



Environment Agency **UK PAH Monitoring and Analysis Network**

Annual Report for 2025

6 August 2026



Document distribution

Environment Agency

UK PAH Monitoring and Analysis Network

Annual Report for 2025

6 August 2026

Prepared for

- Environment Agency
- Department for Environment, Food and Rural Affairs
- Department of Environment, Northern Ireland
- Welsh Government
- Scottish Government

Prepared by

WSP UK Ltd, Gemini Building, Fermi Avenue,
Harwell, Didcot, OX11 0QR, UK

Quality control	Name	Date	Signature
Prepared by:	Christopher Conolly, Sion Carpenter, Jack Davison	6 August 2026	
Reviewed by:	Christopher Conolly	6 August 2026	
Approved by:	Paul Willis	6 August 2026	

WSP UK Limited makes no warranties or guarantees, actual or implied, in relation to this report, or the ultimate commercial, technical, economic, or financial effect on the project to which it relates, and bears no responsibility or liability related to its use other than as set out in the contract under which it was supplied.

1. Executive Summary

This annual report for 2025 for the UK Polycyclic Aromatic Hydrocarbons (PAH) Monitoring and Analysis Network was prepared by WSP for the Environment Agency, the Department for Environment, Food and Rural Affairs, the Northern Ireland Department of Agriculture, Environment and Rural Affairs (DAERA), the Welsh Government and the Scottish Government.

In the UK, ambient (outdoor) air quality is regulated by the Air Quality Standards Regulations (AQSR).

The UK PAH Monitoring and Analysis Network provides data that can be compared to the Target Value 1 ng/m³ for Benzo[a]pyrene with concentrations measured at sites around the UK.

The number of ambient PAH Network air sampling sites remained at 36 during 2025. The network of 2 deposition samplers also remained unchanged.

Most of the sampling locations in the network are urban background (24 sites), but it also includes rural background (5 sites), urban industrial (5 sites) and urban traffic (2 sites). The rural background sites are located at Chilbolton Observatory, Hampshire and Auchencorth Moss, Midlothian. Results from these 2 rural background sites are used to support the European Monitoring and Evaluation Programme ([EMEP](#)) to Level 2. EMEP is a scientifically based and policy driven programme under the Convention on long-range transboundary air pollution (CLRTAP) ([UNECE, 1979](#)) for international co-operation for better understanding of the problems and action to take to solve transboundary air pollution.

The UK PAH Monitoring Network comprises non automatic systems to measure PAH in ambient air and deposition. B[a]P has been identified as a human carcinogen ([IARC, 2010](#)) and has been determined to be a suitable 'marker' for the PAH mixture in ambient air.

Key findings for 2025:

- In 2025 the AQSR target value for Benzo[a]pyrene (B[a]P) (annual mean concentration of 1 ng/m³) was not exceeded at any of the UK PAH Network sites in the UK.
- The highest annual average B[a]P concentrations were recorded at 3 of the 4 urban sites in Northern Ireland and at the urban site of Royston.
 - Derry Brandywell 0.48 ng/m³
 - Ballymena Ballykeel 0.41 ng/m³
 - Royston 0.36 ng/m³
 - Armagh Roadside 0.32 ng/m³
- Most UK sites show seasonality with the higher concentrations being observed in winter with the highest monthly concentration of B[a]P found at the Royston site (1.4 ng/m³ in January) with similar concentrations recorded in January at Armagh



Roadside, Ballymena Ballykeel and at Derry Brandywell in both January and December, all with a concentration of 1.1 ng/m³.

- The network average data capture of the operational sites in 2025 continued to be very high at 99%.

Contents

1.	Executive Summary	3
2.	Introduction	7
2.1	Polycyclic Aromatic Hydrocarbons	7
2.2	Air Quality Policy	8
2.3	Sources of PAHs in the UK	9
3.	The PAH Network	10
3.1	Network Objectives	10
3.2	Network Overview	10
3.3	Samplers in the PAH Network	13
3.3.1	Sampling Quality Control	15
3.4	Network Infrastructure Change	15
3.4.1	Station Infrastructure and Network Re-organisation	15
3.4.2	Data capture, Station Calibrations, Services and Breakdowns	17
3.5	Analytical Techniques and PAH reported	18
4.	Results & Discussions	19
4.1	Comparison of B[a]P annual concentrations against AQSR target values	19
4.2	B[a]P monthly concentrations	20
4.2.1	Northern Ireland sites	20
4.2.2	GB urban background	22
4.2.3	GB rural background	23
4.2.4	GB industrial	24
4.2.5	GB urban traffic	25
4.3	Other PAHs Monthly Concentrations	26
4.3.1	Benz[a]anthracene	27
4.3.2	Benzo[b]fluoranthene	28
4.3.3	Benzo[j]fluoranthene	29
4.3.4	Benzo[k]fluoranthene	30
4.3.5	Indeno[1,2,3-c,d]pyrene	31
4.3.6	Dibenz[a,h]anthracene	32
4.3.7	Benzo[g,h,i]perylene	33
4.4	Depositon ('C') samples	34
4.5	Long-term trends in B[a]P	34
4.5.1	Northern Ireland sites	34



4.5.2	GB urban background	36
4.5.3	GB rural background	37
4.5.4	GB industrial	37
4.5.5	GB urban traffic	39
4.6	Trend Assessment at the UK PAH Network sites	39
5.	Conclusions	41
6.	References	42
7.	Appendix 1: PAH Deposition	43
8.	Appendix 2 Environment Agency, Monitoring Laboratory Service PAH Analysis	44

2. Introduction

This report was prepared by WSP as part of the UK PAH Monitoring and Analysis Network ('the Network' or 'the PAH Network') under a contract with the Environment Agency for the Department for Environment, Food and Rural Affairs (Defra), the Northern Ireland Department of Agriculture, Environment and Rural Affairs (DAERA), the Welsh Government and the Scottish Government.

Prior to its acquisition by WSP, Ricardo originally established the UK's PAH monitoring network in 1991 and have managed the network continuously except for the period October 2010 - September 2016. The original network used high volume Andresen samplers which began to be upgraded to Digitel DHA-80 high volume PM₁₀ aerosol samplers in late 2006 with the first full year of operation of many of the sites being 2007. This annual report presents and discusses data from the network since the upgrade to the Digitel DHA-80 samplers including data collected by a previous contractor.

This interactive annual report contains:

- An introduction to polycyclic aromatic hydrocarbons (PAHs)
- Summary of air quality policy including that relating to PAHs
- Information relating to sources of PAHs in the UK
- A network overview including equipment and details of the sampling locations and changes
- Summary of analytical techniques employed
- A comparison of annual mean B[a]P concentrations with the Air Quality Standard Target Value
- Monthly PAH concentrations in 2025
- Review of trends in B[a]P concentrations

The appendices of this report present data for the monthly deposition concentrations of B[a]P at all Network stations that were operational in 2025. However, all deposition and air concentration data for all other PAHs measured within the network can be accessed via the [UK Air](#) website.

2.1 Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are a group of persistent organic pollutant compounds they contain 2 or more benzene rings; they are generally produced through incomplete combustion or pyrolysis.

The International Agency for Research on Cancer (IARC) has determined that B[a]P is carcinogenic to humans and is currently considered by IARC as the most carcinogenic PAH. IARC monographs evaluate cancer hazards, these are provided online in reports relating to PAH ([IARC, 2010](#)) and chemical agents ([IARC, 2012](#)) including Benzo[a]pyrene (B[a]P). It is

generally accepted that carcinogens such as B[a]P do not have a safe threshold and that any level of exposure may carry some risk of adverse health effects.

All of benz[a]anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, indeno[1,2,3-c,d]pyrene, and benzo[g,h,i]perylene are required to be measured under the Air Quality Standard Regulations in the UK, plus benzo[ghi]perylene which was more recently included in the 2014 technical standard CEN/TS 16645:2014 ([BSI 14a](#)). The IARC Carcinogenic Classification of PAH can be found at [Agents classified by the IARC Monographs, Volumes 1 – 142](#).

2.2 Air Quality Policy

The Ambient Air Quality Directive (2008/50/EC) and Fourth Daughter Directive (2004/107/EC) set standards such as statutory limit values and target values for the concentration of pollutants in ambient air. They also define monitoring and reporting obligations. These Directives were transposed by respective Air Quality Standard Regulations (as detailed below):

- The Air Quality Standards Regulations 2010 in England ([UK Government, 2010](#)), and their December 2016 ([UK Government, 2016](#)) and January 2019 ([UK Government, 2019](#)) amendments
- The Air Quality Standards (Scotland) Regulations 2010 in Scotland ([Scottish Government, 2010](#)), and their December 2016 amendment ([Scottish Government, 2016](#))
- The Air Quality Standards (Wales) Regulations 2010 in Wales ([Welsh Government, 2010](#)) and their February 2019 amendment ([Welsh Government, 2019](#))
- The Air Quality Standards (Northern Ireland) Regulations ([DAERA, 2010](#)), and their December 2017 ([DAERA, 2017](#)), December 2018 ([DAERA, 2018](#)) and November 2020 ([DAERA, 2020](#)) amendments

The Air Quality Standard Regulations (2010) and their amendments set a target value for B[a]P of 1 ng/m³ (total content in the PM₁₀ fraction averaged over a calendar year) along with mandatory measurement requirements.

The respective Secretaries of States for England and the Devolved Government responsible for the Environment have responsibility for meeting the limit values and target values as defined through the Air Quality Standards Regulations. Department for Environment, Food and Rural Affairs (Defra) coordinates assessment for the UK as a whole.

B[a]P's suitability as a marker for the PAH mixture in ambient air as stated in the EC Position Paper on PAH ([EC, 2001](#)) led to it being selected as the measure for monitoring. The reference method for measurement of B[a]P in ambient air is detailed in a British Standard (BS 15549) ([BSI, 2008](#)).

Measurements of PAH in deposition are covered by another British Standard ([BSI, 2011](#)) which details the measurement method sampling, sample preparation and analysis for benz[a]anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene and indeno[1,2,3-c,d]pyrene. There is no limit or target value related to deposition of PAH in the UK.

