – PP9) and proximity of farms (blue circles) as potential NH_3 sources. The farms are identified using satellite/aerial imagery and may or may not be active. (RIGHT): Map of annual average NH_3 concentrations at Peatlands Park (Year 1: June 2020 - May 2021; Year 2: June 2021-May 2022).

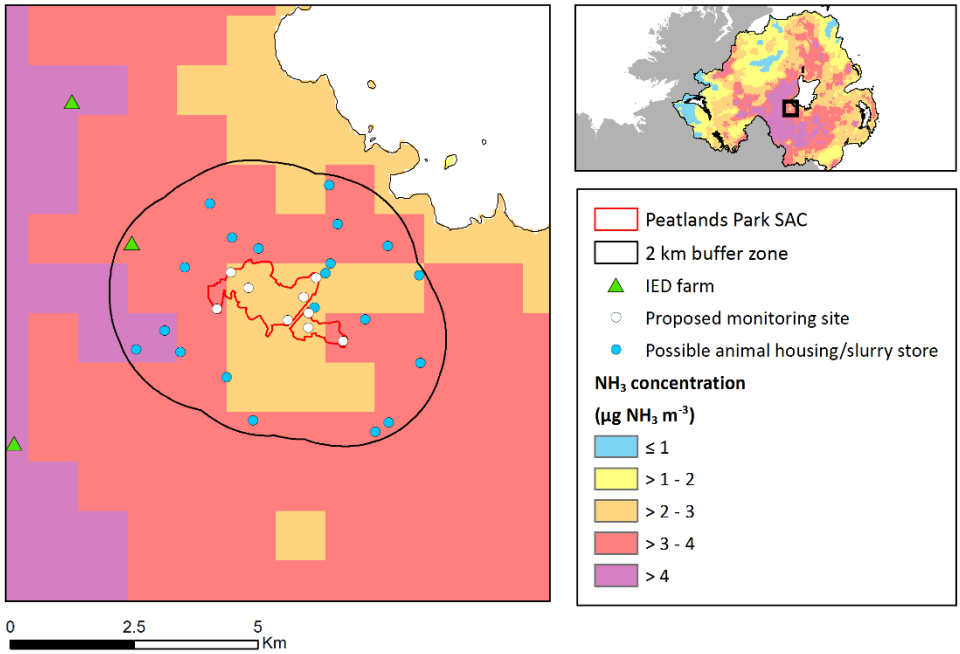


Figure 18: Modelled ground level NH_3 concentrations for Peatlands Park (outlined in red) and the wider landscape at 1 km x 1 km grid resolution (FRAME model output).

Modelled annual average NH_3 concentrations of 2.7- 3.2 µg NH_3 m^{-3} (2017) are estimated for Peatlands Park (Table 5), with the highest concentrations to the west, north and east of the site (Figure 18), i.e., where the site boundaries overlap with the red-coloured grid squares, indicating concentrations >3 µg NH_3 m^{-3} yr^{-1}, on average. The monitoring data for both years show Site PP7 standing out with the highest annual average concentration of 3.9 µg NH_3 m^{-3} in Year 1 (range in monthly measurements of 1.9 - 6.2 µg NH_3 m^{-3}) and 4.1 µg NH_3 m^{-3} in Year 2 (range in monthly measurements of 1.4 – 7.5 µg NH_3 m^{-3}). This is likely due to its proximity to livestock housing at the eastern site boundary. Annual average concentrations at the other 8 sites were smaller and between 2.0 - 2.6 µg NH_3 m^{-3} during Year 1 (range in monthly measurements of 1.2 - 7.2 µg NH_3 m^{-3}) and between 2.1 - 2.7 µg NH_3 m^{-3} during Year 2 (range in monthly measurements of 0.9 – 4.6 µg NH_3 m^{-3}). Annual measured mean concentrations are within the range of the modelled estimates. All sites at Peatlands Park are therefore substantially exceeding the critical level for its designated features of 1 µg m^{-3} (Figure 19).

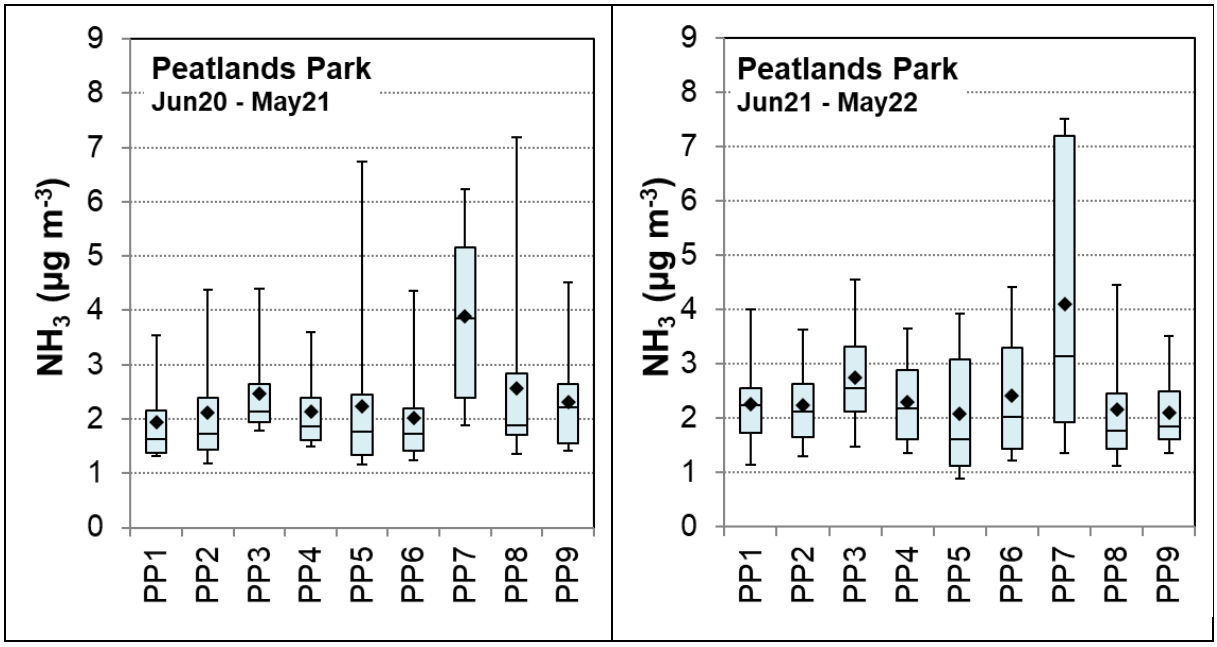


Figure 19: Boxplot comparing annual mean concentrations. Whiskers show the min and max of monitored monthly concentrations.

In terms of seasonal patterns (Figure 20), the main peak evident during Year 1 across all sites occurred again around March 2021 (February to April) and coincides with the slurry spreading season, with a secondary peak in June 2020 (again across all sites). This secondary peak in June 2020 is also visible at the other SACs and may be linked to warmer weather and/or late spring slurry spreading after silage cuts across the wider region. In addition, local peaks/events occurred at different sites in specific months, e.g., at Site PP8 in October 2020, or Site PP7 in August and September 2020. These may be related to slurry or manure spreading or other events/activities close to the monitoring sites.

During Year 2, the main peaks are again in the summer (June 2021) and March (2022), linked to slurry spreading on silage fields and the start of the spring slurry spreading season, respectively. The elevated concentrations during July 2021 are expected to have been influenced by the exceptionally warm weather across Northern Ireland, particularly in the second half of the month (see Section 4.2. for details).

Throughout both years, monthly measured concentrations at most sites track each other closely (within 1 - 2 µg NH_3 m^{-3}), with the exception of the individual peaks at individual measurement sites as described. This suggests that there are common regional concentration patterns across the site, with the hotspot livestock housing source close to Site PP7 standing out most, and the individual occasional peaks at other sites as laid out above (Figure 20). Overall, the modelling and monitoring data complement each other well, lending evidence that the modelled concentration data are fit for purpose across the wider area.

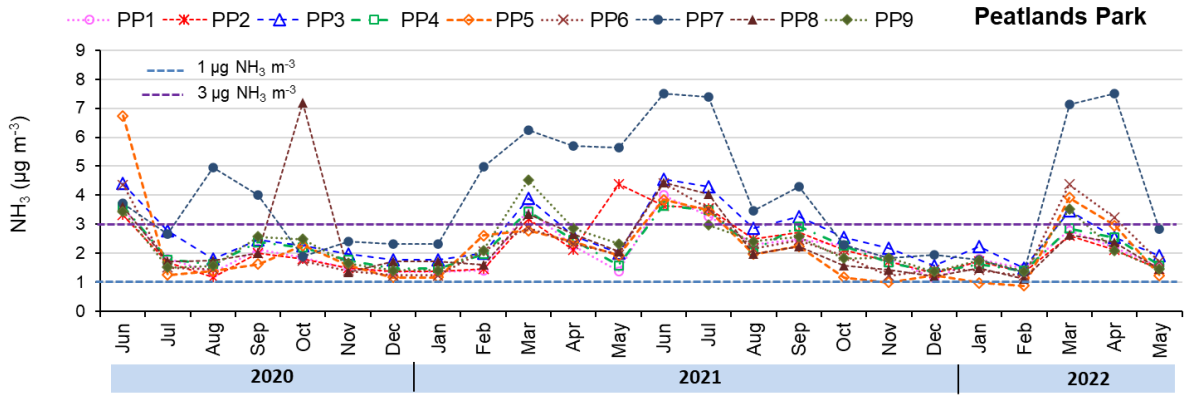


Figure 20: Seasonal cycle in NH_3 concentrations at each of nine monitoring points on Peatlands Park bog, showing similar trends between sites.

4.5 Slieve Beagh

The seven monitoring locations on Slieve Beagh are located to cover the boundaries of the site, across Northern Ireland and the Republic of Ireland. They have been located near access points to enable efficient sampler exchange. Modelled NH_3 concentrations of 1.4 – 2.2 µg NH_3 m^{-3} (2017) are estimated for the site, with the highest concentrations to the north, but with all areas exceeding the critical level for its designated features, of 1 µg NH_3 m^{-3} (Figure 21, Figure 22).

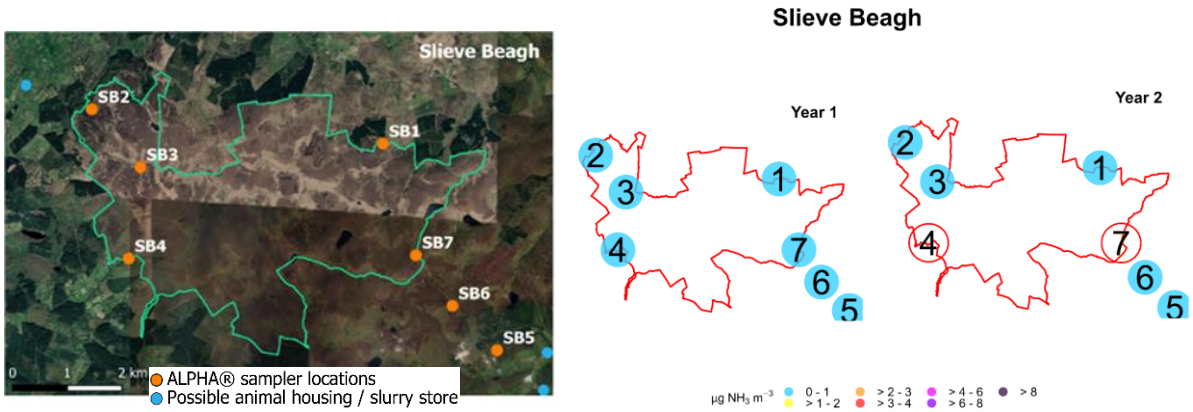


Figure 21: (LEFT) Map of Slieve Beagh, showing locations of the seven monitoring points (SB1 – SB7) and proximity of farms (blue circles) as potential NH_3 sources. The farms were identified using satellite/aerial imagery and may or may not be active. (RIGHT) Map of annual average NH_3 concentrations at Slieve Beagh (Year1: June 2020 - May 2021, Year 2: June 2021-May 2022). The red circles highlight sites that had annual average NH_3 concentrations calculated with relatively low data capture (Site 4: 74% and Site 7: 53%).

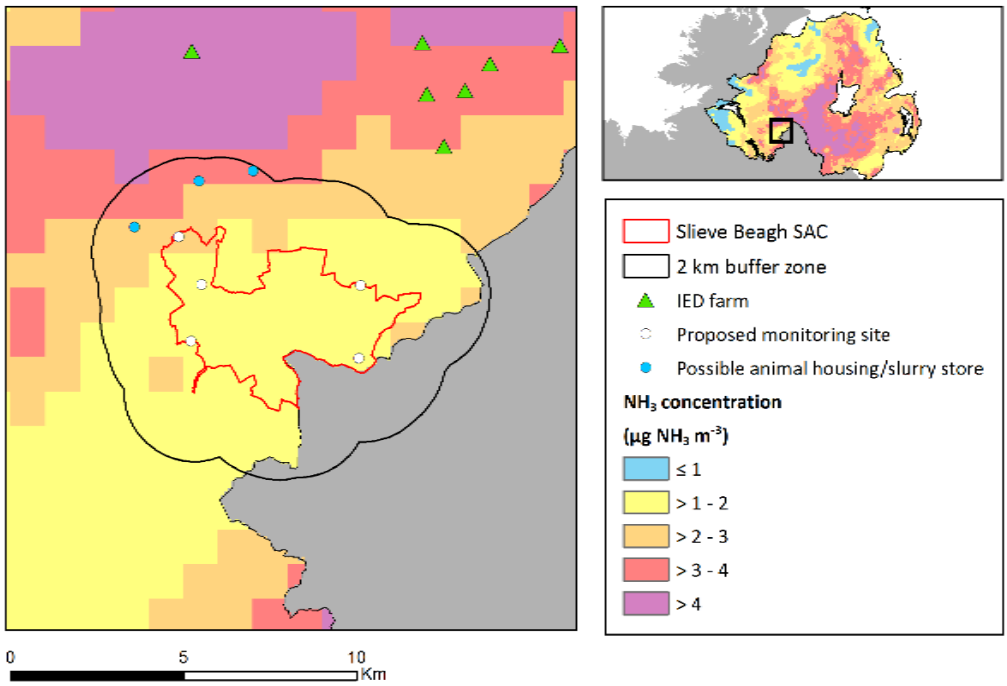


Figure 22: Modelled NH_3 concentrations for Slieve Beagh SAC (outlined in red) and the wider landscape at 1 km x 1 km grid resolution (FRAME model output for 2017).

During the early part of Year 1 (initial COVID lock-down), samples were exposed for a longer period (3 months, Jun - Aug 2020), and again for a 2-month period during Sep - Oct 2020, before normal monthly sampling was commenced in Nov 2020. These longer sampling periods disguise seasonal patterns somewhat, as measurements had to be averaged across longer periods of time. Despite the loss of monthly resolution at the beginning of Year 1 (Jun-Aug 2020, Sep-Oct 2020), the main spring peak around March 2021 is present, consistent with the other designated sites in this report, following strongly through to April. All monitoring locations can be seen to be tracking each other's peaks and troughs for the most part, within a range of 0.5 µg NH_3 m^{-3} of each other. The main exception during Year 1 was Site SB4 which was recording the lowest concentrations during Jun - Aug 2020 but has since reported the second highest or highest concentrations for much of the two years. However, it should be noted that the June 2020 sample at SB4 was exposed for three months from June to August 2020, which presents some uncertainty on data over that period.

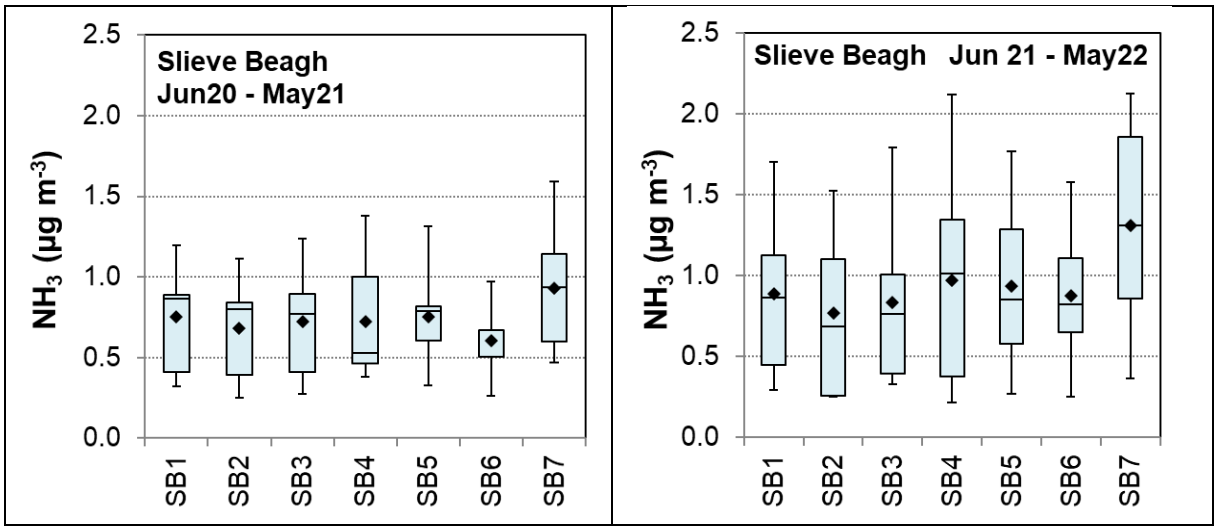


Figure 23: Boxplot comparing annual mean ammonia concentrations at Slieve Beagh. Whiskers show the min and max of monitored monthly concentrations.