International relations are reserved to the UK Government; therefore, Defra (with consultation with the Devolved Governments) retains overall policy responsibility for the formulation of international air quality policy. Defra continues to represent the UK internationally, which reflects that while new domestic legislation is a devolved responsibility the overall compliance with international agreements will remain the responsibility of the UK Government.

The 2 rural background sites located at Chilbolton Observatory, Hampshire and Auchencorth Moss, Midlothian are used to support the European Monitoring and Evaluation Programme (EMEP) to Level 2. EMEP is a scientifically based and policy driven programme under the Convention on long-range transboundary air pollution (CLRTAP) which was signed by the UK in 1979. The convention aids international co-operation to solve transboundary air pollution problems, provides access to emission, measurement and modelling data and provides information on the effects of air pollution on ecosystems, health, crops and materials.

2.3 Sources of PAHs in the UK

Polycyclic aromatic hydrocarbons (PAHs) are a group of persistent organic pollutant compounds. They contain 2 or more benzene rings and are generally produced through incomplete combustion or pyrolysis. The National Atmospheric Emissions Inventory (NAEI) has estimated the emission of PAH for the UK for many years. The inventory estimates the emissions of PAHs including B[a]P. As with all emissions inventories there is some uncertainty in the estimates as the emissions are not based solely on measurements and require some estimation of emission factors and activities being required.

In recent years the Inventory indicates that residential and commercial combustion are the dominant emission sources of B[a]P in the UK. Defra's Clean Air Strategy ([Defra, 2019](#)) reports that the use of wood as a domestic fuel has been calculated to produce 78% of total national emission of B[a]P. However, the most recent information relating to UK Emissions of PAH (including B[a]P) along with other pollutant can be accessed via the [National Atmospheric Emissions Inventory](#) (NAEI). This data is updated on an annual basis.

3. The PAH Network

3.1 Network Objectives

The objective of the PAH Network is to determine the ambient concentrations of PAHs in ambient air in the UK through monitoring and chemical analysis, and deliver or aid the delivery the following:

- A UK assessment of current concentrations of PAHs for assessment against the Air Quality Standards Regulations (1 ng/m³ of B[a]P) provide measurement input for any future reviews.
- A review of the measurements and trends of airborne concentrations of PAHs in representative UK industrial, urban and rural locations.
- Provide data and metadata to [UK Air](#) to enable demonstration of the UK's compliance with the Air Quality Standards Regulations, the OSPAR convention ([OSPAR, 1992](#)) and the UNECE Convention on long-range transboundary air pollution ([UNECE, 1979](#)), to enable a better understanding of sources or potential sources of PAH.

3.2 Network Overview

The monitoring stations operating in the UK PAH Network during 2025 are shown in Figure 1. Two monitoring sites where both Digital particulate samplers and deposition samples are taken are marked in blue (Auchencorth Moss and Chilbolton Observatory). Other sites where only Digital particulate samples are taken are marked in red.

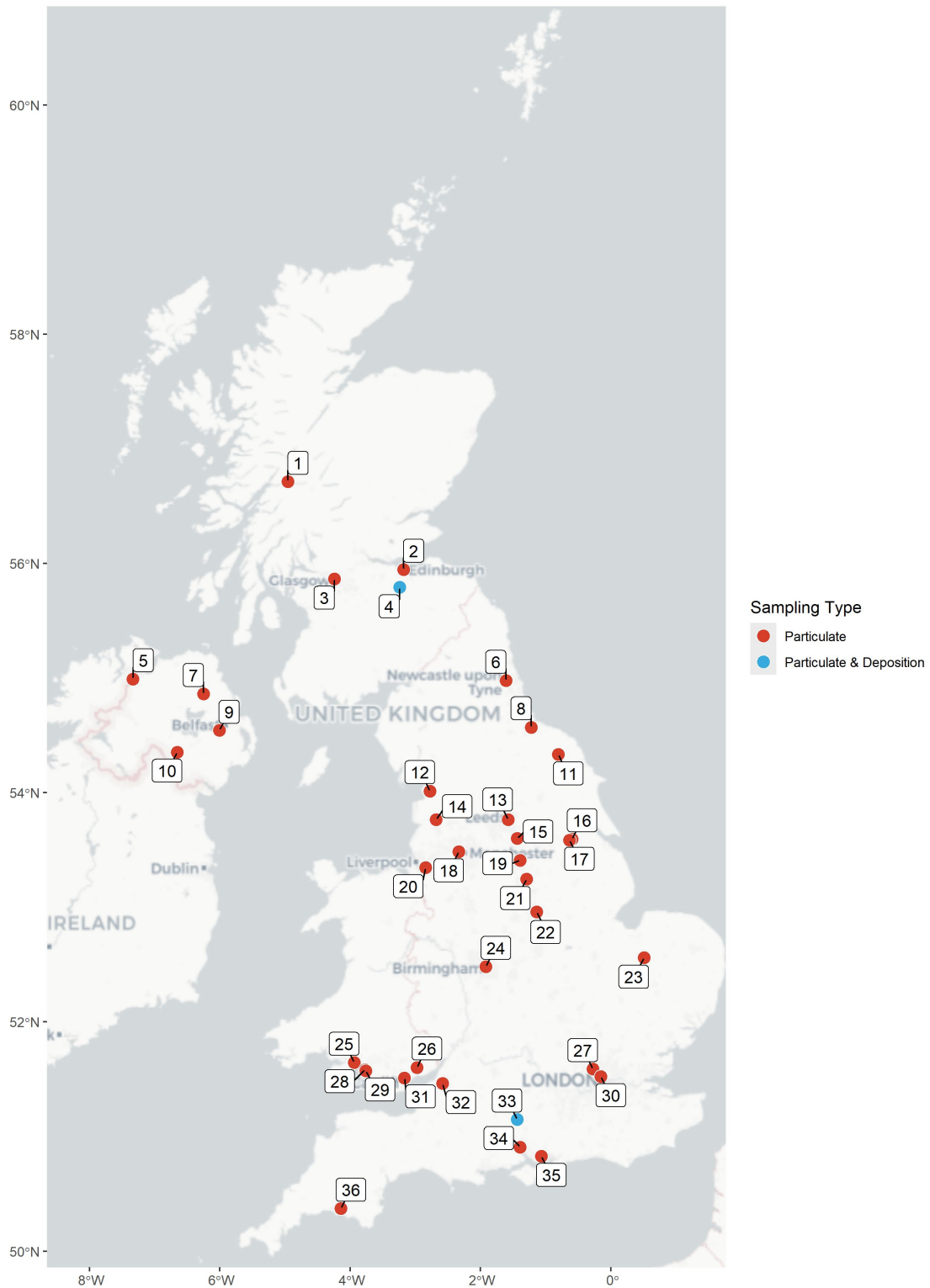


Figure 1: Map of UK PAH monitoring stations in 2025.

Table 1: Site information for UK PAH monitoring stations. 'Map ID' allows for cross reference with Figure 1.

Map ID	Site	Latitude	Longitude	Site Type
1	Kinlochleven	56.71445	-4.954345	Urban Background
2	Edinburgh St Leonards	55.94559	-3.182186	Urban Background
3	Glasgow Townhead	55.86578	-4.243631	Urban Background
4	Auchencorth Moss	55.79216	-3.242900	Rural Background
5	Derry Brandywell	54.99234	-7.332127	Urban Background
6	Newcastle Centre	54.97825	-1.610528	Urban Background
7	Ballymena Ballykeel	54.86160	-6.250873	Urban Background
8	Middlesbrough	54.56930	-1.220874	Urban Industrial
9	Kilmakee Leisure Centre	54.54376	-6.008336	Urban Background
10	Armagh Roadside	54.35373	-6.654558	Urban Traffic
11	High Muffles	54.33450	-0.808820	Rural Background
12	Hazelrigg	54.01364	-2.775402	Rural Background
13	Leeds Millshaw	53.76611	-1.578622	Urban Background
14	Preston	53.76559	-2.680353	Urban Background
15	Royston	53.60028	-1.439450	Urban Background
16	Scunthorpe Low Santon	53.59583	-0.597236	Urban Industrial
17	Scunthorpe Town	53.58634	-0.636811	Urban Industrial
18	Salford Eccles	53.48481	-2.334139	Urban Background
19	Sheffield Tinsley	53.41058	-1.396139	Urban Background
20	Liverpool Speke	53.34633	-2.844333	Urban Background
21	Bolsover	53.24640	-1.297046	Urban Background
22	Nottingham Kenmore Gardens	52.95944	-1.138650	Urban Background
23	Stoke Ferry	52.55985	0.506147	Rural Background
24	Birmingham Ladywood	52.48135	-1.918235	Urban Background
25	Swansea Cwm Level Park	51.64584	-3.939450	Urban Background
26	Newport	51.60120	-2.977281	Urban Background

Map ID	Site	Latitude	Longitude	Site Type
27	London Brent	51.58977	-0.276223	Urban Background
28	Port Talbot Margam	51.58395	-3.770822	Urban Industrial
29	Margam Youth Centre	51.57316	-3.759472	Urban Industrial
30	London Marylebone Road	51.52253	-0.154611	Urban Traffic
31	Cardiff Lakeside	51.51241	-3.169336	Urban Background
32	Bristol St Paul's	51.46284	-2.584482	Urban Background
33	Chilbolton Observatory	51.14962	-1.438228	Rural Background
34	Southampton Centre	50.90817	-1.395757	Urban Background
35	Portsmouth	50.82881	-1.068583	Urban Background
36	Plymouth Centre	50.37167	-4.142361	Urban Background

During 2025 there were no changes to the location of any monitoring site. At the end of 2025 there were 36 sites in the network. Most of the sampling locations are urban background, but the network also includes urban industrial, 2 rural background sites located at Chilbolton Observatory, Hampshire and Auchencorth Moss, Midlothian and 2 urban traffic sites, London Marylebone Road and Armagh Roadside. The rural background sites are used to support the [European Monitoring and Evaluation Programme](#) (EMEP).

3.3 Samplers in the PAH Network

The Network requires the sampling and analysis of 2 types of samples these are particulate and deposition samples.

'PAH Digitel (solid phase)' particulate samplers. These samples are in the PM₁₀ fraction of ambient air on a filter and are taken daily at all network stations using Digitel DHA-80 samplers with automatic filter changers. Each sample is taken for 24 hours with the sample changeover occurring at midnight (GMT). The samples are bulked into groups representing calendar months per location for analysis. The Digitel DHA-80 samplers (see Figure 2) used throughout the Network are considered to be equivalent to the requirements of the Standard for sampling PM₁₀ matter (EN 12341) ([BSI, 2014b](#)). The samplers are therefore valid for use with the Standard method for the measurement of B[a]P in ambient air (EN 15549). The solid phase filter samples have a measurement period of 24 hours at a flowrate of approximately 30 m³/h. In 2021 and 2022 the samplers were upgraded to include improved communication to the samplers to allow improved remote monitoring of individual samplers.

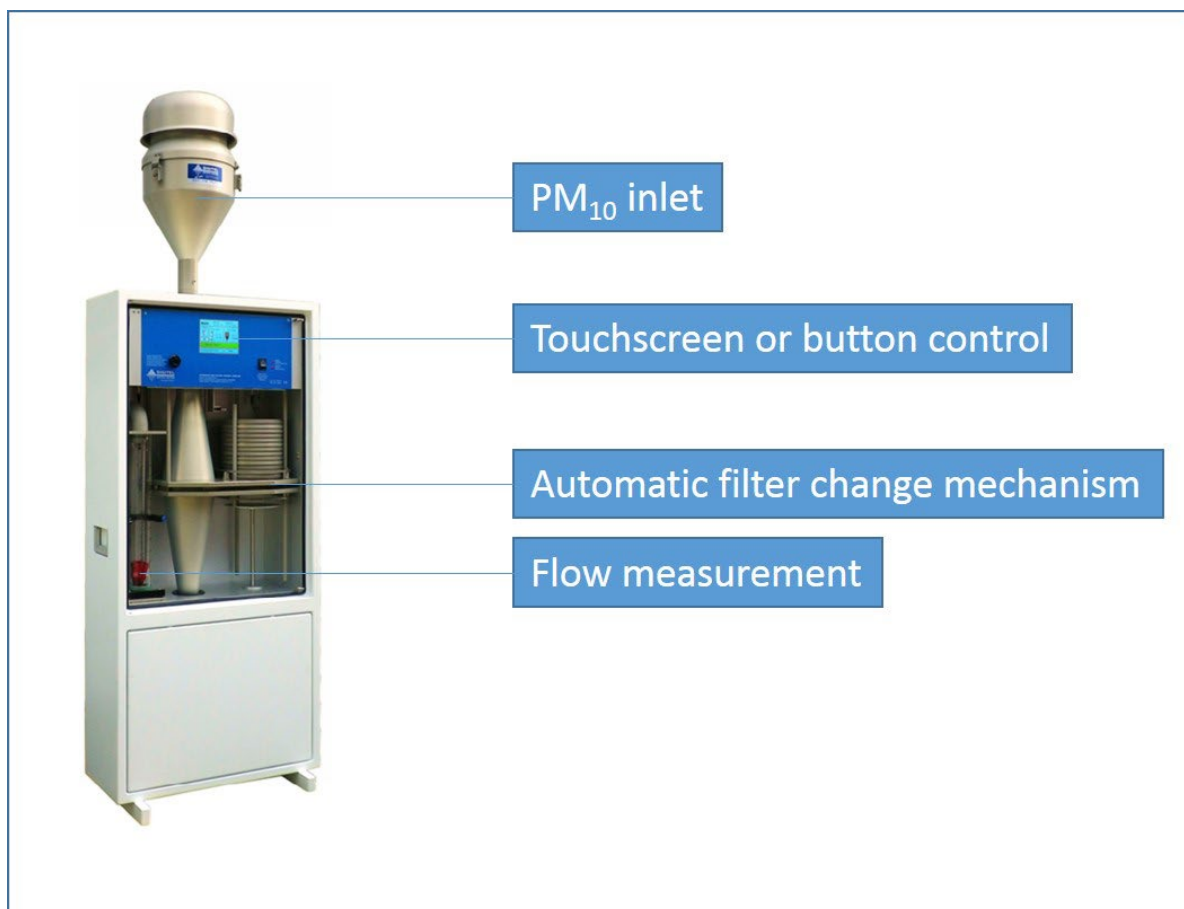


Figure 2: Digital DHA-80 sampler deployed to measure solid phase PAH in the UK Network.

‘PAH deposition’ samplers. These deposition samples are taken fortnightly at 2 rural stations within the network at Auchencorth Moss and Chilbolton Observatory (prior to 2016 the equipment at Chilbolton was located at Harwell). Each sample is taken for 14 days using a deposition sampler (Figure 3) that meets the requirement of the Standard for the measurement of the deposition of PAHs (BS EN 15980). The deposition sampler itself consists of a glass funnel and a brown glass collection bottle, which are located inside a protective tube to minimise photochemical reactions and the degradation of PAHs. The spikes seen on the image have been fitted to the top of the protective tubes to prevent damage and minimise contamination by bird strikes.

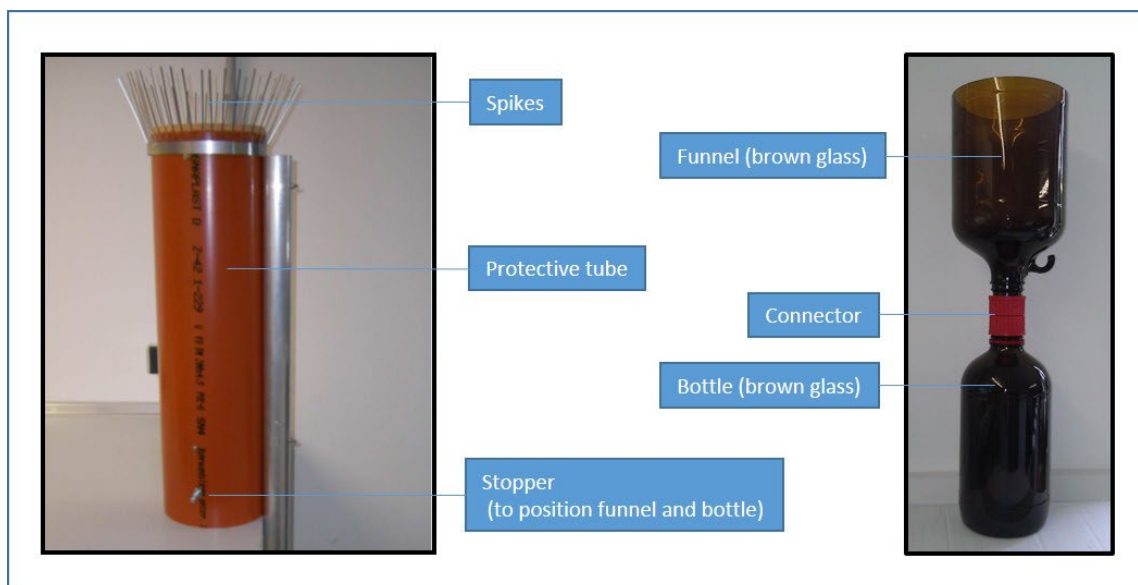


Figure 3: Samplers to measure deposition of PAH in the UK Network.

3.3.1 Sampling Quality Control

To ensure the quality of the sampling procedure there are several checks and quality assurance and quality control measures that are undertaken on the data and the filters used in the samplers prior to use. These include the inspection of sampling media prior to use at sampling sites, analysis of field and sample blanks, checking of equipment operation via online systems, review of the measurement data associated with the filters being returned from the sites to ensure they meet the requirement of the BS EN 15549 standard. In addition to these checks the network is supported by an infrastructure of local site operators who are fully trained and provided with detailed working instructions for site operation.

3.4 Network Infrastructure Change

3.4.1 Station Infrastructure and Network Reorganisation

Under the Air Quality Standards Regulations, the Secretary of State must classify each zone based on whether they exceed the assessment thresholds for specific pollutants as outlined in the Ambient Air Quality Directive (2008/50/EC). This classification must be reviewed at least every 5 years, or more frequently if significant changes occur in activities affecting air quality. As a result of these reviews, there have been changes to the number and location of site in the UK PAH network. There was no reorganisation to the network in 2025 have details of the network reorganisation or periods where sampling is suspended in previous years are detailed below:

- Hove (UKA00439) PAH sampling ceased 31st December 2015
- London Crystal Palace Parade (UKA00373) PAH sampling ceased 31st December 2015
- Nottingham Centre (UKA00274) PAH sampling began 16th November 2016

- Ruardean (UKA00646) PAH sampling began 15th March 2017
- Sheffield Tinsley (UKA00181) PAH sampling began 16th March 2017
- Birmingham Tyburn (UKA00479) PAH sampling ceased 24th May 2017
- Newport (UKA00380) PAH sampling suspended from 16th August 2017 to 6th April 2018 due to safety work at the monitoring site
- Birmingham Ladywood (UKA00655) PAH sampling began 1st June 2018
- Scunthorpe Santon (UKA00506) PAH sampling suspended from 9th September 2020 to 22nd October 2019 due to roof replacement
- Bristol St Paul's (UKA00494) PAH sampling began 1st November 2019
- Liverpool Speke (UKA00247) sampling suspended from the 7th of September 2020 due to site safety work at the monitoring site and restarted in August 2021
- Cardiff Lakeside (UKA00452) sampling suspended from 22nd September to the 28th October due to electrical work and renovations at the school where the sampler is located.
- South Hiendley (UKA00509) site closed 17th August 2021
- Southampton Centre (UKA00235) site opened 16th June 2021
- Ruardean (UKA00646) site closed 20th December 2021
- Plymouth Centre (UKA00360) site opened 1st January 2022
- Preston (UKA00408) site opened 2nd March 2022
- Lynemouth 2 (UKA00556) site closed 14th June 2022
- Armagh Roadside (UKA00541) site opened 20th October 2022
- Portsmouth (UKA00421) site opened 25th January 2023
- Margam Youth Centre (UKA00962) site opened 1st January 2023
- Nottingham Centre (UKA00274) site closed 23rd January 2024
- Nottingham Kenmore Gardens (UK01048) site opened 23rd January 2024

3.4.2 Data capture, Station Calibrations, Services and Breakdowns

All Stations were calibrated and serviced in 2025 and checks on flow were undertaken. Table 2 below shows the data captures for 2025.