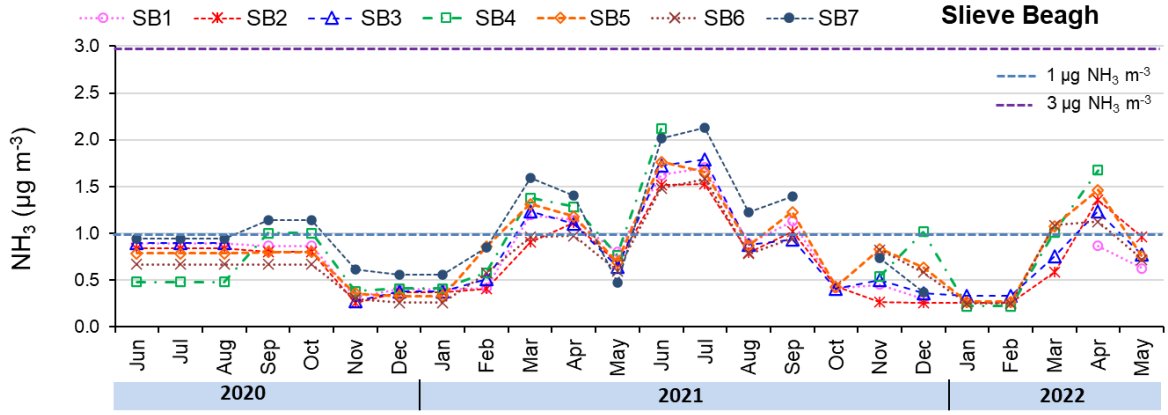


Figure 24: Seasonal cycle in NH_3 concentrations at each of seven monitoring points on Slieve Beagh, showing similar trends between sites.

The Year 1 annual mean measured concentrations at the monitoring sites were just below the UNECE Critical Levels threshold of 1 µg m^{-3}. These relatively low annual mean concentrations were 50 % lower than modelled values (Table 1).

This is likely due to the large size of the reserve and its remote location, with monitoring points located far from sources (> 1km). The exception was Site SB7 with the highest monitored concentrations at the centre of the reserve. Concentrations at Site SB7 (annual mean Year 1 = 0.9 µg NH_3 m^{-3}) were higher than the other six sites (annual mean Year 1 = 0.6 – 0.8 µg NH_3 m^{-3}).

During Year 2, however, the SB7 monitoring sites annual average exceeded the 1 µg m^{-3} threshold, at 1.3 µg NH_3 m^{-3}. However, the site had a relatively low number of valid measurements (6 out of 12 months), which makes these sites' data much more uncertain, and it is difficult to draw conclusions based on the partial monitoring record. Overall, concentrations during the very warm summer of 2021 were much higher than during the previous year, reaching >2 µg NH_3 m^{-3} during June at SB4 and SB7, and again in July at SB7 (no data for SB4). June and July 2021 recorded the highest concentrations overall during the 2021 calendar year, higher than the spring (Mar/Apr) and autumn (Sep) slurry spreading peaks. During the late autumn/winter (Oct 2021 to Feb 2022), concentrations at all sites dropped substantially, to below 0.5 µg NH_3 m^{-3} at most sites, and below 1 µg NH_3 m^{-3} at the remaining sites except SB4 (1.02 µg NH_3 m^{-3}). After a very wet Feb 2022, the spring landspreading peak over the wider area was very pronounced, again reaching >1 µg NH_3 m^{-3} during March at several sites and up to 1.7 µg NH_3 m^{-3} at Site SB4 during April. Overall, it looks like both the warmer temperatures during the summer of 2021 and possibly increased farming activity in the wider area may have combined to increase NH_3 concentrations across parts of Slieve Beagh SAC.

Due to the upland character of this site (in contrast to the lowland SACs), with few local sources and smaller NH_3 concentrations, wet deposition is expected to be a significant influence here and to contribute to a larger fraction of the total nitrogen deposition. It is therefore recommended that wet deposition measurements are introduced here.

4.6 Turmennan

Six monitoring locations were established across Turmennan (
Figure 25), to cover the expected concentration gradients across the site identified from modelling (Figure 26). Modelled NH_3 concentrations of 3.5 - 4.3 µg NH_3 m^{-3} (2017) are estimated for the site (Table 3), with the highest concentrations to the east, likely linked to local sources, substantially exceeding the critical level for its designated features of 1 µg NH_3 m^{-3} (Figure 26). To the north and west (1 - 4 km distance), there are indications of widespread annual average NH_3 concentrations > 4 µg NH_3 m^{-3}.

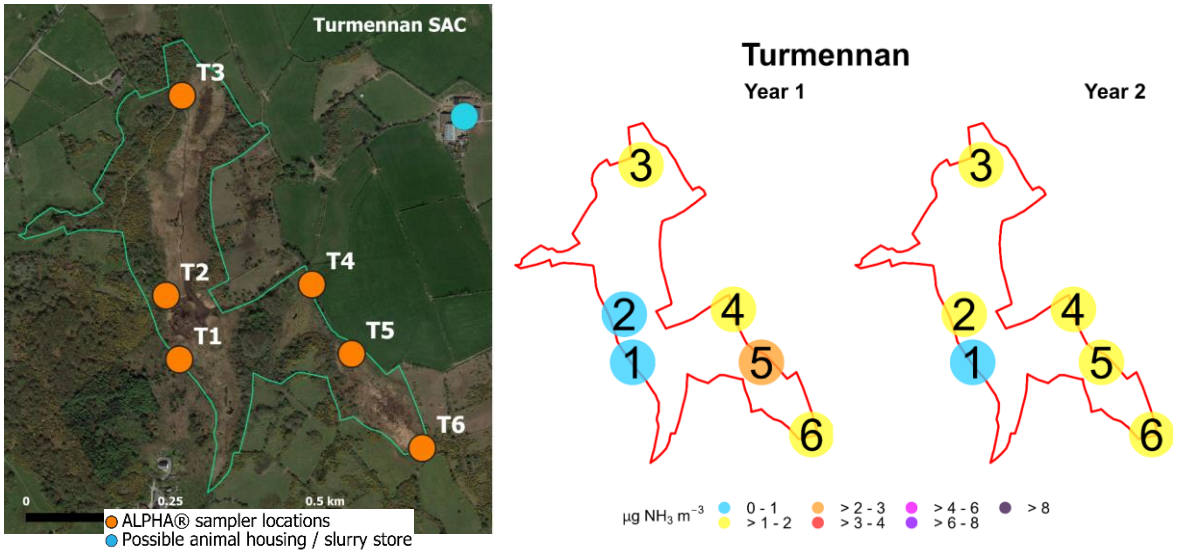


Figure 25: (LEFT) Map of Turmennan, showing locations of the six monitoring points (T1 – T6) and proximity of farms (blue circles) as potential NH_3 sources. The farms are identified using satellite/aerial imagery and may or may not be active. (RIGHT) Map of annual average NH_3 concentrations at Turmennan (Year 1: June 2020 - May 2021, Year 2: June 2021 - May 2022).

Annual mean monitored concentrations across the six sites (Year 1 = 0.9 - 2.1 µg NH_3 m^{-3}; Year 2 = 0.9 – 1.8 µg NH_3 m^{-3}) were substantially lower than the modelled values for grid squares covering the site (range = 3.5 - 4.3 µg NH_3 m^{-3}, Table 3). Four of the measurement sites (T3 – T6) on the northern and eastern side of Turmennan SAC, however, still exceeded the 1 µg NH_3 m^{-3} critical level during Year 1, and all sites apart from T1 exceeded 1 µg NH_3 m^{-3} during Year 2 (with T2 exceeding the 1 µg NH_3 m^{-3} critical level only very marginally at 1.05 µg NH_3 m^{-3}).

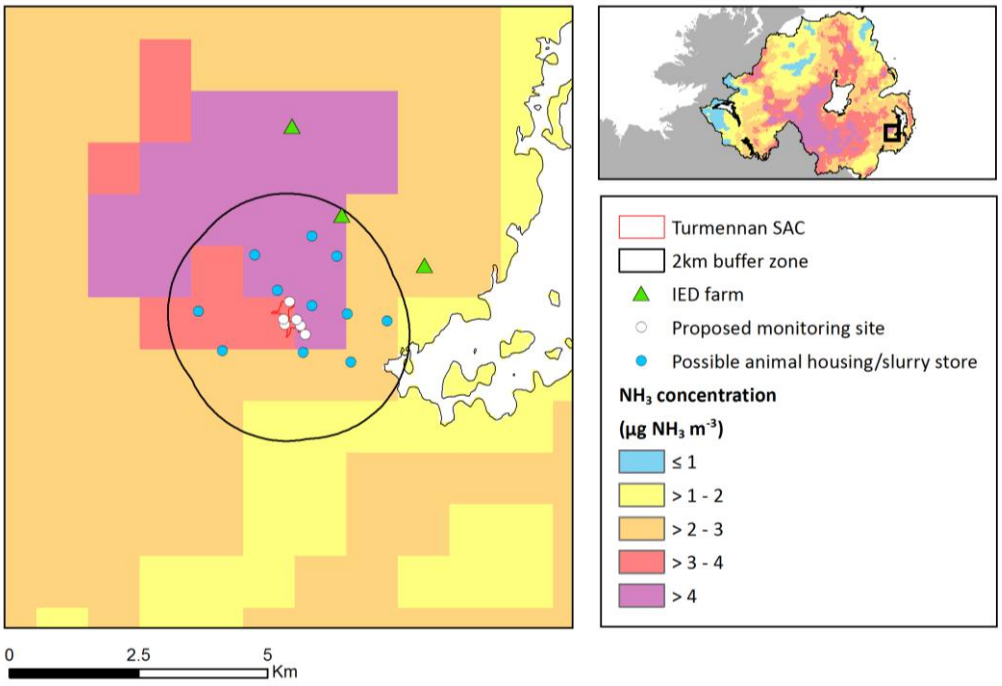


Figure 26: Modelled NH_3 concentrations for Turmennan SAC (outlined in red) and the wider landscape at 1 km x 1 km grid resolution (FRAME model output).

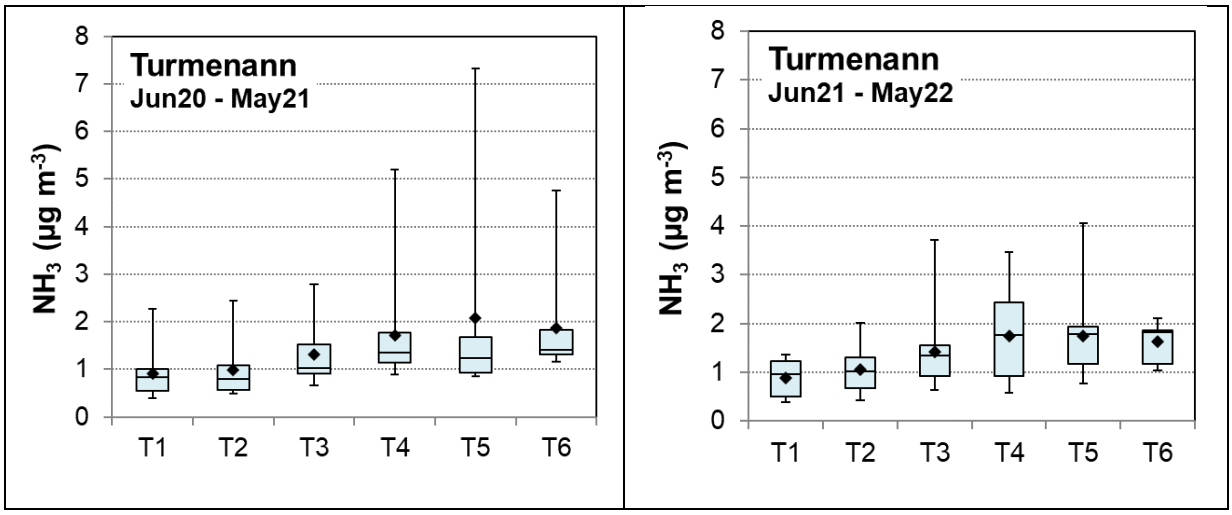


Figure 27: Boxplot comparing annual mean concentrations. Whiskers show the min and max of monitored monthly concentrations.

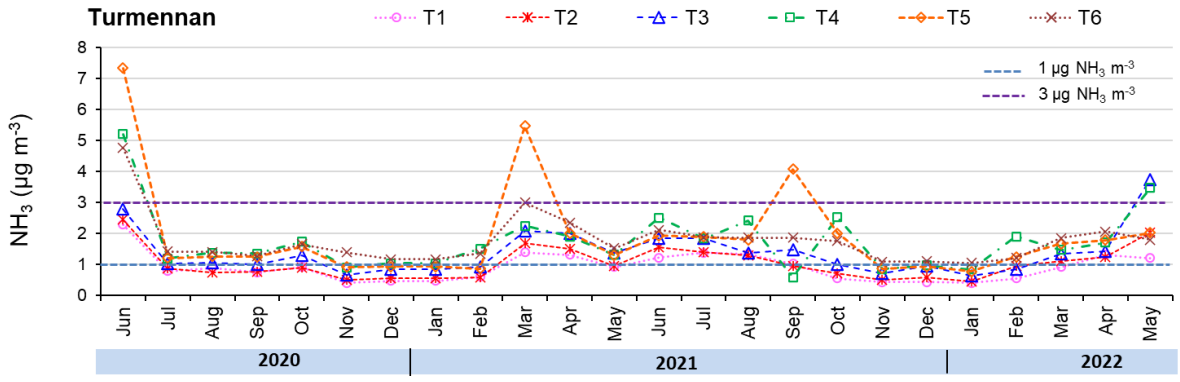


Figure 28: Seasonal cycle in NH_3 concentrations at each of six monitoring points on Turmennan, showing similar trends between sites.

While measured monthly concentrations were consistently between 0.4 and 1.7 µg NH_3 m^{-3} during July 2020 to January 2021, there was a distinct slurry spreading peak around March, with measured concentrations as high as 5.5 µg NH_3 m^{-3} at Site 5, which is immediately to the west of a field that receives slurry regularly (Figure 28). It is assumed that the high concentrations during June 2020 (2.3 - 7.3 µg NH_3 m^{-3}) and May 2022 (1.2 – 3.7 µg NH_3 m^{-3}) also represent slurry spreading activities in between silage cuts. The unusually high June peak in 2020 is visible across most of the SACs and is likely linked to warmer weather across the wider region[4], in combination with emission activities. Concentrations during the summer of 2021 were also higher than would be expected but can likely be related to the very warm weather (see Section 4.2 for details).

Overall, annual average measured concentrations are lower than modelled concentrations, however seasonal peaks are substantial (>5 µg NH_3 m^{-3} monthly average concentrations at the most affected monitoring site in Year 1). These are thought to be due to slurry spreading in the field immediately to the east of the site (large peaks in June 2020 and March 2021), and a smaller peak in October 2020, where the source is at a further distance from the site, i.e. enhanced concentrations are likely due to spreading on other nearby fields.

The lack of similarly high slurry spreading peak in March 2022 may be explained by two possible hypotheses: a) no slurry was spread in the fields immediately to the east of Site T5 (with the smaller peak due to slurry spreading in the wider area), or b) low-emission slurry spreading equipment was used. The latter hypothesis is to be confirmed with local information, but observations during March 2023 showed that slurry had been applied using a low-emission slurry spreading method. If this were to be confirmed to have been true for spring 2022, the monitoring data would provide clear evidence of lower emissions due to mitigation methods being applied.

Turmennan is a very small site at 14.8 ha (i.e., just 14.8 % of a single 1 km by 1 km grid cell), and concentrations may be lower than would otherwise be expected (from the modelled data) due to a large area of semi-natural vegetation to the west, which provides a substantial buffer from any sources located upwind of the prevailing westerly wind direction. The largest local source is the intensively managed field immediately to the east of the site boundary, and is therefore located downwind of the prevailing wind, with any emission plumes expected to be carried away from the site rather than across it. Therefore, any measures to mitigate emissions from this field are likely to be very effective in reducing atmospheric N input from the main local source.

[4] https://www.timeanddate.com/weather/@2641364/historic?month=6&year=2020

5. Further ongoing work

The data presented in this report cover the first two years of monitoring NH_3 concentrations at the six Special Areas of Conservation (SACs), from June 2020 to May 2022. A third year of monitoring is currently under way and a new report will be prepared once the sampling is complete (31 May 2022) and the samples have been processed by the laboratory and analysed.

In addition, moss samples have been collected for Moneygal in early spring 2022, and samples at Curran Bog, Garry Bog, Peatlands Park, Slieve Beagh and Turmennan have been collected in March 2023. These samples will be analysed for a) total foliar N (%N), and b) soluble NH_4-N, to complement the atmospheric NH_3 concentration measurements and this will be covered in a separate report. This additional ecosystem monitoring can be helpful in identifying NH_3 impacts to the plant communities in relation to changes in NH_3 concentrations and N deposition.

Nitrogen biomonitoring approaches such as foliar N (%N) are widely used to complement atmospheric measurements in the assessment of air pollution impacts of nitrogen on vegetation. Their use on a specific site of interest may be used to indicate either a level of exposure (N concentration or deposition) or ecosystem impact. Total foliar N (%N) is an established method, with extensive data on pleurocarpous mosses and some well-studied higher plants, e.g., *Calluna*. Foliar NH_4-N is another N biomonitoring method which provides an indication of plant soluble NH_4-N that is suitable as a sensitive indicator of the level of exposure to N deposition and NH_3 concentrations (JNCC, 2005) and which has been shown to be more sensitive than foliar total N method in some studies (JNCC, 2005).

6. Summary and Conclusions

Annual mean NH_3 concentrations derived from monthly measurements made at all 37 monitoring points across six designated sites are compared in Figure 29. Slieve Beagh is the cleanest of the six SACs monitored, with annual mean concentrations at all seven monitoring points during Year 1 and the majority of the monitoring points during Year 2 falling just below the UNECE Critical Levels threshold of 1 µg NH_3 m^{-3}. The SAC with the next smallest NH_3 concentrations is Moneygal (Year 1 range = 1.1 - 1.3 µg m^{-3}; Year 2 range 1.3 - 1.7 µg NH_3 m^{-3}). Moneygal is also located in a less intensively farmed part of the country and there are no local "hotspot" sources nearby, with no notable gradients across the site for most of the year, indicating wider diffuse sources such as landspreading away from the immediate vicinity of the site during the year. Turmennan has the lowest annual average concentrations at measurement sites furthest from the main local emission source (T1-T3; 0.9 - 1.3 µg NH_3 m^{-3} during Year 1; 0.8 - 1.4 µg NH_3 m^{-3} during Year 2), but with a clear concentration gradient into the site from the sampling locations closest to the source (T4-T6; 1.7-2.1 µg NH_3 m^{-3} during Year 1; 1.4-1.7 µg NH_3 m^{-3} during Year 2), i.e. the large field immediately to the east of the site boundary.