Table 2: PAH data capture in 2025.

Site	Site Environment Type	Data capture
Armagh Roadside	Urban Traffic	99%
Auchencorth Moss	Rural Background	99%
Ballymena Ballykeel	Urban Background	95%
Birmingham Ladywood	Urban Background	99%
Bolsover	Urban Background	99%
Bristol St Paul's	Urban Background	100%
Cardiff Lakeside	Urban Background	99%
Chilbolton Observatory	Rural Background	98%
Derry Brandywell	Urban Background	99%
Edinburgh St Leonards	Urban Background	100%
Glasgow Townhead	Urban Background	97%
Hazelrigg	Rural Background	100%
High Muffles	Rural Background	100%
Kilmakee Leisure Centre	Urban Background	99%
Kinlochleven	Urban Background	96%
Leeds Millshaw	Urban Background	99%
Liverpool Speke	Urban Industrial	100%
London Brent	Urban Background	100%
London Marylebone Road	Urban Traffic	100%
Margam Youth Centre	Urban Industrial	99%
Middlesbrough	Urban Background	100%
Network Average	NA	99%

Site	Site Environment Type	Data capture
Newcastle Centre	Urban Background	100%
Newport	Urban Background	99%
Nottingham Kenmore Gardens	Urban Background	99%
Plymouth Centre	Urban Background	97%
Port Talbot Margam	Urban Industrial	100%
Portsmouth	Urban Background	100%
Preston	Urban Background	99%
Royston	Urban Background	98%
Salford Eccles	Urban Background	100%
Scunthorpe Low Santon	Urban Industrial	100%
Scunthorpe Town	Urban Industrial	99%
Sheffield Tinsley	Urban Background	99%
Southampton Centre	Urban Background	100%
Stoke Ferry	Rural Background	99%
Swansea Cwm Level Park	Urban Background	90%

There were many callouts to sites in 2025 due to site and equipment issues, however, there were no major periods of non-operation that resulted in significant data loss at the majority of sites. The network average data capture across all operational sites in 2025 was 99% with no sites had a data capture below 90%.

The UK PAH Network aims for 100% time coverage and 90% data capture in its data quality. In contrast, the Fourth Daughter Directive (2004/107/EC) mandates only 33% time coverage but also requires a 90% data capture.

3.5 Analytical Techniques and PAH reported

In 2025 all analysis was undertaken by the Environment Agency, Monitoring Laboratory Service. The analytical method used to analyse for PAH in both sampling media is gas chromatography–mass spectrometry (GC-MS). For the PAH analysed and reported from deposition and particulate samples, the typical detection limits and accreditation information are shown in Appendix 2 (Table 4).

4. Results & Discussions

This section presents and discusses the results from the PAH Digitel (solid phase) particulate samplers' stations. The discussion focuses on B[a]P as the Air Quality Standard Regulations Target Value and use B[a]P as the marker for the PAH mixture in ambient air. Some data for other PAHs are also presented below and data for all PAHs for all stations are made available on the [UK Air](https://www.ukair.org.uk/) website.

4.1 Comparison of B[a]P annual concentrations against AQSR target values

The annual mean B[a]P concentration measured at all the PAH Digitel (solid phase) particulate samplers are shown in Figure 4. The darkness of the shading provides an indication of data capture.

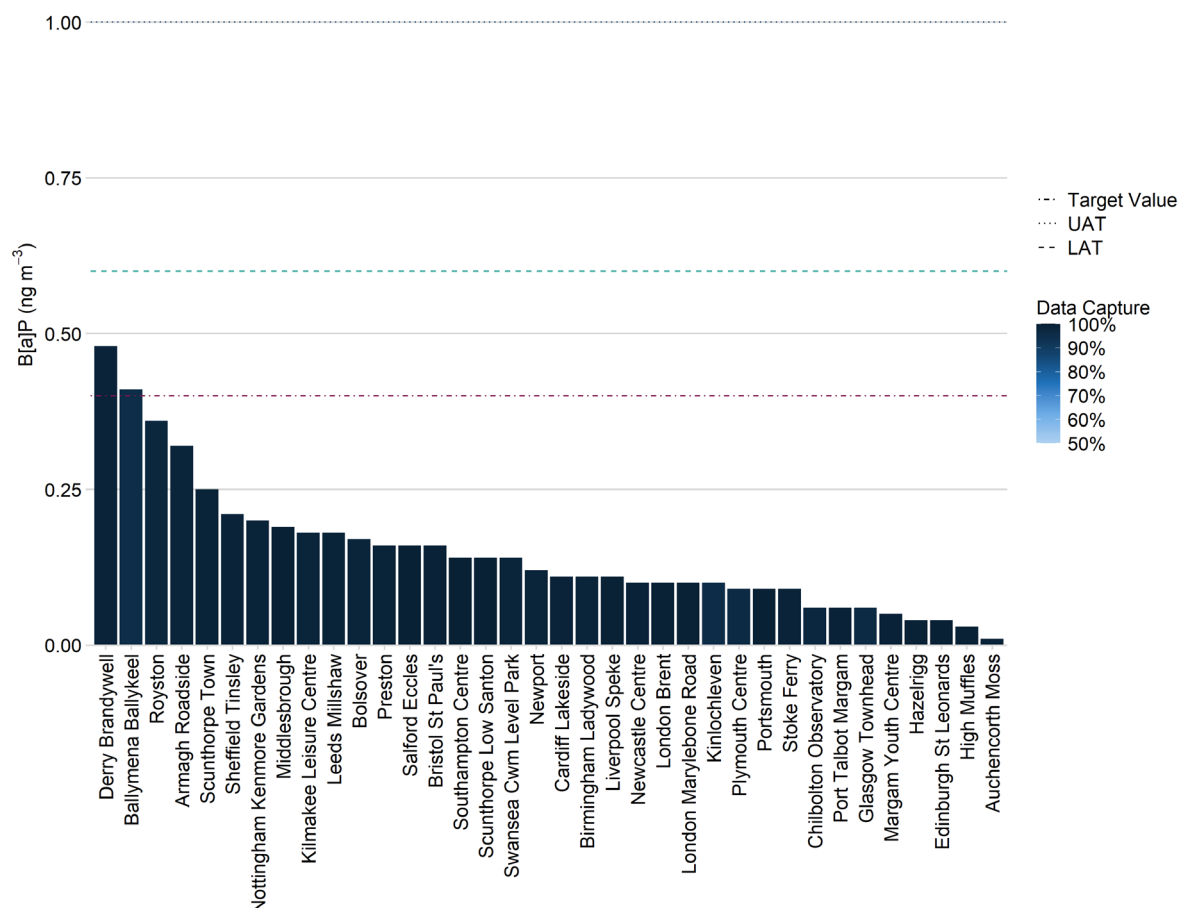


Figure 4: Comparison of annual B[a]P concentrations at all the monitoring stations against Target Value assessment thresholds.

In 2025 no UK PAH Network measurement sites exceeded the annual mean Target Value for B[a]P of 1 ng/m³ or the upper assessment threshold (UAT) of 0.6 ng/m³. Two sites exceeded the lower assessment threshold (LAT) of 0.4 ng/m³. These were Derry Brandwell (0.48 ng/m³), and Ballymena Ballykeel (0.41 ng/m³).

Historically the highest concentrations were recorded at sites with specific emission sources such as steel works (Margam Youth Centre, Port Talbot Margam, Scunthorpe Town and Low Santon). However, following some closures at the 2 steel works resulting in reduced emissions, the highest concentration sites in 2024 and 2025 are the urban sites with solid and wood fuel use contributing to the measured levels.

4.2 B[a]P monthly concentrations

PAH concentrations typically exhibit seasonality, with higher levels being observed during the winter months due to increased domestic and industrial combustion for heating and a lower boundary layer depth.

The boundary layer (often called the Atmospheric Boundary Layer) is the layer of atmosphere next to the surface of the earth. Within this layer air is very well mixed. If the boundary layer decreases in height, as is common in winter months, this can increase concentrations of pollutants within the layer.

Measurement sites with active industrial sources of PAH would generally be expected to show less seasonality as any seasonal emissions from domestic and industrial combustion would be masked by the less seasonal industrial emissions. The monthly concentrations of B[a]P for 2025 grouped by the site characteristic types are shown in Figure 5 to Figure 9.

4.2.1 Northern Ireland sites

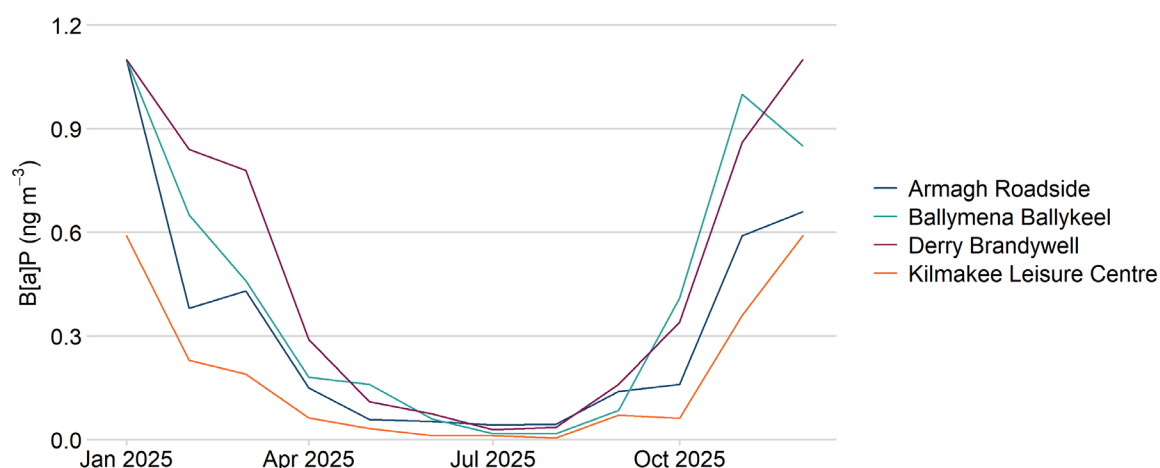


Figure 5: Monthly average B[a]P concentrations at the Northern Ireland sites in 2025.