By contrast, Curran Bog, Garry Bog and Peatlands Park all show much higher annual average concentrations, above 2 µg m^{-3} at most sampling locations. Annual average concentrations across Garry Bog are less variable between sampling locations, and generally around 2 µg NH_3 m^{-3} and up to 2.6 µg NH_3 m^{-3}, on average, with higher values during Year 2. The largest concentrations and largest gradients are seen at Curran Bog and Peatlands Park (>7 µg NH_3 m^{-3}, and >4 µg NH_3 m^{-3}, respectively for each year, at the most polluted monitoring location within each SAC, respectively). These most elevated annual average concentrations are clearly spatially correlated with nearby livestock houses and associated management activities.

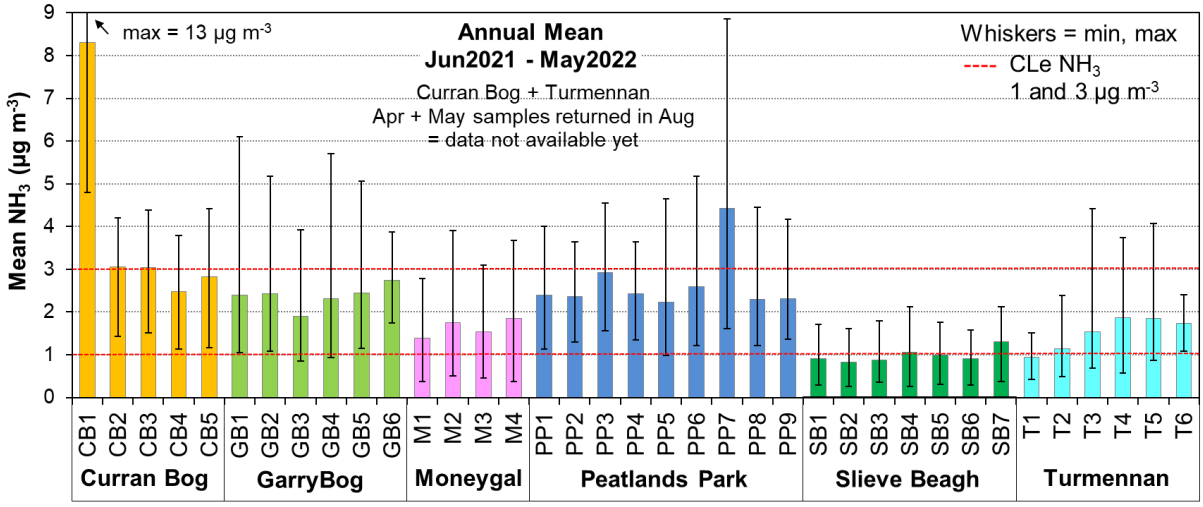


Figure 29: Summary graph comparing annual mean monitored NH_3 concentrations in project year 1 (June 2020 – May 2021) and project year 2 (June 2021 – May 2022) from all locations across the six designated SACs.

Table 1: Monthly monitored atmospheric NH_3 concentrations at all six designated sites (37 sampling points in total) from June 2020 to May 2021.

	2020	2020	2020	2020	2020	2020	2020	2021	2021	2021	2021	2021
Site name	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**
Curran Bog 1	6.53	-	3.83	6.04	8.28	5.73	7.25	7.25	2.47	24.0	5.94	4.65
Curran Bog 2	3.42	2.18	2.06	2.54	2.53	1.78	2.10	2.10	1.82	5.79	2.83	1.34
Curran Bog 3	3.54	2.20	3.49	2.39	2.50	1.97	2.18	2.18	2.01	5.67	2.90	1.50
Curran Bog 4	3.06	1.54	1.60	2.09	2.04	1.54	1.51	1.51	1.92	4.62	2.21	1.32
Curran Bog 5	2.88	1.34	1.72	2.23	2.50	1.69	1.71	1.71	2.13	2.34	2.51	1.39
Garry Bog 1	3.29	1.79	1.12	1.30	1.50	1.14	0.83	0.83	2.39	4.73	1.93	1.59
Garry Bog 2	3.02	1.71	1.55	1.49	1.88	1.43	1.20	1.20	1.85	4.61	2.55	1.41
Garry Bog 3	2.35	1.54	1.43	1.27	1.48	1.06	0.80	0.80	1.67	3.45	1.79	1.14
Garry Bog 4	3.25	1.71	1.75	1.43	1.69	1.28	1.03	1.03	1.91	4.24	2.13	1.31
Garry Bog 5	2.81	1.59	1.48	1.55	1.75	1.56	1.08	1.08	1.94	4.45	2.14	1.35
Garry Bog 6	3.34	1.89	2.04	1.87	1.98	1.76	1.44	1.44	2.26	5.44	2.47	1.48
Moneygal 1	1.74	0.61	1.32	1.16	1.00	0.44	0.46	0.46	1.25	2.66	1.58	1.03
Moneygal 2	1.99	0.46	1.47	1.35	1.22	0.69	0.54	0.54	1.67	2.67	1.88	1.21
Moneygal 3	1.74	0.51	1.22	1.11	0.99	0.53	0.48	0.48	1.45	2.24	1.55	1.06
Moneygal 4	1.92	0.49	1.54	1.39	1.31	0.58	0.59	0.59	1.66	2.65	1.94	1.01
Peatlands Park 1	3.55	1.81	1.32	2.13	1.84	1.47	1.35	1.35	1.41	3.50	2.25	1.37
Peatlands Park 2	3.31	1.67	1.18	2.01	1.80	1.47	1.38	1.38	1.44	3.19	2.12	4.37
Peatlands Park 3	4.40	2.76	1.80	2.46	2.27	1.98	1.78	1.78	1.99	3.89	2.60	1.99
Peatlands Park 4	3.61	1.78	1.62	2.38	2.19	1.77	1.48	1.48	1.97	3.45	2.45	1.57
Peatlands Park 5	6.73	1.24	1.37	1.62	2.27	1.60	1.17	1.17	2.61	2.78	2.39	1.92
Peatlands Park 6	4.36	1.51	1.45	-	1.74	1.39	1.24	1.24	2.07	2.87	2.32	1.95
Peatlands Park 7	5.04	2.65	4.96	4.00	1.90	2.41	2.31	2.31	5.00	6.23	5.70	5.64
Peatlands Park 8	3.61	1.73	1.75	2.01	7.18	1.35	1.70	1.70	1.59	3.34	2.68	2.06
Peatlands Park 9	3.44	1.51	1.56	2.57	2.49	1.65	1.41	1.41	2.09	4.51	2.85	2.33
Slieve Beagh 1	0.89	0.89	0.89	0.86	0.86	0.32	0.40	0.40	0.41	1.20	1.15	0.80
Slieve Beagh 2	0.84	0.84	0.84	0.80	0.80	0.25	0.37	0.37	0.40	0.91	1.11	0.68
Slieve Beagh 3	0.90	0.90	0.90	-	-	0.28	0.37	0.37	0.51	1.24	1.10	0.65
Slieve Beagh 4	0.48	0.48	0.48	1.00	1.00	0.38	0.41	0.41	0.58	1.38	1.28	0.77
Slieve Beagh 5	0.79	0.79	0.79	0.80	0.80	0.36	0.33	0.33	0.86	1.31	1.18	0.69
Slieve Beagh 6	0.67	0.67	0.67	0.67	0.67	0.30	0.26	0.26	0.58	0.96	0.97	0.60
Slieve Beagh 7	0.94	0.94	0.94	1.14	1.14	0.62	0.56	0.56	0.78	1.59	1.40	0.47
Turmennan 1	2.27	0.78	0.89	0.73	0.91	0.40	0.46	0.46	0.59	1.39	1.30	0.90
Turmennan 2	2.44	0.85	0.72	0.76	0.89	0.49	0.54	0.54	0.58	1.68	1.49	0.95
Turmennan 3	2.79	1.03	1.04	1.00	1.30	0.66	0.85	0.85	0.93	2.08	1.99	1.36
Turmennan 4	5.19	1.19	1.37	1.34	1.73	0.90	1.02	1.02	1.51	2.24	1.89	1.31
Turmennan 5	7.33	1.20	1.25	1.24	1.57	0.91	0.92	0.92	0.86	5.46	2.01	1.29
Turmennan 6	4.75	1.41	1.40	1.26	1.65	1.39	1.16	1.16	1.34	2.98	2.35	1.52

Note: Samples that were exposed for > 1 month are shown in blue and underlined. The values are time-integrated averaged NH_3 concentrations over the extended exposure periods. Empty cells = no data (samples lost or other sampling issues)

Table 2: Summary statistics from Year 1 of monitoring. Annual mean, minimum and maximum concentrations and number of sampling periods with valid data at each sampling site, for the 12 monthly measurement period between 1 June 2020 and 31 May 2021.

	Annual mean ($\mu g\ NH_3\ m^{-3}$)				
Site name	**Mean of 12 months**	**Min**	**Max**	**N**	**%CV**
Curran Bog 1	**7.45**	2.47	24.0	11	77%
Curran Bog 2	**2.54**	1.34	5.79	12	46%
Curran Bog 3	**2.71**	1.50	5.67	12	41%
Curran Bog 4	**2.08**	1.32	4.62	12	45%
Curran Bog 5	**2.01**	1.34	2.88	12	24%
Garry Bog 1	**1.87**	0.83	4.73	12	61%
Garry Bog 2	**1.99**	1.20	4.61	12	50%
Garry Bog 3	**1.57**	0.80	3.45	12	47%
Garry Bog 4	**1.90**	1.03	4.24	12	50%
Garry Bog 5	**1.90**	1.08	4.45	12	49%
Garry Bog 6	**2.28**	1.44	5.44	12	49%
Moneygal 1	**1.14**	0.44	2.66	12	57%
Moneygal 2	**1.31**	0.46	2.67	12	52%
Moneygal 3	**1.12**	0.48	2.24	12	50%
Moneygal 4	**1.31**	0.49	2.65	12	52%
Peatlands Park 1	**1.95**	1.32	3.55	12	41%
Peatlands Park 2	**2.11**	1.18	4.37	12	47%
Peatlands Park 3	**2.48**	1.78	4.40	12	34%
Peatlands Park 4	**2.15**	1.48	3.61	12	34%
Peatlands Park 5	**2.24**	1.17	6.73	12	68%
Peatlands Park 6	**2.01**	1.24	4.36	11	46%
Peatlands Park 7	**3.90**	1.90	6.23	12	40%
Peatlands Park 8	**2.56**	1.35	7.18	12	63%
Peatlands Park 9	**2.32**	1.41	4.51	12	41%
Slieve Beagh 1	**0.76**	0.32	1.20	12	40%
Slieve Beagh 2	**0.68**	0.25	1.11	12	39%
Slieve Beagh 3	**0.72**	0.28	1.24	10	46%
Slieve Beagh 4	**0.72**	0.38	1.38	12	50%
Slieve Beagh 5	**0.75**	0.33	1.31	12	41%
Slieve Beagh 6	**0.61**	0.26	0.97	12	39%
Slieve Beagh 7	**0.92**	0.47	1.59	12	38%
Turmennan 1	**0.92**	0.40	2.27	12	57%
Turmennan 2	**0.99**	0.49	2.44	12	59%
Turmennan 3	**1.32**	0.66	2.79	12	48%
Turmennan 4	**1.73**	0.90	5.19	12	67%
Turmennan 5	**2.08**	0.86	7.33	12	100%
Turmennan 6	**1.87**	1.16	4.75	12	57%

Table 3: Monthly monitored atmospheric NH_3 concentrations at all six designated sites (37 sampling points in total) from June 2021 to May 2022 (Year 2).

	2021	2021	2021	2021	2021	2021	2021	2022	2022	2022	2022	2022
Site name	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**
Curran Bog 1	10.6	8.49	7.38	12.6	6.02	8.13	6.28	4.28	4.04	9.71	8.64	7.21
Curran Bog 2	4.16	3.66	2.57	3.82	3.26	1.98	1.43	1.93	2.21	3.55	2.48	3.14
Curran Bog 3	4.24	3.79	2.85	3.84	3.07	1.90	1.51	1.82	1.36	3.70	3.31	2.58
Curran Bog 4	3.73	3.23	2.34	2.99	2.61	1.56	1.13	1.45	1.00	3.20	2.42	2.21
Curran Bog 5	4.42	3.01	2.41	3.17	3.89	1.80	1.38	1.58	0.98	3.62	3.14	2.42
Garry Bog 1	3.76	2.19	1.73	2.50	2.28	1.09	1.06	1.46	1.10	5.15	2.49	1.71
Garry Bog 2	3.16	2.90	2.04	3.10	2.29	1.43	1.08	1.61	1.23	4.37	2.12	1.59
Garry Bog 3	2.73	-	1.62	2.59	1.84	0.98	0.85	1.13	1.00	3.31	1.96	1.37
Garry Bog 4	3.01	2.84	1.94	2.76	2.13	1.36	0.94	1.46	1.29	4.82	2.06	1.46
Garry Bog 5	3.32	2.84	1.98	3.06	2.40	1.73	1.15	1.63	1.30	4.27	1.96	1.58
Garry Bog 6	3.73	3.16	2.71	-	3.33	1.92	1.75	1.48	1.96	3.27	2.87	1.82
Moneygal 1	2.11	2.30	1.00	1.81	0.99	0.38	0.53	0.38	2.35	1.80	1.18	0.53
Moneygal 2	2.54	3.03	1.57	2.16	1.21	0.51	0.61	0.50	3.29	2.40	0.87	0.61
Moneygal 3	2.01	2.28	1.22	2.36	1.66	0.51	0.57	0.39	2.61	1.95	0.97	0.57
Moneygal 4	2.31	3.12	1.81	2.58	1.57	0.37	0.67	0.43	3.11	2.44	1.50	0.67
Peatlands Park 1	4.00	3.27	2.31	2.48	2.27	1.82	1.79	1.48	2.78	2.19	1.52	1.79
Peatlands Park 2	3.64	3.55	2.48	2.72	2.12	1.73	1.71	1.34	2.61	2.10	1.45	1.71
Peatlands Park 3	4.55	4.28	2.86	3.27	2.55	2.18	2.24	1.47	3.48	2.54	1.92	2.24
Peatlands Park 4	3.65	3.48	2.10	2.93	2.25	1.67	1.62	1.40	2.86	2.54	1.57	1.62
Peatlands Park 5	3.84	3.47	1.97	2.23	1.17	0.99	0.98	0.88	3.92	2.96	1.23	0.98
Peatlands Park 6	4.42	3.53	2.15	2.46	1.90	1.21	1.42	1.22	4.37	3.23	1.70	1.42
Peatlands Park 7	7.52	7.38	3.46	4.29	2.30	1.82	1.78	1.36	7.14	7.50	2.83	1.78
Peatlands Park 8	4.45	4.03	1.97	2.25	1.58	1.43	1.49	1.12	2.63	2.39	1.44	1.49
Peatlands Park 9	-	2.98	2.42	2.57	1.82	1.84	1.75	1.38	3.51	2.10	1.45	1.75
Slieve Beagh 1	1.62	1.71	0.89	1.13	0.42	0.45	0.30				0.86	0.63
Slieve Beagh 2	1.52	1.53	0.79	1.02	0.44	0.26	0.25	0.26	0.26	0.58	1.36	0.96
Slieve Beagh 3	1.72	1.79	0.88	0.94	0.41	0.50	0.36	0.33	0.33	0.76	1.23	0.77
Slieve Beagh 4	2.12	-	-	-	-	0.54	1.02	0.22	0.22	1.01	1.68	
Slieve Beagh 5	1.77	1.66	0.87	1.23	0.43	0.83	0.63	0.27	0.27	1.08	1.46	0.75
Slieve Beagh 6	1.48	1.58	0.78	0.94	-	0.82	0.58	0.25	0.25	1.09	1.13	0.72
Slieve Beagh 7	2.02	2.13	1.23	1.39	-	0.74	0.37					
Turmennan 1	1.22	1.37	1.33	1.01	0.54	0.42	0.42	0.39	0.53	0.91	1.30	1.19
Turmennan 2	1.54	1.39	1.27	0.94	0.71	0.48	0.59	0.43	0.93	1.10	1.24	2.02
Turmennan 3	1.84	1.83	1.36	1.47	0.99	0.69	0.94	0.64	0.85	1.35	1.40	3.72
Turmennan 4	2.50	1.83	2.41	0.58	2.51	0.85	0.96	0.84	1.90	1.46	1.70	3.46
Turmennan 5	1.93	1.88	1.79	4.06	2.00	0.86	0.92	0.76	1.24	1.66	1.78	2.01
Turmennan 6	2.11	1.87	1.86	1.85	1.75	1.09	1.09	1.04	1.19	1.85	2.05	1.79

Note: Samples that were exposed for > 1 month are shown in blue and underlined. The values are time-integrated averaged NH_3 concentrations over the extended exposure periods. Empty cells = no data (samples lost or other sampling issues)

Table 4: Summary statistics from Year 2 of monitoring. Annual mean, minimum and maximum concentrations, and number of sampling periods with valid data at each sampling site, for the 12-monthly measurement period between 1 June 2021 and 31 May 2022.

	Annual mean ($\mu g\ NH_3\ m^{-3}$)				
Site name	**Mean of 12 months**	**Min**	**Max**	**N**	**%CV**
Curran Bog 1	7.78	4.04	12.64	12	32%
Curran Bog 2	2.85	1.43	4.16	12	31%
Curran Bog 3	2.83	1.36	4.24	12	35%
Curran Bog 4	2.32	1.00	3.73	12	38%
Curran Bog 5	2.65	0.98	4.42	12	40%
Garry Bog 1	2.21	1.06	5.15	12	55%
Garry Bog 2	2.24	1.08	4.37	12	44%
Garry Bog 3	1.76	0.85	3.31	11	46%
Garry Bog 4	2.17	0.94	4.82	12	49%
Garry Bog 5	2.27	1.15	4.27	12	41%
Garry Bog 6	2.55	1.48	3.73	11	31%
Moneygal 1	1.29	0.38	2.35	12	58%
Moneygal 2	1.63	0.50	3.29	12	62%
Moneygal 3	1.44	0.39	2.61	12	55%
Moneygal 4	1.73	0.37	3.12	12	57%
Peatlands Park 1	2.25	1.13	4.00	12	36%
Peatlands Park 2	2.23	1.30	3.64	12	36%
Peatlands Park 3	2.74	1.47	4.55	12	36%
Peatlands Park 4	2.29	1.35	3.65	12	35%
Peatlands Park 5	2.07	0.88	3.92	12	57%
Peatlands Park 6	2.42	1.21	4.42	12	49%
Peatlands Park 7	4.11	1.36	7.52	12	62%
Peatlands Park 8	2.17	1.12	4.45	12	50%
Peatlands Park 9	2.11	1.36	3.51	11	33%
Slieve Beagh 1	0.89	0.30	1.71	9	58%
Slieve Beagh 2	0.77	0.25	1.53	12	65%
Slieve Beagh 3	0.83	0.33	1.79	12	62%
Slieve Beagh 4	0.97	0.22	2.12	7	74%
Slieve Beagh 5	0.94	0.27	1.77	12	55%
Slieve Beagh 6	0.88	0.25	1.58	11	50%
Slieve Beagh 7	1.31	0.37	2.13	6	53%
Turmennan 1	0.89	0.39	1.37	12	45%
Turmennan 2	1.05	0.43	2.02	12	45%
Turmennan 3	1.42	0.64	3.72	12	58%
Turmennan 4	1.75	0.58	3.46	12	50%
Turmennan 5	1.74	0.76	4.06	12	50%
Turmennan 6	1.63	1.04	2.11	12	25%

Data in red correspond to averages calculated using less than 9 data points (<75% of data capture) and are likely to be less representative of the site annual concentrations.

Table 5: Monitored vs modelled annual mean atmospheric NH_3 concentrations for the six designated sites (monitored annual mean concentrations for each site taken from Tables 2 and 4, as minimum and maximum values from all samplers located on each designated site).

Study Sites	Range in mean annual NH_3 concentrations (µg NH_3 m^{-3})		
	Monitored annual mean (Jun20 – May21)	Monitored annual mean (Jun21 – May22)	Modelled annual mean # (FRAME with 2017 emissions)
Turmennan (*n* = 6)	0.9 – 2.1	0.8 - 1.6	3.5 - 4.3
Curran Bog (*n* = 5)	2.0 – 7.5	2.3 – 7.8	2.3 - 3.2
Peatlands Park (*n* = 9)	2.0 –4.0	1.8 - 3.4	2.7 - 3.2
Garry Bog (*n* = 6)	1.6 – 2.3	1.8 - 2.6	1.9 - 2.4
Moneygal Bog (*n* = 4)	1.1 – 1.3	1.3 - 1.7	1.7 - 2.5
Slieve Beagh (*n* = 7)	0.6 – 0.9	0.8-1.0##	1.4 - 2.2

Note: # across the model grid squares overlapping each site; ## excluding sites with data capture lower than 8 out of 12 months (SB4, SB7).

While this comparison (Table 5) is useful for cross-checking between modelled and measured concentration estimates, the following should be noted (as partly already referred to in this section and in the individual site profiles):

- Ammonia emissions are very highly variable across the landscape, and the modelled 1 km by 1 km grid estimates are based on coarser resolution datasets and assumptions in the underlying emission inventory maps that are used to calculate atmospheric concentrations. In particular, the range of concentrations across monitoring sites in close proximity to each other highlights these existing gradients across the landscape, compared with the much smoother patterns of the modelled data.
- Much seasonal variability is hidden behind the annual average concentrations at each monitoring site, with distinct peaks linked to local sources (such as slurry spreading in spring, early summer and to some degree in the autumn) or the presence of point sources such as livestock houses (see min/max columns in Table 2).

7. Acknowledgements

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8. References

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9. Appendices

9.1 Appendix 1: Site locations

CURRAN

SITE_ID	X (installed)	Y (installed)	Comments
CB1	-6.655776 °W	54.797117°N	First samplers out 15 May 2019
CB2	-6.650816 °W	54.800199°N	First samplers out 15 May 2019
CB3	-6.648403 °W	54.801069°N	First samplers out 15 May 2019
CB4	-6.647016 °W	54.802332 °N	First samplers out 15 May 2019
CB5	-6.632764 °W	54.798460 °N	First samplers out 15 May 2019

GARRY BOG

SITE_ID	X (installed)	Y (installed)	Comments
GB1	-6.542908°W	55.109892 °N	First samplers out 12 May 2019
GB2A	-6.534729°W	55.110814 °N	First samplers out 12 May 2019
GB3A	-6.526396°W	55.112235 °N	First samplers out 12 May 2019
GB4A	-6.529662°W	55.106774 °N	First samplers out 12 May 2019
GB5A	-6.53369 °W	55.107213 °N	First samplers out 12 May 2019
GB6A	6.530935°W	55.102198 °N	First samplers out 12 May 2019

PEATLANDS PARK

SITE_ID	X (installed)	Y (installed)	Comments
PP1	-6.621619 °W	54.487387 °N	First samplers out 11 May 2019
PP2	-6.617950 °W	54.494310 °N	First samplers out 11 May 2019
PP3	-6.610634 °W	54.492140 °N	First samplers out 11 May 2019
PP4	-6.599220 °W	54.486350 °N	First samplers out 11 May 2019
PP5	-6.594760 °W	54.490710 °N	First samplers out 11 May 2019
PP6	-6.592352 °W	54.493966 °N	First samplers out 11 May 2019
PP7	-6.592850 °W	54.487940 °N	First samplers out 11 May 2019
PP8	-6.592710 °W	54.485230 °N	First samplers out 11 May 2019
PP9	-6.581924 °W	54.483213 °N	First samplers out 11 May 2019

TURMENNAN

SITE_ID	X (installed)	Y (installed)	Comments
T1A	-5.715649 °W	54.378410 °N	First samplers out 15 May 2019
T2A	-5.715936 °W	54.379357 °N	First samplers out 15 May 2019
T3A	-5.715262 °W	54.382505 °N	First samplers out 15 May 2019
T4	-5.711966 °W	54.379458 °N	First samplers out 15 May 2019
T5A	-5.710986 °W	54.378411 °N	First samplers out 15 May 2019
T6	-5.709248 °W	54.376939 °N	First samplers out 15 May 2019

MONEYGAL

SITE_ID	X (installed)	Y (installed)	Comments
MB1	-7.63995 °W	54.74081 °N	First samplers out end May 2019
MB2	-7.62600 °W	54.74341 °N	First samplers out end May 2019
MB3	-7.63211 °W	54.73557 °N	First samplers out end May 2019
MB4	-7.62785 °W	54.73946 °N	First samplers out end May 2019

SLIABH BEAGH

SITE_ID	Lat	Lon	Grid Ref	Comments
SB1	54.35827293	-7.158548679	H 5476 4583	First samplers out 05 June 2019
SB2	54.3644863	-7.240406906	H 4941 4648	First samplers out 05 June 2019
SB3	54.35489538	-7.226887465	H 5010 4373	First samplers out 05 June 2019
SB4	54.33988649	-7.230463799	H 5030 4541	First samplers out 05 June 2019
SB5	54.3240792	-7.127126015	H 5684 4205	First samplers out 05 June 2019
SB6	54.33150042	-7.139501697	H 5600 4287	First samplers out 05 June 2019
SB7	54.33994168	-7.149579518	H 5537 4380	First samplers out 05 June 2019

9.2 Appendix 2: Data tables Year 2 (June 2021 - May 2022)

Curran Bog

Curran Bog			Date / Time			ppm NH_4^+ in 3 ml extract						NH_3 ($\mu g\ m^{-3}$)	
Year	Month	Site	OUT	IN	Time (Hrs)	ALPHA 1	ALPHA 2	ALPHA 3	mean	% CV	BLANK	Calibrated[1]	Comments
2021	Jun	CB1	2021/05/28 14:00:00	2021/07/02 14:20:00	840.3	10.27	10.10	10.37	10.25	1.3%	0.093	**10.6**	
2021	Jun	CB2	2021/05/28 12:00:00	2021/07/02 12:40:00	840.7	4.06	4.27	3.95	4.09	3.9%	0.093	**4.16**	
2021	Jun	CB3	2021/05/28 12:20:00	2021/07/02 12:55:00	840.6	4.31	4.10	4.09	4.17	3.0%	0.093	**4.24**	
2021	Jun	CB4	2021/05/28 12:25:00	2021/07/02 13:10:00	840.8	3.69	3.70	3.65	3.68	0.8%	0.093	**3.73**	
2021	Jun	CB5	2021/05/28 10:45:00	2021/07/02 11:20:00	840.6	4.31	4.17	4.54	4.34	4.2%	0.093	**4.42**	
2021	Jul	CB1	2021/07/02 14:20:00	2021/07/30 14:15:00	671.9	6.81	6.50	6.69	6.67	2.3%	0.142	**8.49**	filter pierced
2021	Jul	CB2	2021/07/02 12:40:00	2021/07/30 12:15:00	671.6	3.00	3.10	2.77	2.95	5.7%	0.142	**3.66**	
2021	Jul	CB3	2021/07/02 12:55:00	2021/07/30 12:30:00	671.6	2.82	2.78	3.57	3.06	14.6%	0.142	**3.79**	
2021	Jul	CB4	2021/07/02 13:10:00	2021/07/30 12:42:00	671.5	2.67	2.57	2.62	2.62	2.0%	0.142	**3.23**	
2021	Jul	CB5	2021/07/02 11:20:00	2021/07/30 11:15:00	671.9	2.46	2.51	2.41	2.46	2.0%	0.142	**3.01**	
2021	Aug	CB1	2021/07/30 14:18:00	2021/08/27 11:15:00	669.0	5.55	5.99	5.82	5.79	3.9%	0.137	**7.38**	
2021	Aug	CB2	2021/07/30 12:20:00	2021/08/27 09:13:00	668.9	2.29	1.86	2.16	2.10	10.5%	0.137	**2.57**	
2021	Aug	CB3	2021/07/30 12:31:00	2021/08/27 09:25:00	668.9	2.58	2.06	2.30	2.31	11.3%	0.137	**2.85**	
2021	Aug	CB4	2021/07/30 12:42:00	2021/08/27 09:38:00	668.9	1.72	1.98	2.09	1.93	9.7%	0.137	**2.34**	
2021	Aug	CB5	2021/07/30 11:15:00	2021/08/27 08:15:00	669.0	1.92	2.03	1.99	1.98	2.8%	0.137	**2.41**	
2021	Sep	CB1	2021/08/27 11:15:00	2021/09/30 14:30:00	819.3	11.78	12.05	11.98	11.94	1.2%	0.089	**12.6**	
2021	Sep	CB2	2021/08/27 09:13:00	2021/09/30 13:00:00	819.8	3.66	3.45	3.90	3.67	6.2%	0.089	**3.82**	
2021	Sep	CB3	2021/08/27 09:25:00	2021/09/30 13:20:00	819.9	3.63	3.73	3.73	3.69	1.5%	0.089	**3.84**	
2021	Sep	CB4	2021/08/27 09:38:00	2021/09/30 13:30:00	819.9	2.89	3.02	2.77	2.89	4.4%	0.089	**2.99**	
2021	Sep	CB5	2021/08/27 08:15:00	2021/09/30 12:00:00	819.8	3.20	2.92	3.05	3.06	4.7%	0.089	**3.17**	
2021	Oct	CB1	2021/09/30 14:30:00	2021/10/29 14:20:00	695.8	4.83	4.96	4.88	4.89	1.3%	0.097	**6.02**	
2021	Oct	CB2	2021/09/30 13:00:00	2021/10/29 12:45:00	695.7	2.68	2.62	2.77	2.69	2.8%	0.097	**3.26**	
2021	Oct	CB3	2021/09/30 13:20:00	2021/10/29 13:10:00	695.8	2.64	2.36	2.63	2.54	6.3%	0.097	**3.07**	
2021	Oct	CB4	2021/09/30 13:30:00	2021/10/29 13:25:00	695.9	2.08	2.09	2.35	2.17	7.2%	0.097	**2.61**	
2021	Oct	CB5	2021/09/30 12:00:00	2021/10/29 11:00:00	695.0	3.04	2.49	4.04	3.19	24.6%	0.097	**3.89**	
2021	Nov	CB1	2021/10/29 14:20:00	2021/11/26 12:37:00	671.3	6.88	6.74	5.43	6.35	12.6%	0.107	8.13	
2021	Nov	CB2	2021/10/29 12:45:00	2021/11/26 11:10:00	671.4	1.62	1.64	-	1.63	1.0%	0.107	**1.98**	1 sampler on the ground
2021	Nov	CB3	2021/10/29 13:10:00	2021/11/26 11:25:00	671.2	1.55	1.48	1.67	1.56	6.2%	0.107	**1.90**	
2021	Nov	CB4	2021/10/29 13:25:00	2021/11/26 11:40:00	671.2	1.26	1.37	1.29	1.30	4.2%	0.107	**1.56**	
2021	Nov	CB5	2021/10/29 11:00:00	2021/11/26 09:40:00	671.7	1.79	1.40	1.28	1.49	17.8%	0.107	**1.80**	
2021	Dec	CB1	2021/11/26 12:37:00	2021/12/17 12:30:00	503.9	3.31	4.65	3.45	3.80	19.3%	0.183	**6.28**	
2021	Dec	CB2	2021/11/26 11:10:00	2021/12/17 10:30:00	503.3	1.08	0.93	*0.144	1.01	10.7%	0.183	**1.43**	Velcro tab missing on a sampler
2021	Dec	CB3	2021/11/26 11:25:00	2021/12/17 10:40:00	503.3	1.02	1.03	1.10	1.05	4.2%	0.183	**1.51**	
2021	Dec	CB4	2021/11/26 11:40:00	2021/12/17 10:50:00	503.2	0.81	0.85	0.83	0.83	2.3%	0.183	**1.13**	
2021	Dec	CB5	2021/11/26 09:40:00	2021/12/17 09:45:00	504.1	1.03	1.08	0.82	0.98	14.4%	0.183	**1.38**	

2022	Jan	CB1	2021/12/17 12:45:00	2022/01/28 13:45:00	1009.0	5.63	5.97	6.38	5.99	6.3%	0.146	4.28	
2022	Jan	CB2	2021/12/17 10:30:00	2022/01/27 11:40:00	985.2	2.62	2.77	2.74	2.71	3.0%	0.146	1.93	
2022	Jan	CB3	2021/12/17 10:40:00	2022/01/28 11:00:00	1008.3	2.56	2.68	3.44	2.89	16.6%	0.146	1.82	
2022	Jan	CB4	2021/12/17 10:50:00	2022/01/28 10:35:00	1007.7	2.05	2.12	2.20	2.12	3.5%	0.146	1.45	
2022	Jan	CB5	2021/12/17 09:45:00	2022/01/28 09:50:00	1008.1	2.48	2.19	2.24	2.30	6.7%	0.146	1.58	
2022	Feb	CB1	2022/01/28 13:45:00	2022/02/25 14:15:00	672.5	3.71	3.95	3.78	3.81	3.3%	0.125	4.04	
2022	Feb	CB2	2022/01/27 11:40:00	2022/02/25 12:30:00	696.8	-	2.19	2.24	2.22	1.6%	0.125	2.21	Ba1 result discarded, sample on ground
2022	Feb	CB3	2022/01/28 11:00:00	2022/02/25 12:45:00	673.8	1.74	1.21	1.14	1.37	24.1%	0.125	1.36	Taken in 25/01/2022 on the record card, assumed Feb above
2022	Feb	CB4	2022/01/28 10:35:00	2022/02/25 13:00:00	674.4	1.04	-	1.04	1.04	0.1%	0.125	1.00	
2022	Feb	CB5	2022/01/28 09:50:00	2022/02/25 10:15:00	672.4	1.05	1.00	1.00	1.02	2.5%	0.125	0.98	
2022	Mar	CB1	2022/02/25 14:15:00	2022/03/25 14:30:00	672.3	9.23	9.14	8.61	8.99	3.7%	0.138	9.7	
2022	Mar	CB2	2022/02/25 12:30:00	2022/03/25 12:40:00	672.2	-	3.35	3.39	3.37	0.9%	0.138	3.55	Wrong Cap, sampler on the ground
2022	Mar	CB3	2022/02/25 12:45:00	2022/03/25 12:50:00	672.1	3.49	3.63	3.41	3.51	3.3%	0.138	3.70	
2022	Mar	CB4	2022/02/25 13:00:00	2022/03/25 13:15:00	672.2	2.82	3.43	2.92	3.06	10.7%	0.138	3.20	
2022	Mar	CB5	2022/02/25 10:15:00	2022/03/25 10:30:00	672.3	3.48	3.32	3.52	3.44	3.2%	0.138	3.62	
2022	Apr	CB1	2022/03/25 14:30:00	2022/04/29 14:40:00	839.2	10.59	9.46	9.79	9.95	5.9%	0.142	8.6	Received August
2022	Apr	CB2	2022/03/25 12:40:00	2022/04/29 12:50:00	839.2	3.47	2.26	3.08	2.94	21.1%	0.142	2.48	Received in August
2022	Apr	CB3	2022/03/25 12:50:00	2022/04/29 13:00:00	839.2	3.86	3.95	3.85	3.89	1.3%	0.142	3.31	Received in August
2022	Apr	CB4	2022/03/25 13:15:00	2022/04/29 13:20:00	839.1	2.90	2.75	2.95	2.87	3.6%	0.142	2.42	Received in August
2022	Apr	CB5	2022/03/25 10:30:00	2022/04/29 10:40:00	839.2	3.76	3.50	3.81	3.69	4.5%	0.142	3.14	Received in August
2022	May	CB1	2022/04/29 14:40:00	2022/07/08 14:35:00	1679.9	17.23	15.20	17.27	16.56	7.1%	0.149	7.21	Arrived in August
2022	May	CB2	2022/04/29 12:50:00	2022/07/08 12:55:00	1680.1	7.70	7.39	6.79	7.29	6.3%	0.149	3.14	Arrived in August
2022	May	CB3	2022/04/29 13:00:00	2022/07/08 13:00:00	1680.0	5.73	6.00	6.36	6.03	5.2%	0.149	2.58	Arrived in August
2022	May	CB4	2022/04/29 13:20:00	2022/07/08 13:25:00	1680.1	5.14	4.83	5.56	5.18	7.1%	0.149	2.21	Arrived in August
2022	May	CB5	2022/04/29 10:40:00	2022/07/08 10:30:00	1679.8	4.97	5.78	6.22	5.66	11.3%	0.149	2.42	Arrived in August

CV values in red surpass the <15% check and have higher uncertainty.