The Armagh Roadside site is a roadside site however it was considered better placed for comparison with the other Northern Ireland sites with similar concentrations and seasonality.

The Northern Ireland measurement sites generally have much higher concentrations of B[a]P than the UK mainland sites. This is particularly noticeable in the winter months. As in previous years the Monthly variation of B[a]P concentrations in Northern Ireland for 2025 continued to show pronounced seasonal variation with low concentrations in the summer months and higher in winter.

In 2025 the highest monthly concentration of B[a]P, for the Northern Ireland sites, was 1.1 ng/m³ recorded in January at Armagh Roadside, Ballymena Ballykeel and at Derry Brandywell in both January and December.

The observed seasonal variation supports the understanding that the PAH sites in Northern Ireland are highly influenced by emission from wood and other solid fuel usage for domestic heating.

4.2.2 GB urban background

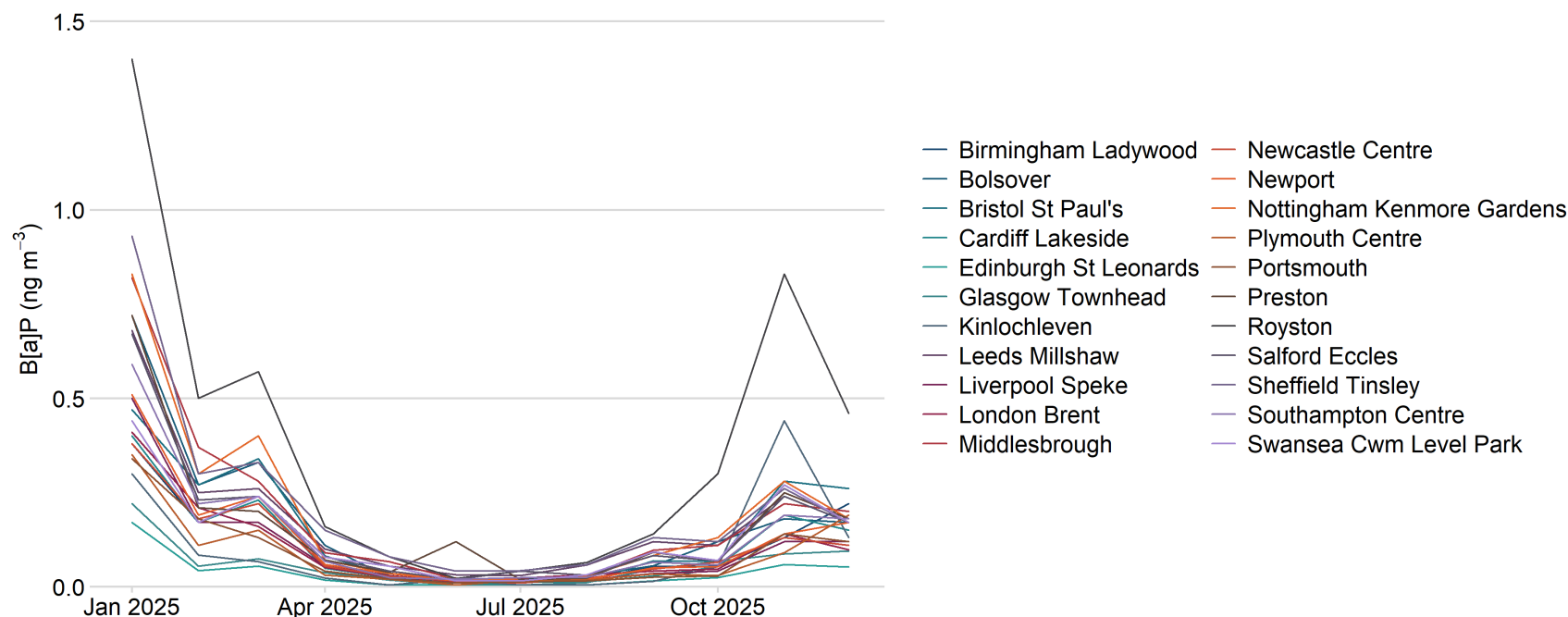


Figure 6: Monthly average B[a]P concentrations at urban background sites in Great Britain (GB) in 2025.

Urban background sites in GB generally exhibited seasonal variability resulting from the anticipated wood and other solid fuel usage. Whilst this is not as pronounced as the Northern Ireland sites, there is still an observed elevation in concentrations during the winter months.

The highest 2025 monthly concentration of all the UK PAH network sites was recorded at Royston at 1.4 ng/m³ in January.

There was a pronounced elevation in concentration of B[a]P observed in November at many of the GB urban background sites and it is likely to be as a result Guy Fawkes Night and the associated emissions from the combustion on bonfires.

4.2.3 GB rural background

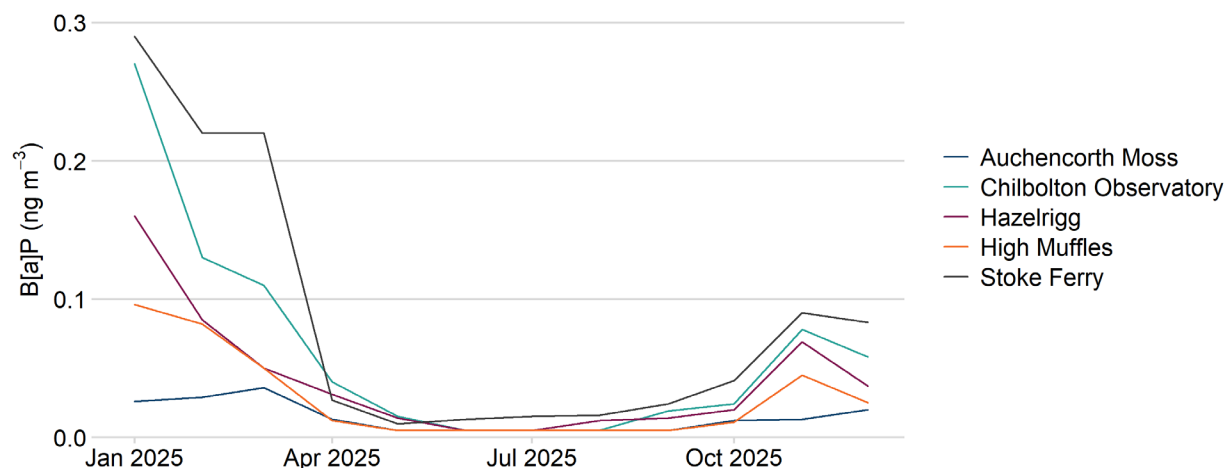


Figure 7: Monthly average B[a]P concentrations at rural background sites in GB in 2025.

The most rural site in the PAH network is generally considered to be Auchencorth Moss (blue line), it is not thought that PAH concentrations at this site are influenced significantly by any local sources or by industry. This site would be the best site to represent the PAH concentration of regional background concentrations.

The rural PAH network sites show much lower concentrations throughout the year than most of the urban and industrial sites. However, there is still seasonality observed at the sites due to increased emissions from domestic and commercial burning and a lower boundary layer depth in the winter months which both contribute to the increased concentrations. The elevation in November is also seen which is thought to be due to the 'Guy Fawkes Night effect'.

4.2.4 GB industrial

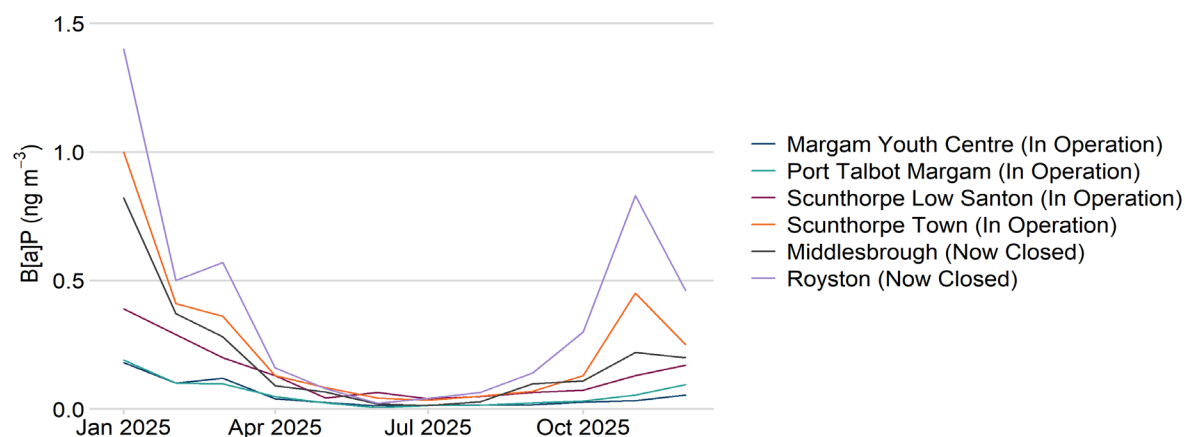


Figure 8: Figure 8: Monthly average B[a]P concentrations at operating industrial sites and those where industrial processes are no longer operational (referred to on the figure as (Now closed))

The coke oven plant at Scunthorpe was closed in spring 2023 however the steelworks continue to operate with the 2 remaining blast furnaces following the UK government passing of legislation in April 2025 to prevent their shutdown.

The coke oven plant at the Port Talbot steel works was closed in March 2024 with the 2 remaining blast furnaces at the steel works closing at the end of June and the end of September 2024. This ended the large-scale traditional/ primary steel making process at the site.

The UK's remaining operational primary steel making process at Scunthorpe uses a basic oxygen steelmaking (BOS) process.

Raw materials are processed by a sinter plant which produces an iron rich feedstock from heating fine particles of iron ore, limestone and coke (a carbon rich material) to produce larger pieces called sinter. These pieces and additional coke are used in the blast furnaces.

The coke oven plant is an industrial process that converts coal into coke, a carbon rich material used in the steel manufacturing process. The process in coke ovens generally emits high fugitive emissions of PAH. The Sinter plant and blast furnace processes also emit PAH however when compared to coke oven plants these generally have less local impact and have lower fugitive emissions. The remaining activities at the Scunthorpe steel works can still produce significant dust-bound PAH.