Garry Bog

Garry Bog			Date / Time			ppm NH_4^+ in 3 ml extract						NH_3 ($\mu g\ m^{-3}$)	
Year	Month	Site	OUT	IN	Time (Hrs)	ALPHA 1	ALPHA 2	ALPHA 3	mean	% CV	BLANK	Calibrated[1]	Comments
2021	Jun	GB1	2021/05/24 09:47:00	2021/06/30 12:24:00	890.6	3.81	4.05	3.89	3.92	3.1%	0.093	**3.76**	
2021	Jun	GB2	2021/05/24 10:55:00	2021/06/30 10:30:00	887.6	3.19	3.28	3.44	3.30	3.8%	0.093	**3.16**	
2021	Jun	GB3	2021/05/24 11:16:00	2021/06/30 10:51:00	887.6	2.84	2.94	2.80	2.86	2.4%	0.093	**2.73**	
2021	Jun	GB4	2021/05/24 11:52:00	2021/06/30 11:26:00	887.6	3.11	3.17	3.17	3.15	1.2%	0.093	**3.01**	
2021	Jun	GB5	2021/05/24 12:04:00	2021/06/30 11:36:00	887.5	3.58	3.46	3.35	3.46	3.2%	0.093	**3.32**	
2021	Jun	GB6	2021/05/24 10:15:00	2021/06/30 09:58:00	887.7	3.86	3.93	3.87	3.88	1.1%	0.093	**3.73**	
2021	Jul	GB1	2021/06/30 12:24:00	2021/07/27 12:07:00	647.7	1.76	1.81	1.71	1.76	2.8%	0.142	**2.19**	
2021	Jul	GB2	2021/06/30 10:33:00	2021/07/27 10:28:00	647.9	2.48	2.25	2.15	2.29	7.4%	0.142	**2.90**	
2021	Jul	GB3	2021/06/30 10:52:00	2021/07/27 10:49:00	647.9	1.52	2.89	-	2.21	43.8%	0.142	-	Sample pots knocked off, chewed - Deer
2021	Jul	GB4	2021/06/30 11:29:00	2021/07/27 11:19:00	647.8	2.23	2.27	2.24	2.25	1.0%	0.142	**2.84**	
2021	Jul	GB5	2021/06/30 11:39:00	2021/07/27 11:29:00	647.8	2.27	2.33	2.14	2.25	4.3%	0.142	**2.84**	
2021	Jul	GB6	2021/06/30 09:59:00	2021/07/27 12:34:00	650.6	2.52	2.53	2.43	2.49	2.4%	0.142	**3.16**	
2021	Aug	GB1	2021/07/27 12:10:00	2021/09/01 12:00:00	863.8	1.78	1.85	1.90	1.84	3.4%	0.137	**1.73**	Spider webs around samplers
2021	Aug	GB2	2021/07/27 10:30:00	2021/09/01 10:43:00	864.2	2.36	2.03	2.05	2.15	8.5%	0.137	**2.04**	
2021	Aug	GB3	2021/07/27 10:50:00	2021/09/01 10:59:00	864.2	1.75	1.73	1.73	1.74	0.7%	0.137	**1.62**	Spider webs around sample pots
2021	Aug	GB4	2021/07/27 11:21:00	2021/09/01 11:23:00	864.0	2.01	1.99	2.16	2.05	4.3%	0.137	**1.94**	Bird poo on post when setting out
2021	Aug	GB5	2021/07/27 11:30:00	2021/09/01 11:32:00	864.0	2.25	1.87	2.15	2.09	9.4%	0.137	**1.98**	Spider web around samplers
2021	Aug	GB6	2021/07/27 12:36:00	2021/09/01 12:20:00	863.7	2.67	3.19	2.58	2.81	11.8%	0.137	**2.71**	small amount of spider webs
2021	Sep	GB1	2021/09/01 12:00:00	2021/10/01 15:00:00	723.0	2.16	2.12	2.21	2.16	2.2%	0.089	**2.50**	
2021	Sep	GB2	2021/09/01 10:43:00	2021/10/01 13:37:00	722.9	2.61	2.80	2.55	2.65	5.0%	0.089	**3.10**	
2021	Sep	GB3	2021/09/01 10:59:00	2021/10/01 13:49:00	722.8	2.15	2.40	2.15	2.23	6.5%	0.089	**2.59**	
2021	Sep	GB4	2021/09/01 11:23:00	2021/10/01 14:17:00	722.9	2.35	2.41	2.37	2.37	1.4%	0.089	**2.76**	
2021	Sep	GB5	2021/09/01 11:33:00	2021/10/01 14:26:00	722.9	2.62	2.78	2.45	2.62	6.3%	0.089	**3.06**	
2021	Sep	GB6	2021/09/01 12:20:00	2021/10/01 15:19:00	723.0	1.07	0.43	1.24	0.91	47.1%	0.089	-	filter pierced, filter very wet, All pots on the ground
2021	Oct	GB1	2021/10/01 15:01:00	2021/10/29 14:50:00	671.8	2.08	1.68	1.79	1.85	11.4%	0.097	**2.28**	
2021	Oct	GB2	2021/10/01 13:37:00	2021/10/29 13:21:00	671.7	1.90	1.83	1.84	1.85	2.0%	0.097	**2.29**	
2021	Oct	GB3	2021/10/01 13:50:00	2021/10/29 13:40:00	671.8	1.58	1.53	1.42	1.51	5.6%	0.097	**1.84**	
2021	Oct	GB4	2021/10/01 14:17:00	2021/10/29 14:10:00	671.9	1.73	1.79	1.68	1.73	3.3%	0.097	**2.13**	
2021	Oct	GB5	2021/10/01 14:27:00	2021/10/29 14:19:00	671.9	1.98	1.90	1.95	1.94	2.0%	0.097	**2.40**	

Atmospheric ammonia assessments on six designates sites in Northern Ireland

2021	Oct	GB6	2021/10/01 15:19:00	2021/10/29 15:09:00	671.8	2.59	2.66	2.71	2.65	2.3%	0.097	**3.33**	In date blank, so but out had (29/10/2021 15:09) so assumed to be in date.
2021	Nov	GB1	2021/10/29 14:50:00	2021/11/30 12:08:00	766.3	1.10	1.01	1.06	1.06	4.1%	0.107	**1.09**	
2021	Nov	GB2	2021/10/29 13:21:00	2021/11/30 10:45:00	766.4	1.30	1.60	1.19	1.36	15.6%	0.107	**1.43**	
2021	Nov	GB3	2021/10/29 13:40:00	2021/11/30 11:01:00	766.4	1.04	0.95	0.92	0.97	6.2%	0.107	**0.98**	
2021	Nov	GB4	2021/10/29 14:10:00	2021/11/30 11:27:00	766.3	1.24	1.37	1.28	1.30	5.4%	0.107	**1.36**	
2021	Nov	GB5	2021/10/29 14:19:00	2021/11/30 11:35:00	766.3	1.50	2.01	1.38	1.63	20.6%	0.107	**1.73**	
2021	Nov	GB6	2021/10/29 15:09:00	2021/11/30 12:26:00	766.3	1.75	1.81	1.82	1.79	1.9%	0.107	**1.92**	
2021	Dec	GB1	2021/11/30 12:08:00	2021/12/29 13:45:00	697.6	1.05	0.98	1.05	1.03	4.1%	0.183	**1.06**	
2021	Dec	GB2	2021/11/30 10:45:00	2021/12/29 12:20:00	697.6	0.98	1.09	1.08	1.05	5.7%	0.183	**1.08**	
2021	Dec	GB3	2021/11/30 11:02:00	2021/12/29 12:36:00	697.6	0.86	0.77	0.96	0.86	11.4%	0.183	**0.85**	
2021	Dec	GB4	2021/11/30 11:28:00	2021/12/29 13:01:00	697.5	0.88	0.94	0.98	0.93	5.2%	0.183	**0.94**	
2021	Dec	GB5	2021/11/30 11:36:00	2021/12/29 13:11:00	697.6	1.09	1.16	1.05	1.10	4.8%	0.183	**1.15**	
2021	Dec	GB6	2021/11/30 12:27:00	2022/01/25 12:12:00	1343.7	-	2.67	2.99	2.83	8.1%	0.146	**1.75**	These have been exposed for 2 months. Could not access (29/12/2021). Pot with no cap was found on ground
2022	Jan	GB1	2021/12/29 13:45:00	2022/01/25 11:55:00	646.2	1.49	1.41	1.34	1.41	5.3%	0.146	1.46	
2022	Jan	GB2	2021/12/29 12:21:00	2022/01/25 10:29:00	646.1	1.34	2.26	1.75	1.78	25.9%	0.146	1.61	
2022	Jan	GB3	2021/12/29 12:36:00	2022/01/25 10:45:00	646.2	1.14	1.09	1.14	1.12	2.9%	0.146	1.13	
2022	Jan	GB4	2021/12/29 13:01:00	2022/01/25 11:11:00	646.2	1.31	1.45	1.50	1.42	7.1%	0.146	1.46	
2022	Jan	GB5	2021/12/29 13:11:00	2022/01/25 11:19:00	646.1	1.52	1.62	2.04	1.72	16.0%	0.146	1.63	dirty, wet, opened
2022	Jan	GB6	2021/11/30 12:27:00	2022/01/25 12:12:00	1343.7	-	2.67	2.99	2.83	8.1%	0.146	1.48	These have been exposed for 2 months. Could not access (29/12/2021). Pot with no cap was found on ground
2022	Feb	GB1	2022/01/25 11:55:00	2022/03/04 13:31:00	913.6	1.59	1.48	1.38	1.48	7.0%	0.125	1.10	
2022	Feb	GB2	2022/01/25 10:29:00	2022/03/04 13:48:00	915.3	1.64	1.62	1.68	1.65	1.8%	0.125	1.23	
2022	Feb	GB3	2022/01/25 10:45:00	2022/03/04 14:03:00	915.3	1.51	1.33	1.26	1.37	9.7%	0.125	1.00	
2022	Feb	GB4	2022/01/25 11:11:00	2022/03/04 14:39:00	915.5	1.73	1.87	1.56	1.72	9.1%	0.125	1.29	
2022	Feb	GB5	2022/01/25 11:19:00	2022/03/04 14:40:00	915.3	1.72	1.61	1.89	1.74	7.9%	0.125	1.30	
2022	Feb	GB6	2022/01/25 12:12:00	2022/03/04 13:12:00	913.0	2.31	2.89	2.45	2.55	12.0%	0.125	1.96	
2022	Mar	GB1	2022/03/04 13:31:00	2022/03/28 10:57:00	572.4	4.26	4.13	4.01	4.13	3.0%	0.138	5.15	
2022	Mar	GB2	2022/03/04 13:49:00	2022/03/28 12:40:00	573.9	3.60	3.51	3.51	3.54	1.4%	0.138	4.37	
2022	Mar	GB3	2022/03/04 14:03:00	2022/03/28 12:25:00	573.4	-	2.74	2.69	2.71	1.2%	0.138	3.31	Very Wet1 sampler found on ground, On bog dam building using peat on site which has left bore patches.

2022	Mar	GB4	2022/03/04 14:40:00	2022/03/28 11:55:00	572.3	3.76	4.09	3.78	3.88	4.7%	0.138	4.82	
2022	Mar	GB5	2022/03/04 14:40:00	2022/03/28 11:47:00	572.1	3.37	3.46	3.54	3.45	2.5%	0.138	4.27	faint smell, slurry coming in
2022	Mar	GB6	2022/03/04 13:12:00	2022/03/28 10:38:00	572.4	-	2.76	2.60	2.68	4.5%	0.138	3.27	
2022	Apr	GB1	2022/03/28 10:58:00	2022/04/25 10:55:00	672.0	2.39	2.39	-	2.39	0.0%	0.142	2.49	1 sampler on the ground
2022	Apr	GB2	2022/03/28 12:41:00	2022/04/25 12:41:00	672.0	2.09	1.92	2.13	2.05	5.4%	0.142	2.12	
2022	Apr	GB3	2022/03/28 12:26:00	2022/04/25 12:14:00	671.8	2.01	1.71	1.98	1.90	8.5%	0.142	1.96	
2022	Apr	GB4	2022/03/28 11:55:00	2022/04/25 11:49:00	671.9	2.02	1.98	-	1.77	1.4%	0.142	2.06	
2022	Apr	GB5	2022/03/28 11:48:00	2022/04/25 11:42:00	671.9	1.91	1.86	1.95	1.90	2.2%	0.142	1.96	
2022	Apr	GB6	2022/03/28 10:38:00	2022/04/25 10:37:00	672.0	2.70	2.49	3.01	2.73	9.5%	0.142	2.87	
2022	May	GB1	2022/04/25 10:55:00	2022/05/30 11:12:00	840.3	2.04	2.06	2.20	2.10	3.9%	0.149	1.71	
2022	May	GB2	2022/04/25 12:41:00	2022/05/30 11:58:00	839.3	1.99	1.87	2.02	1.96	4.0%	0.149	1.59	
2022	May	GB3	2022/04/25 12:14:00	2022/05/30 12:12:00	840.0	1.55	1.68	1.90	1.71	10.3%	0.149	1.37	
2022	May	GB4	2022/04/25 11:49:00	2022/05/30 12:39:00	840.8	1.76	1.84	1.82	1.81	2.3%	0.149	1.46	
2022	May	GB5	2022/04/25 11:42:00	2022/05/30 12:47:00	841.1	1.91	1.93	2.00	1.95	2.4%	0.149	1.58	
2022	May	GB6	2022/04/25 10:37:00	2022/05/30 10:55:00	840.3	2.26	2.27	2.15	2.23	3.1%	0.149	1.82	

CV values in red surpass the <15% check and have higher uncertainty.

Moneygal

Moneygal			Date / Time			ppm NH_4^+ in 3 ml extract						NH_3 ($\mu g\ m^{-3}$)	
Year	Month	Site	OUT	IN	Time (Hrs)	ALPHA 1	ALPHA 2	ALPHA 3	mean	% CV	BLANK	Calibrated[1]	Comments
2021	Jun	M1	2021/05/28 13:18:00	2021/06/29 11:42:00	766.4	2.08	1.87	1.87	1.94	6.2%	0.093	**2.11**	
2021	Jun	M2	2021/05/28 12:15:00	2021/06/29 11:50:00	767.6	-	2.52	2.11	2.32	12.5%	0.093	**2.54**	
2021	Jun	M3	2021/05/28 12:57:00	2021/06/29 12:22:00	767.4	1.87	1.85	1.85	1.86	0.7%	0.093	**2.01**	Turf cutting by machinery in field to west.
2021	Jun	M4	2021/05/28 11:56:00	2021/06/29 11:40:00	767.7	2.26	2.06	2.03	2.12	5.9%	0.093	**2.31**	
2021	Jul	M1	2021/06/29 11:44:00	2021/07/26 13:13:00	649.5	1.93	1.72	1.89	1.85	6.2%	0.142	**2.30**	
2021	Jul	M2	2021/06/29 11:52:00	2021/07/26 11:58:00	648.1	2.29	2.30	2.57	2.39	6.7%	0.142	**3.03**	
2021	Jul	M3	2021/06/29 12:25:00	2021/07/26 12:42:00	648.3	1.83	1.81	1.85	1.83	0.9%	0.142	**2.28**	
2021	Jul	M4	2021/06/29 11:42:00	2021/07/26 11:44:00	648.0	2.61	2.42	2.34	2.46	5.7%	0.142	**3.12**	
2021	Aug	M1	2021/07/26 13:15:00	2021/08/31 12:56:00	863.7	1.14	1.10	1.14	1.13	1.7%	0.137	**1.00**	
2021	Aug	M2	2021/07/26 11:59:00	2021/08/31 12:07:00	864.1	1.79	1.76	1.52	1.69	8.7%	0.137	**1.57**	
2021	Aug	M3	2021/07/26 12:44:00	2021/08/31 12:34:00	863.8	1.47	1.29	1.27	1.34	8.0%	0.137	**1.22**	hole in the filter
2021	Aug	M4	2021/07/26 11:46:00	2021/08/31 11:54:00	864.1	1.75	2.06	1.97	1.92	8.1%	0.137	**1.81**	
2021	Sep	M1	2021/08/31 12:56:00	2021/10/04 12:49:00	815.9	1.79	1.72	1.81	1.78	2.7%	0.089	**1.81**	
2021	Sep	M2	2021/08/31 12:07:00	2021/10/04 12:31:00	816.4	2.03	2.15	2.13	2.10	3.0%	0.089	**2.16**	
2021	Sep	M3	2021/08/31 12:34:00	2021/10/04 11:48:00	815.2	2.23	2.36	2.27	2.29	2.9%	0.089	**2.36**	
2021	Sep	M4	2021/08/31 11:54:00	2021/10/04 11:38:00	815.7	2.41	2.50	2.57	2.49	3.3%	0.089	**2.58**	
2021	Oct	M1	2021/10/04 12:51:00	2021/10/26 13:04:00	528.2	0.69	0.70	0.69	0.69	1.0%	0.097	**0.99**	
2021	Oct	M2	2021/10/04 12:33:00	2021/10/26 12:48:00	528.2	0.85	0.86	0.78	0.83	5.8%	0.097	**1.21**	
2021	Oct	M3	2021/10/04 11:50:00	2021/10/26 12:08:00	528.3	1.18	1.15	0.97	1.10	10.6%	0.097	**1.66**	
2021	Oct	M4	2021/10/04 11:40:00	2021/10/26 11:50:00	528.2	1.08	1.03	1.04	1.05	2.7%	0.097	**1.57**	
2021	Nov	M1	2021/10/26 13:04:00	2021/12/01 13:01:00	865.0	0.49	0.47	0.48	0.48	2.0%	0.107	**0.38**	
2021	Nov	M2	2021/10/26 12:48:00	2021/12/01 12:09:00	864.4	0.63	0.57	0.65	0.61	6.5%	0.107	**0.51**	
2021	Nov	M3	2021/10/26 12:08:00	2021/12/01 11:55:00	864.8	0.61	0.62	0.60	0.61	1.3%	0.107	**0.51**	
2021	Nov	M4	2021/10/26 11:50:00	2021/12/01 12:44:00	865.9	0.52	0.43	0.47	0.48	9.5%	0.107	**0.37**	
2021	Dec	M1	2021/12/01 13:02:00	2021/12/30 12:37:00	695.6	0.67	0.64	0.73	0.68	6.5%	0.183	**0.62**	
2021	Dec	M2	2021/12/01 12:09:00	2021/12/30 11:50:00	695.7	0.92	0.93	0.86	0.90	4.0%	0.183	**0.91**	
2021	Dec	M3	2021/12/01 11:56:00	2021/12/30 12:22:00	696.4	0.97	0.71	-	0.84	21.6%	0.183	**0.83**	Sampler with all lids found on the ground
2021	Dec	M4	2021/12/01 12:45:00	2021/12/30 11:35:00	694.8	0.81	0.97	0.82	0.86	10.5%	0.183	**0.86**	

2022	Jan	M1	2021/12/30 12:37:00	2022/02/02 13:58:00	817.4	0.70	0.75	-	0.82	4.9%	0.146	0.53	
2022	Jan	M2	2021/12/30 11:50:00	2022/02/02 12:34:00	816.7	0.94	0.74	0.75	0.81	13.8%	0.146	0.61	
2022	Jan	M3	2021/12/30 12:22:00	2022/02/02 13:44:00	817.4	0.91	0.70	0.70	0.77	15.4%	0.146	0.57	
2022	Jan	M4	2021/12/30 11:35:00	2022/02/02 11:49:00	816.2	0.73	0.97	0.95	0.88	14.7%	0.146	0.67	
2022	Feb	M1	2022/02/02 13:58:00	2022/03/02 12:55:00	671.0	-	0.46	0.47	0.47	1.2%	0.125	0.38	
2022	Feb	M2	2022/02/02 12:34:00	2022/03/02 12:03:00	671.5	0.57	0.52	0.64	0.58	10.1%	0.125	0.50	
2022	Feb	M3	2022/02/02 13:44:00	2022/03/02 12:44:00	671.0	0.45	0.54	0.45	0.48	10.5%	0.125	0.39	
2022	Feb	M4	2022/02/02 11:49:00	2022/03/02 12:14:00	672.4	0.51	-	0.52	0.51	0.7%	0.125	0.43	
2022	Mar	M1	2022/03/02 12:55:00	2022/03/25 12:42:00	551.8	1.83	2.14	1.71	1.89	11.7%	0.138	2.35	
2022	Mar	M2	2022/03/02 12:03:00	2022/03/25 11:45:00	551.7	2.85	2.48	2.47	2.60	8.4%	0.138	3.29	
2022	Mar	M3	2022/03/02 12:44:00	2022/03/25 12:29:00	551.7	2.18	2.16	1.94	2.09	6.4%	0.138	2.61	
2022	Mar	M4	2022/03/02 12:14:00	2022/03/25 11:55:00	551.7	2.42	2.45	2.52	2.46	2.1%	0.138	3.11	
2022	Apr	M1	2022/03/25 12:43:00	2022/04/27 12:42:00	791.0	1.93	2.26	1.95	2.05	9.0%	0.142	1.80	
2022	Apr	M2	2022/03/25 11:45:00	2022/04/27 11:55:00	791.2	-	2.81	2.57	2.69	6.4%	0.142	2.40	One on the ground coming in
2022	Apr	M3	2022/03/25 12:29:00	2022/04/27 12:58:00	791.5	2.42	1.99	2.22	2.21	9.7%	0.142	1.95	
2022	Apr	M4	2022/03/25 11:56:00	2022/04/27 11:37:00	790.7	2.80	2.81	2.60	2.74	4.4%	0.142	2.44	
2022	May	M1	2022/04/27 12:42:00	2022/05/25 11:58:00	671.3	1.17	1.25	1.24	1.22	3.9%	0.149	1.18	
2022	May	M2	2022/04/27 11:57:00	2022/05/25 12:50:00	672.9	0.97	0.98	0.87	0.94	6.4%	0.149	0.87	
2022	May	M3	2022/04/27 12:58:00	2022/05/25 12:32:00	671.6	1.11	1.00	0.99	1.03	6.2%	0.149	0.97	
2022	May	M4	2022/04/27 11:37:00	2022/05/25 11:46:00	672.1	1.59	1.53	1.44	1.52	5.0%	0.149	1.50	

CV values in red surpass the <15% check and have higher uncertainty.

Peatlands Park

Peatlands Park			Date / Time			ppm NH_4^+ in 3 ml extract						NH_3 ($\mu g\ m^{-3}$)	
Year	Month	Site	OUT	IN	Time (Hrs)	ALPHA 1	ALPHA 2	ALPHA 3	mean	% CV	BLANK	Calibrated[1]	Comments
2021	Jun	PP1	2021/05/26 11:34:00	2021/06/28 11:36:00	792.0	3.64	3.61	3.91	3.72	4.4%	0.093	**4.00**	wrong cap
2021	Jun	PP2	2021/05/26 11:53:00	2021/06/28 11:56:00	792.0	3.29	3.42	3.46	3.39	2.6%	0.093	**3.64**	wrong cap
2021	Jun	PP3	2021/05/26 12:08:00	2021/06/28 12:12:00	792.1	4.16	4.27	4.23	4.22	1.3%	0.093	**4.55**	wrong cap
2021	Jun	PP4	2021/05/26 09:58:00	2021/06/28 10:01:00	792.0	3.43	3.23	3.53	3.40	4.6%	0.093	**3.65**	wrong cap
2021	Jun	PP5	2021/05/26 10:39:00	2021/06/28 10:43:00	792.1	3.38	3.78	3.55	3.57	5.6%	0.093	**3.84**	wrong cap
2021	Jun	PP6	2021/05/26 11:02:00	2021/06/28 11:08:00	792.1	4.32	4.02	3.96	4.10	4.7%	0.093	**4.42**	wrong cap
2021	Jun	PP7	2021/05/26 10:15:00	2021/06/28 10:20:00	792.1	6.75	6.53	7.43	6.90	6.8%	0.093	**7.52**	wrong cap, Strong chicken ammonia smell
2021	Jun	PP8	2021/05/26 10:25:00	2021/06/28 10:30:00	792.1	4.00	3.98	4.40	4.12	5.7%	0.093	**4.45**	wrong cap
2021	Jun	PP9	2021/05/26 09:40:00	2021/06/28 09:53:00	792.2	3.76	5.04	6.43	5.08	26.4%	0.093	-	Filter and membrane pushed in, wrong cap, Bananas left on top, Two pots with papers pushed in
2021	Jul	PP1	2021/06/28 11:36:00	2021/07/30 12:05:00	768.5	2.91	2.94	3.21	3.02	5.5%	0.142	**3.27**	
2021	Jul	PP2	2021/06/28 11:56:00	2021/07/30 12:25:00	768.5	3.34	3.35	3.09	3.26	4.5%	0.142	**3.55**	
2021	Jul	PP3	2021/06/28 12:12:00	2021/07/30 12:40:00	768.5	3.86	3.91	3.96	3.91	1.2%	0.142	**4.28**	
2021	Jul	PP4	2021/06/28 10:04:00	2021/07/30 10:45:00	768.7	3.19	3.23	-	3.21	0.9%	0.142	**3.48**	Ba3 sample missing
2021	Jul	PP5	2021/06/28 10:43:00	2021/07/30 11:25:00	768.7	3.18	3.17	3.24	3.20	1.2%	0.142	**3.47**	
2021	Jul	PP6	2021/06/28 11:08:00	2021/07/30 11:40:00	768.5	3.27	3.19	3.26	3.24	1.4%	0.142	**3.53**	
2021	Jul	PP7	2021/06/28 10:21:00	2021/07/30 11:00:00	768.6	6.51	6.63	6.76	6.63	1.8%	0.142	**7.38**	
2021	Jul	PP8	2021/06/28 10:31:00	2021/07/30 11:10:00	768.7	3.66	3.74	3.67	3.69	1.1%	0.142	**4.03**	
2021	Jul	PP9	2021/06/28 09:53:00	2021/07/30 10:35:00	768.7	2.93	2.62	2.73	2.76	5.7%	0.142	**2.98**	When putting out bananas left on top, Removed
2021	Aug	PP1	2021/07/30 12:05:00	2021/08/27 12:31:00	672.4	1.82	1.77	2.15	1.91	10.7%	0.137	**2.31**	
2021	Aug	PP2	2021/07/30 12:25:00	2021/08/27 12:56:00	672.5	2.02	1.90	2.23	2.05	8.2%	0.137	**2.48**	
2021	Aug	PP3	2021/07/30 12:40:00	2021/08/27 13:16:00	672.6	2.30	2.23	2.49	2.34	5.7%	0.137	**2.86**	
2021	Aug	PP4	2021/07/30 10:45:00	2021/08/27 10:59:00	672.2	1.78	1.76	1.71	1.75	2.2%	0.137	**2.10**	
2021	Aug	PP5	2021/07/30 11:25:00	2021/08/27 11:43:00	672.3	1.57	1.60	1.78	1.65	7.1%	0.137	**1.97**	
2021	Aug	PP6	2021/07/30 11:40:00	2021/08/27 12:01:00	672.3	2.00	1.68	1.70	1.79	9.8%	0.137	**2.15**	Strong odour from nearby pig farm
2021	Aug	PP7	2021/07/30 11:00:00	2021/08/27 11:17:00	672.3	2.84	2.80	2.77	2.80	1.2%	0.137	**3.46**	
2021	Aug	PP8	2021/07/30 11:10:00	2021/08/27 11:28:00	672.3	1.61	1.75	1.60	1.65	5.2%	0.137	**1.97**	
2021	Aug	PP9	2021/07/30 10:35:00	2021/08/27 10:43:00	672.1	2.10	1.89	-	1.99	7.6%	0.137	**2.42**	Ba3 sample missing
2021	Sep	PP1	2021/08/27 12:31:00	2021/09/30 12:18:00	815.8	2.47	2.36	2.38	2.40	2.4%	0.089	**2.48**	
2021	Sep	PP2	2021/08/27 12:56:00	2021/09/30 12:39:00	815.7	2.59	2.66	2.64	2.63	1.2%	0.089	**2.72**	

2021	Sep	PP3	2021/08/27 13:16:00	2021/09/30 12:54:00	815.6	3.09	3.13	3.20	3.14	1.7%	0.089	**3.27**	
2021	Sep	PP4	2021/08/27 10:59:00	2021/09/30 10:55:00	815.9	2.80	2.95	2.73	2.83	4.0%	0.089	**2.93**	
2021	Sep	PP5	2021/08/27 11:43:00	2021/09/30 11:38:00	815.9	2.19	2.14	2.18	2.17	1.2%	0.089	**2.23**	
2021	Sep	PP6	2021/08/27 12:01:00	2021/09/30 11:54:00	815.9	2.38	2.39	2.37	2.38	0.3%	0.089	**2.46**	
2021	Sep	PP7	2021/08/27 11:17:00	2021/09/30 11:11:00	815.9	4.23	3.91	4.13	4.09	4.0%	0.089	**4.29**	
2021	Sep	PP8	2021/08/27 11:28:00	2021/09/30 11:19:00	815.9	2.15	2.19	2.22	2.18	1.7%	0.089	**2.25**	
2021	Sep	PP9	2021/08/27 10:43:00	2021/09/30 10:42:00	816.0	2.44	2.52	2.51	2.49	1.8%	0.089	**2.57**	
2021	Oct	PP1	2021/09/30 12:20:00	2021/11/05 11:58:00	864.6	2.44	2.22	2.34	2.34	4.7%	0.097	**2.27**	
2021	Oct	PP2	2021/09/30 12:40:00	2021/11/05 12:15:00	864.6	2.20	2.20	2.19	2.20	0.2%	0.097	**2.12**	Pulling ant broken sprayed with weed killer
2021	Oct	PP3	2021/09/30 12:56:00	2021/11/05 12:33:00	864.6	2.69	2.61	2.56	2.62	2.4%	0.097	**2.55**	
2021	Oct	PP4	2021/09/30 10:58:00	2021/11/05 10:26:00	864.5	2.61	2.15	2.21	2.32	10.7%	0.097	**2.25**	
2021	Oct	PP5	2021/09/30 11:39:00	2021/11/05 11:08:00	864.5	1.25	1.22	1.29	1.25	2.7%	0.097	**1.17**	
2021	Oct	PP6	2021/09/30 11:55:00	2021/11/05 11:21:00	864.4	2.12	1.89	1.92	1.98	6.3%	0.097	**1.90**	
2021	Oct	PP7	2021/09/30 11:11:00	2021/11/05 10:39:00	864.5	2.37	2.34	2.39	2.37	1.1%	0.097	**2.30**	
2021	Oct	PP8	2021/09/30 11:19:00	2021/11/05 10:51:00	864.5	1.53	1.63	1.82	1.66	8.6%	0.097	**1.58**	
2021	Oct	PP9	2021/09/30 10:43:00	2021/11/05 10:15:00	864.5	1.88	1.95	1.86	1.90	2.5%	0.097	**1.82**	
2021	Nov	PP1	2021/11/05 11:58:00	2021/11/29 12:31:00	576.6	1.39	1.26	1.28	1.31	5.4%	0.107	**1.82**	
2021	Nov	PP2	2021/11/05 12:15:00	2021/11/29 12:52:00	576.6	1.25	-	1.24	1.25	1.0%	0.107	**1.73**	
2021	Nov	PP3	2021/11/05 12:33:00	2021/11/29 13:07:00	576.6	1.66	1.46	1.51	1.54	7.0%	0.107	**2.18**	
2021	Nov	PP4	2021/11/05 10:26:00	2021/11/29 11:08:00	576.7	1.22	1.17	1.25	1.21	3.5%	0.107	**1.67**	
2021	Nov	PP5	2021/11/05 11:08:00	2021/11/29 11:50:00	576.7	0.78	0.76	0.73	0.76	3.0%	0.107	**0.99**	
2021	Nov	PP6	2021/11/05 11:21:00	2021/11/29 12:04:00	576.7	0.91	0.87	0.95	0.91	4.2%	0.107	**1.21**	
2021	Nov	PP7	2021/11/05 10:40:00	2021/11/29 11:23:00	576.7	1.30	1.29	1.35	1.31	2.5%	0.107	**1.82**	
2021	Nov	PP8	2021/11/05 10:51:00	2021/11/29 11:33:00	576.7	1.02	1.08	1.05	1.05	2.9%	0.107	**1.43**	
2021	Nov	PP9	2021/11/05 10:15:00	2021/11/29 10:58:00	576.7	1.26	1.34	1.36	1.32	4.0%	0.107	**1.84**	
2021	Dec	PP1	2021/11/29 12:31:00	2022/01/04 11:38:00	863.1	1.26	1.36	1.29	1.30	4.1%	0.183	**1.13**	
2021	Dec	PP2	2021/11/29 12:53:00	2022/01/04 11:57:00	863.1	1.49	1.48	1.45	1.47	1.4%	0.183	**1.30**	
2021	Dec	PP3	2021/11/29 13:08:00	2022/01/04 12:10:00	863.0	1.71	1.75	-	1.73	1.8%	0.183	**1.57**	Ba3 lost at site
2021	Dec	PP4	2021/11/29 11:08:00	2022/01/04 10:12:00	863.1	1.56	1.50	1.50	1.52	2.5%	0.183	**1.35**	
2021	Dec	PP5	2021/11/29 11:51:00	2022/01/04 11:21:00	863.5	1.47	1.43	1.36	1.42	3.8%	0.183	**1.25**	
2021	Dec	PP6	2021/11/29 12:04:00	2022/01/04 10:25:00	862.4	1.29	1.46	2.03	1.59	24.5%	0.183	**1.43**	
2021	Dec	PP7	2021/11/29 11:23:00	2022/01/04 10:48:00	863.4	2.20	2.16	1.96	2.11	6.1%	0.183	**1.95**	
2021	Dec	PP8	2021/11/29 11:33:00	2022/01/04 10:51:00	863.3	1.29	1.52	1.32	1.38	8.9%	0.183	**1.21**	
2021	Dec	PP9	2021/11/29 10:59:00	2022/01/04 10:01:00	863.0	1.59	1.46	-	1.52	6.1%	0.183	**1.36**	
2022	Jan	PP1	2022/01/04 11:38:00	2022/01/26 12:05:00	528.4	1.41	1.21	1.65	1.42	15.5%	0.146	**1.79**	
2022	Jan	PP2	2022/01/04 11:57:00	2022/01/26 12:22:00	528.4	1.35	1.45	1.28	1.36	6.1%	0.146	**1.71**	