Where there are high concentration sources emitting pollutants invariant throughout the year there is less pronounced seasonality. Where emissions decrease from industrial sources as seen at Port Talbot and Scunthorpe in recent years more seasonality will be observed. The seasonality at all the Port Talbot and Scunthorpe sites have increased since the closures of the

coke oven plants at both sites and the closure of the primary steel making process at Port Talbot.

The highest 2025 monthly concentration of B[a]P at the operational industrial sites was observed at Scunthorpe Town, a B[a]P concentration of 1.00 ng/m³ was measured at the site which is slightly higher than the 2024 high of 0.83 ng/m³ measured at Port Talbot Margam. In 2025 the maximum monthly concentration at the ex-industrial sites of Royston (1.4 ng/m³) was higher than at Scunthorpe Town.

The sites of Middlesbrough and Royston which did have industrial sources, that have since ceased operation, both of which are now considered urban background sites, do show seasonality. These ex-industrial sites may be influenced by the emissions from domestic heating emission, using solid fuel, in addition to the lower boundary layer depth in the winter months which also contributes to the increased concentrations.

4.2.5 GB urban traffic

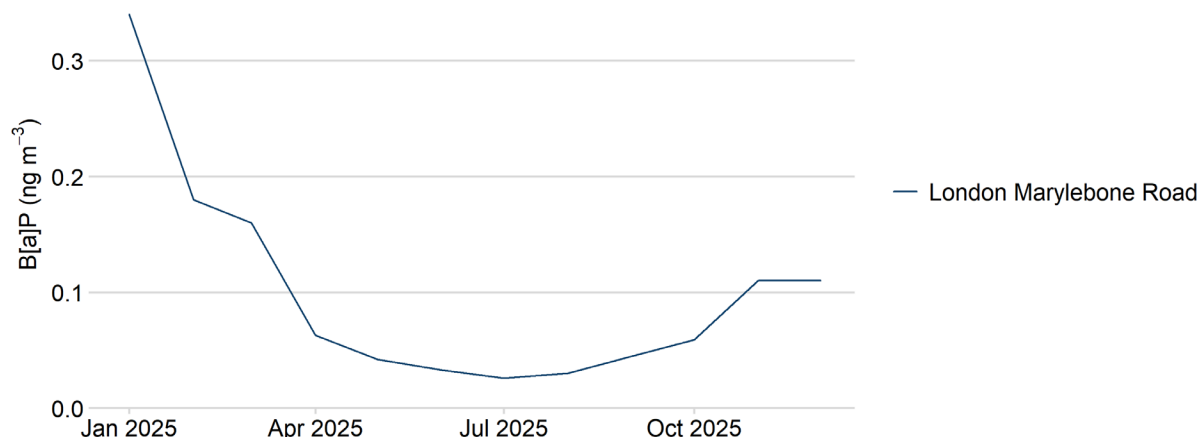


Figure 9: Monthly average B[a]P concentrations at the urban traffic site in GB in 2025.

Whilst there are now 2 PAH network sites that are considered as urban traffic sites the newly established Armagh Roadside site fits better with the Northern Ireland sites and has been discussed in that section of the report.

The London Marylebone Road urban traffic site is at a location that has significant traffic flow which is likely to be consistent throughout the year. However, there is a clear seasonality observed at the site and the magnitude of the seasonality of B[a]P measured at London Marylebone Road is comparable to that measured at other urban background sites in Great Britain. This continues to indicate that the concentrations of B[a]P at the site are not dominated by traffic even though the site is a traffic site and could indicate that it is a result of seasonal emissions relating to domestic and other heating emissions. As with the other urban sites there

appears to be an elevation in concentrations in November 2025 which is generally attributed to Guy Fawkes Night.

4.3 Other PAHs Monthly Concentrations

The Air Quality Standards Regulations also specifies that a least 6 specific PAHs should be monitored in addition to benzo[a]pyrene at a limited number of measurement stations. The reason for their measurement is to enable the contribution of benzo[a]pyrene in air to be assessed and this was agreed when the original legislation was created. The PAH referred to are benz[a]anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene, and dibenz[a,h]anthracene. The European Committee for standardization (CEN TC264 WG21) developed a Technical Specification, PD CEN/TS 16645:2014 ([BSI, 2014b](#)), for the measurement of these PAHs and benzo[g,h,i]perylene in the particulate phase. The UK PAH Network measures all the PAH referred to in the Technical Specification ([BSI, 2014b](#)) at all stations and since Ricardo took over the network from the previous contractor, these have been analysed and reported separately. The monthly mean concentration of each of these PAHs measured at the sites are shown in the figures below. A visual only review of the figures suggests these PAH appear to follow similar seasonal trends to those of the 'marker' B[a]P, which indicates that the assumptions made in using B[a]P as a marker are well founded.

Most of the sites appear to show seasonality and an elevation in concentration in November in 2025 which is likely to be attributable to Guy Fawkes Night.

4.3.1 Benz[a]anthracene

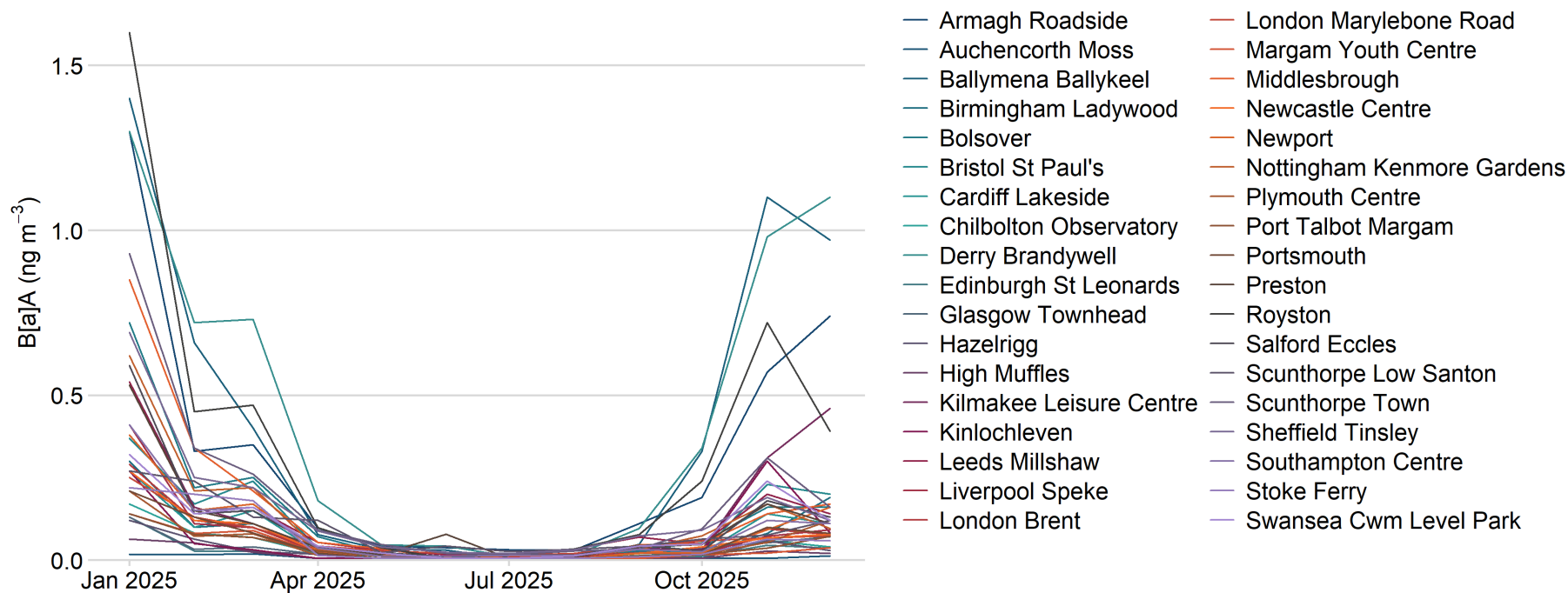


Figure 10: Monthly mean benz[a]anthracene concentrations at the UK PAH sites.

4.3.2 Benzo[*b*]fluoranthene

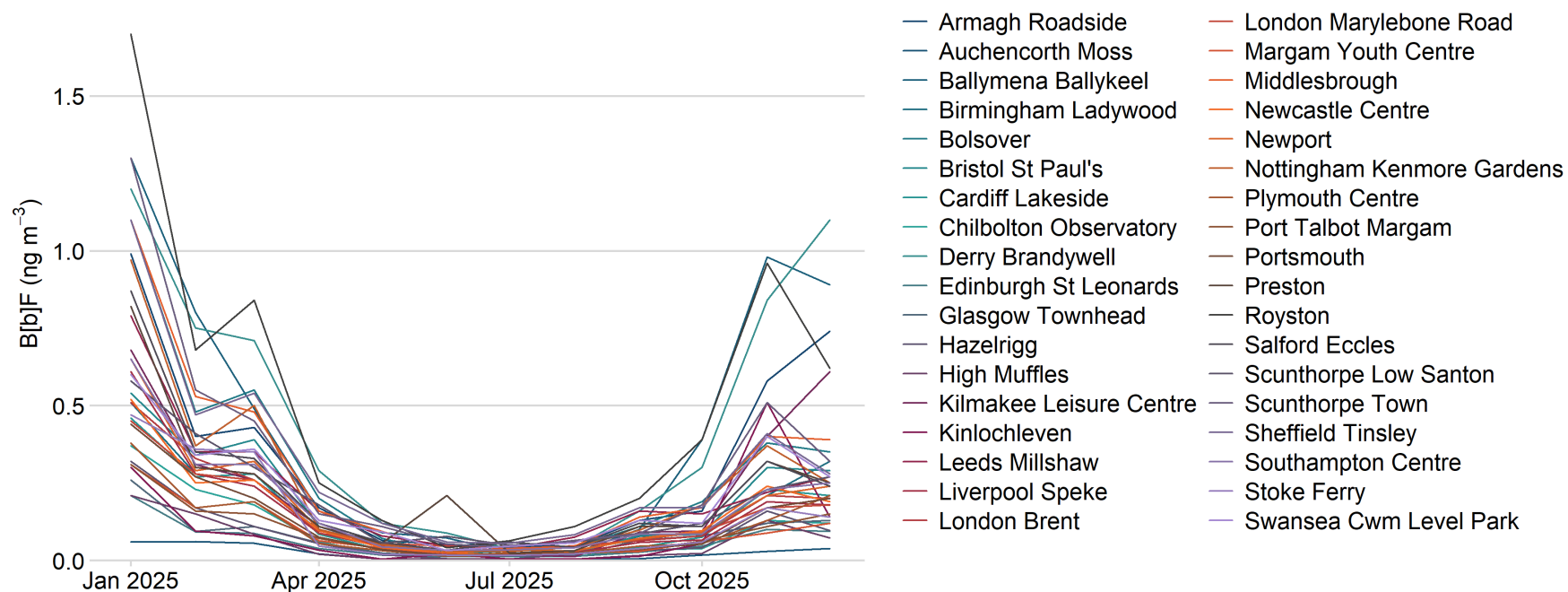


Figure 11: Monthly mean benz[*b*]fluoranthene concentrations at the UK PAH sites.