2022	Jan	PP3	2022/01/04 12:10:00	2022/01/26 12:34:00	528.4	1.71	1.89	1.62	1.74	7.7%	0.146	**2.24**	
2022	Jan	PP4	2022/01/04 10:12:00	2022/01/26 10:38:00	528.4	1.32	1.29	1.29	1.30	1.1%	0.146	**1.62**	
2022	Jan	PP5	2022/01/04 11:21:00	2022/01/26 11:17:00	527.9	0.89	0.87	0.76	0.84	8.2%	0.146	**0.98**	pushed in
2022	Jan	PP6	2022/01/04 10:25:00	2022/01/26 11:32:00	529.1	1.13	1.28	1.06	1.16	9.8%	0.146	**1.42**	
2022	Jan	PP7	2022/01/04 10:48:00	2022/01/26 10:53:00	528.1	1.40	1.38	1.44	1.41	2.4%	0.146	**1.78**	
2022	Jan	PP8	2022/01/04 10:51:00	2022/01/26 11:02:00	528.2	1.23	1.13	1.24	1.20	5.1%	0.146	**1.49**	
2022	Jan	PP9	2022/01/04 10:01:00	2022/01/26 10:29:00	528.5	1.39	-	-	1.39	-	0.146	**-**	Pot dismantled, found on ground
2022	Feb	PP1	2022/01/26 12:06:00	2022/02/28 12:11:00	792.1	1.57	2.00	1.59	1.72	14.0%	0.125	**1.48**	
2022	Feb	PP2	2022/01/26 12:22:00	2022/02/28 12:27:00	792.1	1.64	1.56	1.48	1.56	5.4%	0.125	**1.34**	
2022	Feb	PP3	2022/01/26 12:34:00	2022/02/28 12:40:00	792.1	1.58	1.94	1.61	1.71	11.8%	0.125	**1.47**	
2022	Feb	PP4	2022/01/26 10:38:00	2022/02/28 10:40:00	792.0	1.75	1.51	1.62	1.62	7.4%	0.125	**1.40**	
2022	Feb	PP5	2022/01/26 11:17:00	2022/02/28 11:25:00	792.1	0.96	1.32	0.92	1.07	20.9%	0.125	**0.88**	
2022	Feb	PP6	2022/01/26 11:32:00	2022/02/28 11:42:00	792.2	1.30	1.19	1.80	1.43	22.8%	0.125	**1.22**	
2022	Feb	PP7	2022/01/26 10:53:00	2022/02/28 11:02:00	792.1	1.63	1.51	1.60	1.58	4.1%	0.125	**1.36**	
2022	Feb	PP8	2022/01/26 11:02:00	2022/02/28 11:10:00	792.1	1.25	1.41	-	1.33	8.2%	0.125	**1.12**	
2022	Feb	PP9	2022/01/26 10:29:00	2022/02/28 10:31:00	792.0	1.54	1.51	1.78	1.61	9.0%	0.125	**1.38**	
2022	Mar	PP1	2022/02/28 12:11:00	2022/03/29 10:58:00	693.8	2.83	2.84	2.59	2.76	5.1%	0.138	**2.78**	
2022	Mar	PP2	2022/02/28 12:27:00	2022/03/29 11:14:00	693.8	2.55	2.68	2.54	2.59	3.0%	0.138	**2.61**	
2022	Mar	PP3	2022/02/28 12:40:00	2022/03/29 11:30:00	693.8	3.72	3.24	3.27	3.41	7.8%	0.138	**3.48**	
2022	Mar	PP4	2022/02/28 10:40:00	2022/03/29 09:37:00	693.9	2.93	2.80	2.76	2.83	3.3%	0.138	**2.86**	
2022	Mar	PP5	2022/02/28 11:25:00	2022/03/29 10:15:00	693.8	4.13	3.74	3.61	3.83	7.1%	0.138	**3.92**	
2022	Mar	PP6	2022/02/28 11:42:00	2022/03/29 10:31:00	693.8	4.37	4.24	4.15	4.25	2.5%	0.138	**4.37**	
2022	Mar	PP7	2022/02/28 11:02:00	2022/03/29 09:52:00	693.8	6.56	6.94	7.06	6.85	3.9%	0.138	**7.14**	
2022	Mar	PP8	2022/02/28 11:10:00	2022/03/29 10:00:00	693.8	2.43	2.77	2.63	2.61	6.5%	0.138	**2.63**	
2022	Mar	PP9	2022/02/28 10:31:00	2022/03/29 09:00:00	693.5	3.47	3.18	3.68	3.44	7.2%	0.138	**3.51**	
2022	Apr	PP1	2022/03/29 10:58:00	2022/04/26 11:43:00	672.8	2.27	1.92	2.16	2.12	8.3%	0.142	**2.19**	
2022	Apr	PP2	2022/03/29 11:14:00	2022/04/26 13:58:00	674.7	2.06	2.04	2.03	2.04	0.8%	0.142	**2.10**	
2022	Apr	PP3	2022/03/29 11:31:00	2022/04/26 13:41:00	674.2	2.37	2.53	2.40	2.44	3.5%	0.142	**2.54**	
2022	Apr	PP4	2022/03/29 09:37:00	2022/04/26 10:21:00	672.7	2.38	2.35	2.59	2.44	5.3%	0.142	**2.54**	
2022	Apr	PP5	2022/03/29 10:15:00	2022/04/26 10:59:00	672.7	3.06	2.72	2.68	2.82	7.3%	0.142	**2.96**	
2022	Apr	PP6	2022/03/29 10:31:00	2022/04/26 11:15:00	672.7	2.90	2.86	3.42	3.06	10.2%	0.142	**3.23**	
2022	Apr	PP7	2022/03/29 09:52:00	2022/04/26 10:36:00	672.7	6.60	6.35	7.93	6.96	12.2%	0.142	**7.50**	
2022	Apr	PP8	2022/03/29 10:00:00	2022/04/26 10:45:00	672.8	2.19	2.08	2.61	2.29	12.3%	0.142	**2.39**	
2022	Apr	PP9	2022/03/29 09:00:00	2022/04/26 10:12:00	673.2	1.98	2.09	-	2.39	26.3%	0.142	**2.10**	
2022	May	PP1	2022/04/26 11:43:00	2022/05/31 11:40:00	840.0	1.87	1.83	1.93	1.88	2.8%	0.149	**1.52**	
2022	May	PP2	2022/04/26 13:58:00	2022/05/31 11:56:00	838.0	1.73	1.74	1.92	1.79	5.9%	0.149	**1.45**	

2022	May	PP3	2022/04/26 13:41:00	2022/05/31 12:09:00	838.5	2.48	2.34	2.18	2.33	6.4%	0.149	**1.92**	
2022	May	PP4	2022/04/26 10:21:00	2022/05/31 10:21:00	840.0	1.97	1.80	2.05	1.94	6.5%	0.149	**1.57**	
2022	May	PP5	2022/04/26 11:00:00	2022/05/31 10:57:00	840.0	1.66	1.52	1.49	1.55	5.8%	0.149	**1.23**	
2022	May	PP6	2022/04/26 11:15:00	2022/05/31 11:12:00	840.0	2.13	2.00	2.14	2.09	3.8%	0.149	**1.70**	
2022	May	PP7	2022/04/26 10:36:00	2022/05/31 10:34:00	840.0	3.16	3.76	3.19	3.37	10.0%	0.149	**2.83**	
2022	May	PP8	2022/04/26 10:45:00	2022/05/31 10:43:00	840.0	1.86	1.79	1.74	1.79	3.4%	0.149	**1.44**	
2022	May	PP9	2022/04/26 10:12:00	2022/05/31 10:12:00	840.0	1.91	1.78	1.70	1.80	5.9%	0.149	**1.45**	

CV values in red surpass the <15% check and have higher uncertainty.

Slieve Beagh

Slieve Beagh			Date / Time			ppm NH_4^+ in 3 ml extract						NH_3 ($\mu g\ m^{-3}$)	
Year	Month	Site	OUT	IN	Time (Hrs)	ALPHA 1	ALPHA 2	ALPHA 3	mean	% CV	BLANK	Calibrated[1]	Comments
2021	Jun	SB1	2021/05/27 13:00:00	2021/06/28 11:30:00	766.5	1.63	1.43	1.49	1.51	6.6%	0.093	**1.62**	
2021	Jun	SB2	2021/05/27 13:45:00	2021/06/28 12:30:00	766.7	1.46	1.44	1.39	1.43	2.5%	0.093	**1.52**	
2021	Jun	SB3	2021/05/27 15:00:00	2021/06/28 14:00:00	767.0	1.54	1.58	1.69	1.60	4.7%	0.093	**1.72**	
2021	Jun	SB4	2021/05/27 15:45:00	2021/06/28 15:30:00	767.7	-	1.95	-	1.95	-	0.093	**2.12**	1 sampler on the ground, 1 sampler not located
2021	Jun	SB5	2021/05/27 08:00:00	2021/06/28 11:00:00	771.0	1.68	1.63	1.64	1.65	1.8%	0.093	**1.77**	
2021	Jun	SB6	2021/05/27 08:15:00	2021/06/28 10:30:00	770.3	1.38	-	1.42	1.40	2.0%	0.093	**1.48**	
2021	Jun	SB7	2021/05/27 08:45:00	2021/06/28 10:00:00	769.3	-	1.87	-	1.87	-	0.093	**2.02**	2 Samplers on the ground
2021	Jul	SB1	2021/06/28 11:30:00	2021/07/28 08:30:00	717.0	1.48	1.58	1.57	1.54	3.6%	0.142	**1.71**	filter wet
2021	Jul	SB2	2021/06/28 12:30:00	2021/07/28 09:20:00	716.8	-	-	1.39	1.39	-	0.142	**1.53**	filter wet, samplers on the ground
2021	Jul	SB3	2021/06/28 14:00:00	2021/07/28 10:30:00	716.5	1.63	1.63	1.57	1.61	2.3%	0.142	**1.79**	filter wet
2021	Jul	SB4	-	-	-	-	-	-	-	-	0.142	**-**	Samples not returned, LSO couldn't access site
2021	Jul	SB5	2021/06/28 11:00:00	2021/07/28 11:00:00	720.0	1.47	1.52	1.52	1.51	1.9%	0.142	**1.66**	filter wet
2021	Jul	SB6	2021/06/28 10:30:00	2021/07/28 11:20:00	720.8	1.42	-	1.47	1.44	2.3%	0.142	**1.58**	filter wet, only 2 samplers present
2021	Jul	SB7	2021/06/28 10:00:00	2021/07/28 11:50:00	721.8	1.92	1.84	1.93	1.90	2.7%	0.142	**2.13**	filter wet
2021	Aug	SB1	2021/07/28 08:30:00	2021/08/30 09:00:00	792.5	0.91	0.94	0.99	0.94	4.6%	0.137	**0.89**	
2021	Aug	SB2	2021/07/28 09:20:00	2021/08/30 10:30:00	793.2	0.81	0.88	0.87	0.85	4.3%	0.137	**0.79**	
2021	Aug	SB3	2021/07/28 10:30:00	2021/08/30 11:00:00	792.5	0.90	0.97	0.92	0.93	3.6%	0.137	**0.88**	
2021	Aug	SB4	-	-	-	-	-	-	-	-	0.137	**-**	No samples present, monitoring point damaged.
2021	Aug	SB5	2021/07/28 11:00:00	2021/08/30 12:30:00	793.5	0.96	0.91	0.91	0.93	3.0%	0.137	**0.87**	
2021	Aug	SB6	2021/07/28 11:20:00	2021/08/30 12:45:00	793.4	0.88	0.81	-	0.85	6.4%	0.137	**0.78**	
2021	Aug	SB7	2021/07/28 11:50:00	2021/08/30 13:15:00	793.4	1.17	1.25	1.32	1.25	5.9%	0.137	**1.23**	
2021	Sep	SB1	2021/08/30 09:00:00	2021/10/04 09:30:00	840.5	1.18	1.12	1.22	1.17	4.2%	0.089	**1.13**	
2021	Sep	SB2	2021/08/30 10:30:00	2021/10/04 10:30:00	840.0	-	0.96	1.18	1.07	14.0%	0.089	**1.02**	filter wet

2021	Sep	SB3	2021/08/30 11:00:00	2021/10/04 11:30:00	840.5	0.94	1.04	0.99	0.99	5.0%	0.089	**0.94**	
2021	Sep	SB4	2021/08/30 12:00:00	2021/10/04 12:00:00	840.0	-	-	-	-	-	0.089	**-**	filter wet and dirty, wrong caps on, samplers on the ground
2021	Sep	SB5	2021/08/30 12:30:00	2021/10/04 13:00:00	840.5	1.37	1.23	1.21	1.27	7.2%	0.089	**1.23**	
2021	Sep	SB6	2021/08/30 12:45:00	2021/10/04 13:20:00	840.6	0.91	0.85	1.24	1.00	21.2%	0.089	**0.94**	
2021	Sep	SB7	2021/08/30 13:15:00	2021/10/04 13:30:00	840.3	-	1.42	1.44	1.43	1.1%	0.089	**1.39**	filter wet
2021	Oct	SB1	2021/10/04 09:30:00	2021/11/16 10:00:00	1033.5	0.60	0.60	0.56	0.59	4.3%	0.097	**0.42**	
2021	Oct	SB2	2021/10/04 10:30:00	2021/11/16 10:45:00	1033.3	-	-	0.62	0.62	-	0.097	**0.44**	filter very wet
2021	Oct	SB3	2021/10/04 11:30:00	2021/11/16 11:45:00	1033.2	0.56	0.59	0.60	0.58	3.5%	0.097	**0.41**	
2021	Oct	SB4	2021/10/04 12:00:00	2021/11/16 12:30:00	1033.5	0.80	0.44	-	0.46	73.7%	0.097	**-**	filter very wet, sampler washout
2021	Oct	SB5	2021/10/04 13:00:00	2021/11/16 13:15:00	1033.2	0.60	0.61	0.60	0.60	1.0%	0.097	**0.43**	filter moist
2021	Oct	SB6	2021/10/04 13:20:00	2021/11/16 13:30:00	1033.2	0.08	0.04	0.04	0.05	45.1%	0.097	**-**	filter very wet, samplers on ground very windy conditions
2021	Oct	SB7	2021/10/04 13:30:00	2021/11/16 14:00:00	1033.5	-	0.43	-	0.43	-	0.097	**-**	filter very wet, samplers on ground very windy conditions
2021	Nov	SB1	2021/11/16 10:00:00	2021/12/16 09:30:00	719.5	0.44	0.57	0.43	0.48	16.2%	0.107	**0.45**	
2021	Nov	SB2	2021/11/16 10:45:00	2021/12/16 10:30:00	719.7	0.33	0.38	0.25	0.32	21.4%	0.107	**0.26**	
2021	Nov	SB3	2021/11/16 11:45:00	2021/12/16 11:00:00	719.3	0.55	0.47	0.53	0.52	8.7%	0.107	**0.50**	
2021	Nov	SB4	2021/11/16 12:30:00	2021/12/16 11:30:00	719.0	0.54	-	0.56	0.55	1.4%	0.107	**0.54**	
2021	Nov	SB5	2021/11/16 13:15:00	2021/12/15 14:30:00	697.3	0.68	0.83	0.80	0.77	10.8%	0.107	**0.83**	
2021	Nov	SB6	2021/11/16 13:30:00	2021/12/15 14:45:00	697.2	0.52	0.73	1.04	0.76	34.5%	0.107	**0.82**	
2021	Nov	SB7	2021/11/16 14:00:00	2021/12/15 15:00:00	697.0	0.66	0.73	-	0.69	7.1%	0.107	**0.74**	
2021	Dec	SB1	2021/12/16 09:30:00	2022/01/18 10:00:00	792.5	0.50	0.32	0.53	0.45	24.4%	0.183	**0.30**	
2021	Dec	SB2	2021/12/16 10:30:00	2022/01/18 11:00:00	792.5	0.37	0.45	-	0.41	14.0%	0.183	**0.25**	
2021	Dec	SB3	2021/12/16 11:00:00	2022/01/18 11:30:00	792.5	0.48	0.53	-	0.51	6.7%	0.183	**0.36**	
2021	Dec	SB4	2021/12/16 11:30:00	2022/01/18 12:30:00	793.0	1.02	1.19	-	1.11	10.9%	0.183	**1.02**	
2021	Dec	SB5	2021/12/15 14:30:00	2022/01/18 13:30:00	815.0	0.70	0.64	0.98	0.77	23.5%	0.183	**0.63**	
2021	Dec	SB6	2021/12/15 14:45:00	2022/01/18 14:00:00	815.3	0.30	0.49	1.39	0.73	80.5%	0.183	**0.58**	
2021	Dec	SB7	2021/12/15 15:00:00	2022/01/18 14:30:00	815.5	0.52	0.54	-	0.53	2.6%	0.183	**0.37**	
2022	Jan	SB1	2022/01/18 10:00:00	2022/02/22 07:30:00	837.5	-	0.22	-	0.22	-	0.146	-	Wet Filters
2022	Jan	SB2	2022/01/18 11:00:00	2022/02/22 08:00:00	837.0	0.42	0.44	-	0.43	3.2%	0.146	0.26	Wet Filters
2022	Jan	SB3	2022/01/18 11:30:00	2022/02/22 08:30:00	837.0	0.48	0.50	0.56	0.51	8.5%	0.146	0.33	Wet Filters
2022	Jan	SB4	2022/01/18 12:30:00	2022/02/22 09:00:00	836.5	0.64	0.19	0.32	0.38	59.4%	0.146	0.22	Wet Filters
2022	Jan	SB5	2022/01/18 13:30:00	2022/02/22 09:30:00	836.0	0.44	0.37	0.51	0.44	15.7%	0.146	0.27	
2022	Jan	SB6	2022/01/18 14:00:00	2022/02/22 16:30:00	842.5	0.29	0.42	0.56	0.42	32.5%	0.146	0.25	
2022	Jan	SB7	2022/01/18 14:30:00	2022/02/22 16:45:00	842.3	-	-	-	-	-	0.146	-	Only 2 samplers returned, 2 samplers on ground - very windy, 1 sampler missing
2022	Feb	SB1	see jan									-	Wet Filters