4.3.3 Benzo[j]fluoranthene

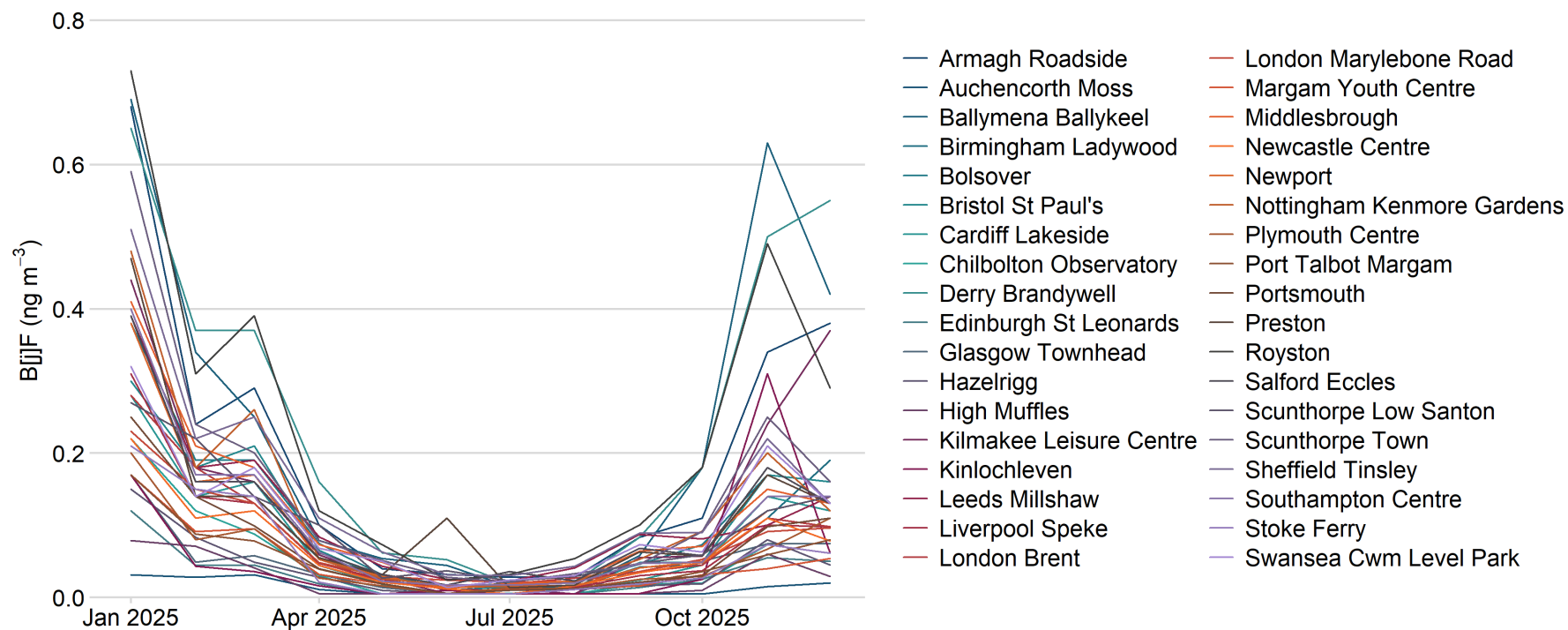


Figure 12: Monthly mean benzo[j]fluoranthene concentrations at the UK PAH sites.

4.3.4 Benzo[k]fluoranthene

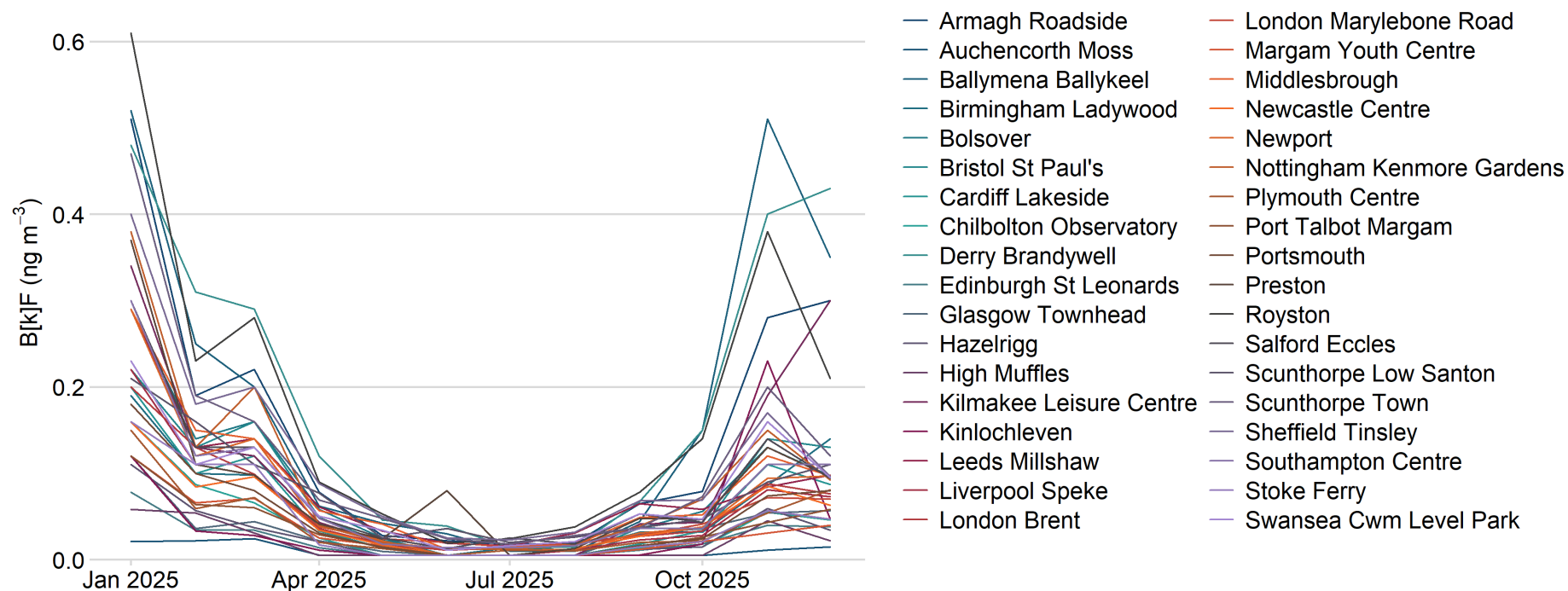


Figure 13: Monthly mean benzo[k]fluoranthene concentrations at the UK PAH sites.

4.3.5 Indeno[1,2,3-c,d]pyrene

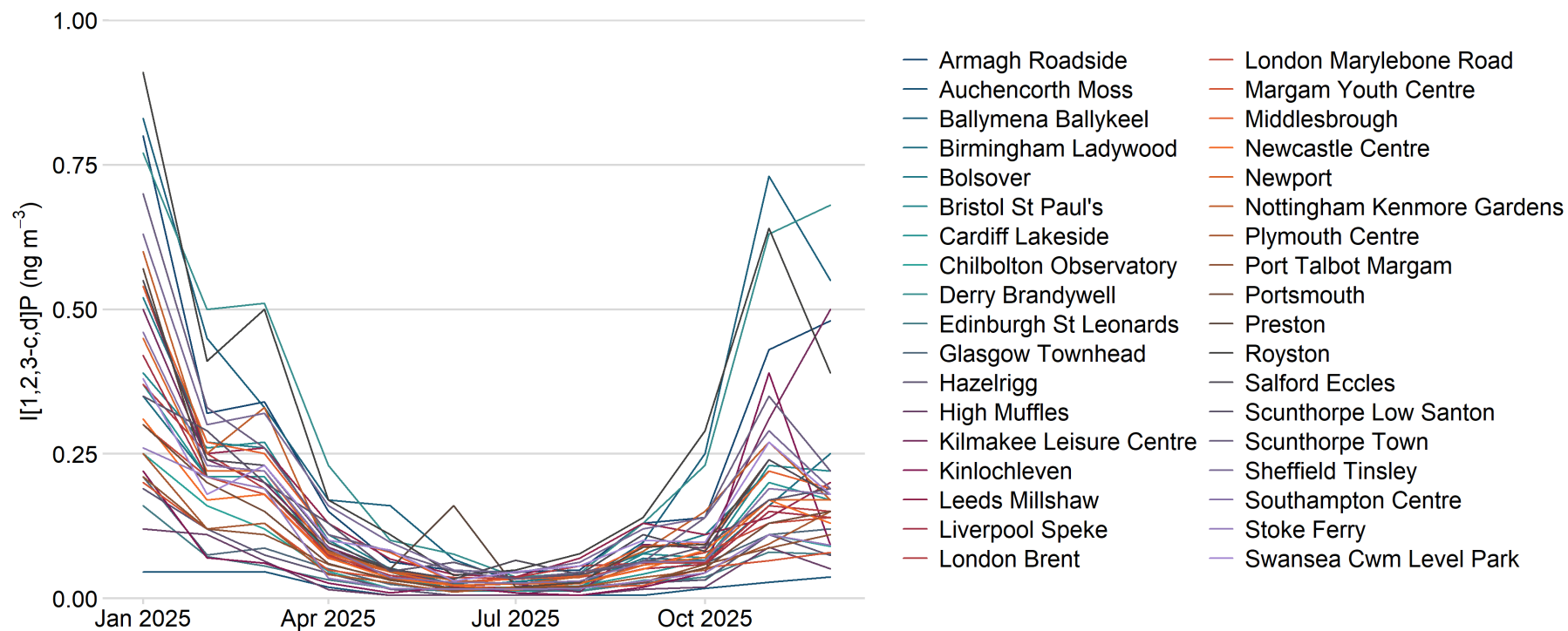


Figure 14: Monthly mean indeno[1,2,3-cd]pyrene concentrations at the UK PAH sites.