2022	Feb	SB2	see jan									0.26	Wet Filters
2022	Feb	SB3	see jan									0.33	Wet Filters
2022	Feb	SB4	see jan									0.22	Wet Filters
2022	Feb	SB5	see jan									0.27	
2022	Feb	SB6	see jan									0.25	
2022	Feb	SB7	see jan									-	Only 2 samplers returned, 2 samplers on ground - very windy, 1 sampler missing
2022	Mar	SB1	2022/02/22 07:30:00	2022/03/22 09:30:00	674.0	0.22		0.19	0.21	9.9%	0.125	-	Concentrations from the samplers are too low when subtracting the blank, invalidated
2022	Mar	SB2	2022/02/22 08:00:00	2022/03/22 10:30:00	674.5	0.69	0.63	-	0.80	6.2%	0.125	0.58	
2022	Mar	SB3	2022/02/22 08:30:00	2022/03/22 11:30:00	675.0	0.85	0.79	-	0.70	4.9%	0.125	0.76	
2022	Mar	SB4	2022/02/22 09:00:00	2022/03/22 12:00:00	675.0	1.25	-	0.85	1.05	27.1%	0.125	1.01	Wet
2022	Mar	SB5	2022/02/22 09:30:00	2022/03/22 13:30:00	676.0	1.12	1.10	-	1.11	0.8%	0.125	1.08	
2022	Mar	SB6	2022/02/22 16:30:00	2022/03/22 14:00:00	669.5	0.82	1.42	1.10	1.11	26.9%	0.125	1.09	
2022	Mar	SB7	2022/02/22 16:45:00	2022/03/22 14:30:00	669.8	0.17	-	-	0.17	-	0.125	-	Wet & Dirty, Ba2 & Ba3 invalidated, washed out
2022	Apr	SB1	2022/03/22 09:30:00	2022/05/12 10:00:00	1223.5	1.52	1.63	-	1.57	5.0%	0.138	0.86	
2022	Apr	SB2	2022/03/22 10:30:00	2022/05/12 11:00:00	1223.5	2.25	2.53	-	2.39	8.4%	0.138	1.36	
2022	Apr	SB3	2022/03/22 11:30:00	2022/05/12 11:45:00	1223.2	2.17	2.17	2.21	2.18	1.0%	0.138	1.23	
2022	Apr	SB4	2022/03/22 12:00:00	2022/05/12 12:15:00	1223.3	-	2.85	2.98	2.92	3.2%	0.138	1.68	
2022	Apr	SB5	2022/03/22 13:30:00	2022/05/12 13:45:00	1223.3	2.83	2.61	2.27	2.57	11.1%	0.138	1.46	
2022	Apr	SB6	2022/03/22 14:00:00	2022/05/12 14:30:00	1223.5	1.96	2.06	-	1.78	3.5%	0.138	1.13	
2022	Apr	SB7	2022/03/22 14:30:00	2022/05/12 14:45:00	1223.2	-	-	-	-	-	0.138	-	No samplers present at the monitoring station
2022	May	SB1	2022/05/12 10:00:00	2022/06/13 10:00:00	768.0	0.74	0.78	0.80	0.77	4.3%	0.142	0.63	
2022	May	SB2	2022/05/12 11:00:00	2022/06/13 10:45:00	767.8	1.28	1.03	1.03	1.11	13.0%	0.142	0.96	
2022	May	SB3	2022/05/12 11:45:00	2022/06/13 11:30:00	767.8	0.89	1.00	0.88	0.92	7.1%	0.142	0.77	Wet, Wet & Pierced, Wet
2022	May	SB4	2022/05/12 12:15:00	2022/06/13 12:00:00	767.7	0.43	-	-	0.43	-	0.142	-	Wet, Wet, Wet & Pierced
2022	May	SB5	2022/05/12 13:45:00	2022/06/13 13:00:00	767.3	0.92	0.85	0.94	0.90	4.7%	0.142	0.75	
2022	May	SB6	2022/05/12 14:30:00	2022/06/13 13:45:00	767.3	0.73	0.94	0.92	0.87	13.4%	0.142	0.72	
2022	May	SB7	2022/05/12 14:45:00	2022/06/13 14:00:00	767.3	-	-	-	-	-	0.142	-	sample not analysed, error

CV values in red surpass the <15% check and have higher uncertainty.

Turmennan

Turmennan			Date / Time			ppm NH_4^+ in 3 ml extract						NH_3 ($\mu g\ m^{-3}$)	
Year	Month	Site	OUT	IN	Time (Hrs)	ALPHA 1	ALPHA 2	ALPHA 3	mean	% CV	BLANK	Calibrated[1]	Comments
2021	Jun	T1	2021/05/27 16:50:00	2021/06/29 15:40:00	790.8	1.28	1.22	1.08	1.19	8.4%	0.093	**1.22**	owner has cut grass in a narrow path (1mx50m long) and left cuttings where they fell. Grass cut on 21/06/2021
2021	Jun	T2	2021/05/27 16:58:00	2021/06/29 16:10:00	791.2	1.40	1.61	1.44	1.48	7.7%	0.093	**1.54**	
2021	Jun	T3	2021/05/27 17:14:00	2021/06/29 17:00:00	791.8	1.79	1.81	1.68	1.76	4.1%	0.093	**1.84**	
2021	Jun	T4	2021/05/27 15:31:00	2021/06/29 19:00:00	795.5	2.24	2.52	2.33	2.37	6.1%	0.093	**2.50**	May - No stock in field. June- No stock in field
2021	Jun	T5	2021/05/27 15:15:00	2021/06/29 18:40:00	795.4	1.97	1.80	1.77	1.85	5.7%	0.093	**1.93**	
2021	Jun	T6	2021/05/27 14:58:00	2021/06/29 18:20:00	795.4	2.10	1.99	1.94	2.01	3.9%	0.093	**2.11**	Evidence of much stock poaching around wall that sampler is on but no stock currently there.
2021	Jul	T1	2021/06/29 15:44:00	2021/07/23 10:36:00	570.9	1.02	1.05	1.04	1.04	1.3%	0.142	**1.37**	
2021	Jul	T2	2021/06/29 16:10:00	2021/07/23 11:31:00	571.3	1.16	0.97	1.03	1.05	9.2%	0.142	**1.39**	sample out time adjusted to remove overlap
2021	Jul	T3	2021/06/29 17:05:00	2021/07/23 12:48:00	571.7	1.23	1.35	1.43	1.34	7.5%	0.142	**1.83**	
2021	Jul	T4	2021/06/29 19:00:00	2021/07/23 09:25:00	566.4	1.29	1.28	1.42	1.33	5.7%	0.142	**1.83**	time out updated to remove overlap
2021	Jul	T5	2021/06/29 18:40:00	2021/07/23 08:30:00	565.8	1.31	1.58	1.19	1.36	15.0%	0.142	**1.88**	time out updated to remove overlap
2021	Jul	T6	2021/06/29 18:25:00	2021/07/23 08:30:00	566.1	1.38	1.32	1.36	1.35	2.3%	0.142	**1.87**	
2021	Aug	T1	2021/07/23 10:40:00	2021/08/26 12:55:00	818.3	1.01	0.95	2.18	1.38	50.0%	0.137	**1.33**	Landowner mowed the grass track adjacent to post on 25th AUG
2021	Aug	T2	2021/07/23 11:35:00	2021/08/26 13:22:00	817.8	1.11	1.47	1.41	1.33	14.6%	0.137	**1.27**	
2021	Aug	T3	2021/07/23 12:53:00	2021/08/26 14:00:00	817.1	1.43	1.39	-	1.41	1.9%	0.137	**1.36**	
2021	Aug	T4	2021/07/23 09:29:00	2021/08/26 15:45:00	822.3	2.20	-	1.82	2.01	13.2%	0.137	**2.41**	Very recent cut of hay from adjacent field. Much cattle poaching avoided post but as it's up on a stone wall it remains undisturbed.
2021	Aug	T5	2021/07/23 09:09:00	2021/08/26 16:05:00	822.9	1.79	1.89	1.78	1.82	3.3%	0.137	**1.79**	
2021	Aug	T6	2021/07/23 08:35:00	2021/08/26 16:20:00	823.8	1.84	1.93	-	1.89	3.6%	0.137	**1.86**	
2021	Sep	T1	2021/08/26 12:55:00	2021/09/27 10:30:00	765.6	0.94	1.04	0.94	0.97	5.7%	0.089	**1.01**	As mentioned last month, owner had done some weed spraying-visible this month as dead blackberry in vincinity of post.
2021	Sep	T2	2021/08/26 13:22:00	2021/09/27 10:40:00	765.3	0.90	0.91	0.94	0.91	2.2%	0.089	**0.94**	
2021	Sep	T3	2021/08/26 14:00:00	2021/09/27 11:15:00	765.3	1.33	1.32	1.48	1.37	6.7%	0.089	**1.47**	filter wet
2021	Sep	T4	2021/08/26 15:45:00	2021/09/27 12:50:00	765.1	-	-	-	0.59	7.5%	0.089	-	Data flagged invalid due to expert judgement

2021	Sep	T5	2021/09/14 14:25:00	2021/09/27 12:45:00	310.3	1.64	1.45	1.50	1.53	6.5%	0.089	**4.06**	Aug: Had filled in sheet but got stung by wasp and forgot to put new vials out on 26/08/2021 so returned on 14/09/2021 and put them out.
2021	Sep	T6	2021/08/26 16:20:00	2021/09/27 12:24:00	764.1	1.77	1.69	1.66	1.71	3.4%	0.089	**1.85**	
2021	Oct	T1	2021/09/27 10:35:00	2021/10/28 10:05:00	743.5	0.57	0.54	-	0.55	3.6%	0.097	**0.54**	
2021	Oct	T2	2021/09/27 10:45:00	2021/10/28 10:20:00	743.6	0.67	0.67	0.75	0.70	6.6%	0.097	**0.71**	
2021	Oct	T3	2021/09/27 11:20:00	2021/10/28 10:35:00	743.3	0.93	0.95	-	0.94	1.8%	0.097	**0.99**	
2021	Oct	T4	2021/09/27 12:55:00	2021/10/28 11:30:00	742.6	2.24	2.21	2.25	2.23	1.0%	0.097	**2.51**	
2021	Oct	T5	2021/09/27 12:50:00	2021/10/28 11:38:00	742.8	1.88	1.76	1.74	1.79	4.2%	0.097	**2.00**	
2021	Oct	T6	2021/09/27 12:30:00	2021/10/28 11:50:00	743.3	1.74	1.45	1.56	1.58	9.1%	0.097	**1.75**	
2021	Nov	T1	2021/10/28 10:10:00	2021/11/24 10:10:00	649.0	0.43	0.42	0.42	0.42	1.5%	0.107	**0.42**	Trees in adjacent ash & oak planted woodland being thinned with smaller chippings left on site on 24/25 Nov and again 14/15 dec.
2021	Nov	T2	2021/10/28 10:25:00	2021/11/24 10:20:00	648.9	0.42	0.50	0.48	0.47	9.2%	0.107	**0.48**	
2021	Nov	T3	2021/10/28 10:40:00	2021/11/24 10:40:00	649.0	0.68	0.57	0.62	0.62	9.2%	0.107	**0.69**	
2021	Nov	T4	2021/10/28 11:35:00	2021/11/24 11:40:00	649.1	0.74	0.76	0.72	0.74	3.2%	0.107	**0.85**	
2021	Nov	T5	2021/10/28 11:44:00	2021/11/24 11:45:00	649.0	0.74	0.71	0.79	0.75	5.9%	0.107	**0.86**	NIBOG30 December lid on samples, assumed it's site 29 as no samples for this site were present in the batch, only the record card
2021	Nov	T6	2021/10/28 11:55:00	2021/11/24 11:25:00	648.5	0.89	0.90	0.95	0.91	3.4%	0.107	**1.09**	
2021	Dec	T1	2021/11/24 10:15:00	2021/12/15 09:52:00	503.6	0.40	0.44	0.44	0.43	5.7%	0.183	**0.42**	Tree in adjacent ash+ oak woodland being thinned (with some chippings left on site) on 24th & 25th Nov 21 and again on 14th & 15th Dec 21. 15th Dec (thinning now adjacent to sampling post)
2021	Dec	T2	2021/11/24 10:25:00	2021/12/15 10:10:00	503.7	0.53	0.51	-	0.52	2.7%	0.183	**0.59**	
2021	Dec	T3	2021/11/24 10:45:00	2021/12/15 10:35:00	503.8	0.57	0.96	0.65	0.73	29.0%	0.183	**0.94**	
2021	Dec	T4	2021/11/24 11:45:00	2021/12/15 11:50:00	504.1	0.78	0.62	0.81	0.74	14.2%	0.183	**0.96**	
2021	Dec	T5	2021/11/24 11:50:00	2021/12/15 11:40:00	503.8	0.71	0.65	0.79	0.71	9.7%	0.183	**0.92**	
2021	Dec	T6	2021/11/24 11:30:00	2021/12/15 11:30:00	504.0	0.75	0.86	0.82	0.81	7.0%	0.183	**1.09**	LSO "I was sent 2 boxes labelled 5 and, in my confusion, didn't realise one was probably 6 so new samplers out at this one for Jan" disregard previous Ps - " found sampler later + put it in".
2022	Jan	T1	2021/12/15 09:55:00	2022/01/27 10:20:00	1032.4	0.68	0.74	0.64	0.69	6.9%	0.146	0.39	Trees + Oak plantation- being thinned with some chipping of branches yesterday + today (15/12/21) and on 24/25 Nov.
2022	Jan	T2	2021/12/15 10:15:00	2022/01/27 10:40:00	1032.4	0.72	0.78	0.73	0.74	4.8%	0.146	0.43	
2022	Jan	T3	2021/12/15 10:38:00	2022/01/27 11:00:00	1032.4	0.98	1.06	1.04	1.03	4.3%	0.146	0.64	

2022	Jan	T4	2021/12/15 11:54:00	2022/01/27 09:45:00	1029.9	1.36	1.31	1.24	1.30	4.5%	0.146	0.84	
2022	Jan	T5	2021/12/15 11:40:00	2022/01/27 09:35:00	1029.9	1.18	1.24	1.19	1.20	2.5%	0.146	0.76	
2022	Jan	T6	2021/12/17 11:10:00	2022/01/27 09:20:00	982.2	1.47	1.58	1.53	1.53	3.4%	0.146	**1.04**	New sample box then located and put out at 17/12/21 @ 11:10am
2022	Feb	T1	2022/01/27 10:20:00	2022/02/25 10:35:00	696.2	0.60	0.62	0.67	0.63	5.8%	0.125	0.53	
2022	Feb	T2	2022/01/27 10:40:00	2022/02/25 10:50:00	696.2	1.19	1.04	0.79	1.00	20.4%	0.125	0.93	
2022	Feb	T3	2022/01/27 11:00:00	2022/02/25 11:10:00	696.2	0.98	0.96	0.83	0.92	8.7%	0.125	0.85	Truxor enters farm here to access reedbed for cutting, no veg pile
2022	Feb	T4	2022/01/27 09:45:00	2022/02/25 12:43:00	699.0	-	1.86	1.98	1.92	4.4%	0.125	1.90	
2022	Feb	T5	2022/01/27 09:35:00	2022/02/25 12:30:00	698.9	1.10	1.61	1.20	1.30	20.5%	0.125	1.24	
2022	Feb	T6	2022/01/27 09:20:00	2022/02/25 12:20:00	699.0	-	1.26	-	1.26	-	0.125	1.19	
2022	Mar	T1	2022/02/25 10:40:00	2022/03/28 10:30:00	742.8	1.07	1.11	0.99	1.06	5.5%	0.138	0.91	
2022	Mar	T2	2022/02/25 10:53:00	2022/03/28 10:50:00	743.0	1.18	1.23	1.33	1.25	5.9%	0.138	1.10	
2022	Mar	T3	2022/02/25 11:13:00	2022/03/28 11:20:00	743.1	1.45	1.47	1.57	1.49	4.2%	0.138	1.35	
2022	Mar	T4	2022/02/25 12:45:00	2022/03/28 12:30:00	742.7	1.63	1.55	1.64	1.60	3.1%	0.138	1.46	
2022	Mar	T5	2022/02/25 12:33:00	2022/03/28 12:20:00	742.8	1.71	1.81	1.91	1.81	5.6%	0.138	1.66	
2022	Mar	T6	2022/02/25 12:22:00	2022/03/28 12:00:00	742.6	1.93	2.19	1.88	2.00	8.4%	0.138	1.85	
2022	Apr	T1	2022/03/28 10:30:00	2022/04/28 10:50:00	744.3	1.44	1.49	1.36	1.43	4.4%	0.142	1.30	Received in August
2022	Apr	T2	2022/03/28 10:50:00	2022/04/28 11:15:00	744.4	1.49	1.39	1.22	1.37	10.2%	0.142	1.24	Received in August
2022	Apr	T3	2022/03/28 11:20:00	2022/04/28 11:40:00	744.3	1.51	1.58	1.52	1.54	2.5%	0.142	1.40	Received in August
2022	Apr	T4	2022/03/28 12:30:00	2022/04/28 12:50:00	744.3	1.79	1.83	1.88	1.84	2.6%	0.142	1.70	Received in August
2022	Apr	T5	2022/03/28 12:20:00	2022/04/28 12:40:00	744.3	1.92	1.92	1.89	1.91	0.9%	0.142	1.78	Received in August
2022	Apr	T6	2022/03/28 12:00:00	2022/04/28 12:05:00	744.1	2.19	2.21	2.16	2.19	1.1%	0.142	2.05	Received in August
2022	May	T1	2022/04/28 10:50:00	2022/07/08 13:00:00	1706.2	2.53	2.94	3.25	2.91	12.5%	0.149	1.19	Arrived in August
2022	May	T2	2022/04/28 11:15:00	2022/07/08 13:25:00	1706.2	4.09	4.89	5.46	4.81	14.3%	0.149	2.02	Arrived in August, Date in on card doesn't match with previous date "FD"
2022	May	T3	2022/04/28 11:40:00	2022/07/08 13:50:00	1706.2	9.06	9.67	7.54	8.76	12.5%	0.149	3.72	Arrived in August
2022	May	T4	2022/04/28 12:50:00	2022/07/08 11:50:00	1703.0	7.99	8.29	6.08	7.45	16.1%	0.149	3.46	Arrived in August
2022	May	T5	2022/04/28 12:40:00	2022/07/08 11:30:00	1702.8	5.22	5.09	4.07	4.79	13.1%	0.149	2.01	Arrived in August
2022	May	T6	2022/04/28 12:05:00	2022/07/08 11:00:00	1702.9	4.34	4.24	2.90	3.82	20.9%	0.149	1.79	Arrived in August

CV values in red surpass the <15% check and have higher uncertainty.

Contact

enquiries@ceh.ac.uk

@UK_CEH

ceh.ac.uk

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Bangor

UK Centre for Ecology & Hydrology

Environment Centre Wales

Deiniol Road

Bangor

Gwynedd

LL57 2UW

+44 (0)1248 374500

Edinburgh

UK Centre for Ecology & Hydrology

Bush Estate

Penicuik

Midlothian

EH26 0QB

+44 (0)131 4454343

UK Centre for Ecology & Hydrology