4.3.6 Dibenz[a,h]anthracene

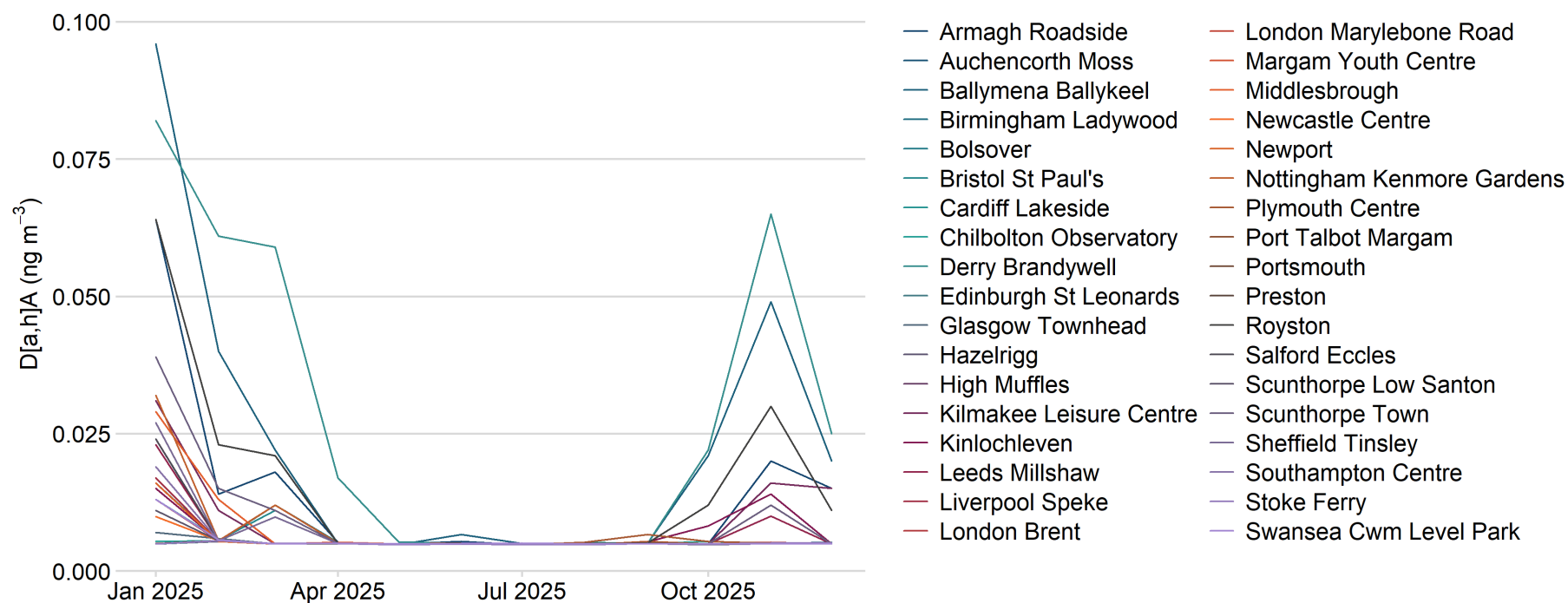


Figure 15: Monthly mean dibenz[a,h]anthracene concentrations at the UK PAH sites.

4.3.7 Benzo[g,h,i]perylene

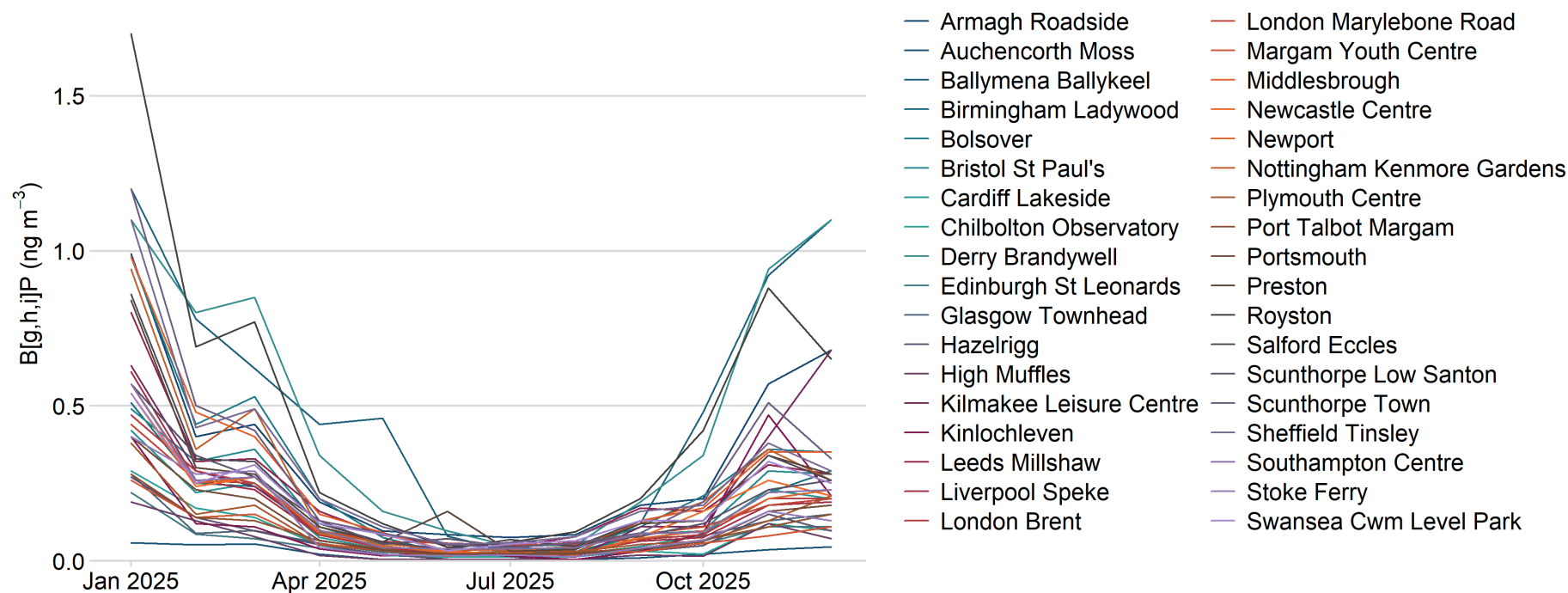


Figure 16: Monthly mean benzo[g,h,i]perylene concentrations at the UK PAH sites.

4.4 Deposition ('C') samples

The 4 weekly bulked samples of B[a]P concentrations measured in deposition at the Auchencorth Moss and Chilbolton Observatory sites are displayed in Appendix 1. The levels of PAH at these rural sites in the UK are very low as reported in the previous annual reports.

There isn't a Target Value associated with the deposition measurements. However, the monitoring conducted at the 2 sites does enable the UK to report and review trends in measured concentrations at these sites. All deposition data is available on the [UK Air](#) website.

4.5 Long-term trends in B[a]P

Figure 17 to Figure 21 show the annual mean B[a]P concentrations measured at Digitel (solid phase) PAH Network stations since 2007 split by site type or location. The annual mean concentrations can also be downloaded on the [UK Air](#) website.

4.5.1 Northern Ireland sites

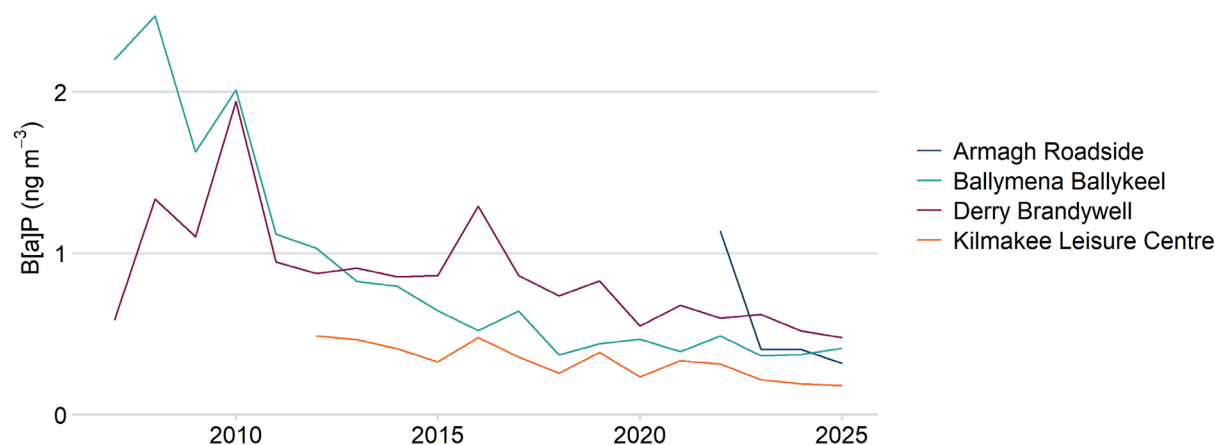


Figure 17: Annual average B[a]P concentrations at the Northern Ireland Network sites from 2007 to 2025.

Figure 17 shows that whilst there is a clear downward trend in B[a]P concentrations at the Ballymena Ballykeel site over the measurement period (2007-2018) however the trend has flattened significantly since with no clear trend. The Derry Brandywell and Kilmakee Leisure Centre sites appear to only show a slight downward trend over their running periods. A full assessment of the trend at the Armagh Roadside site is not possible as it has only been operational for just over 3 years, but concentrations are similar to those seen at other Northern Ireland PAH measurement sites. It should be noted that the 2022 Armagh Roadside datapoint



does not represent a full year of measurements, only having 19.9% data capture being representative of November and December 2022.

4.5.2 GB urban background

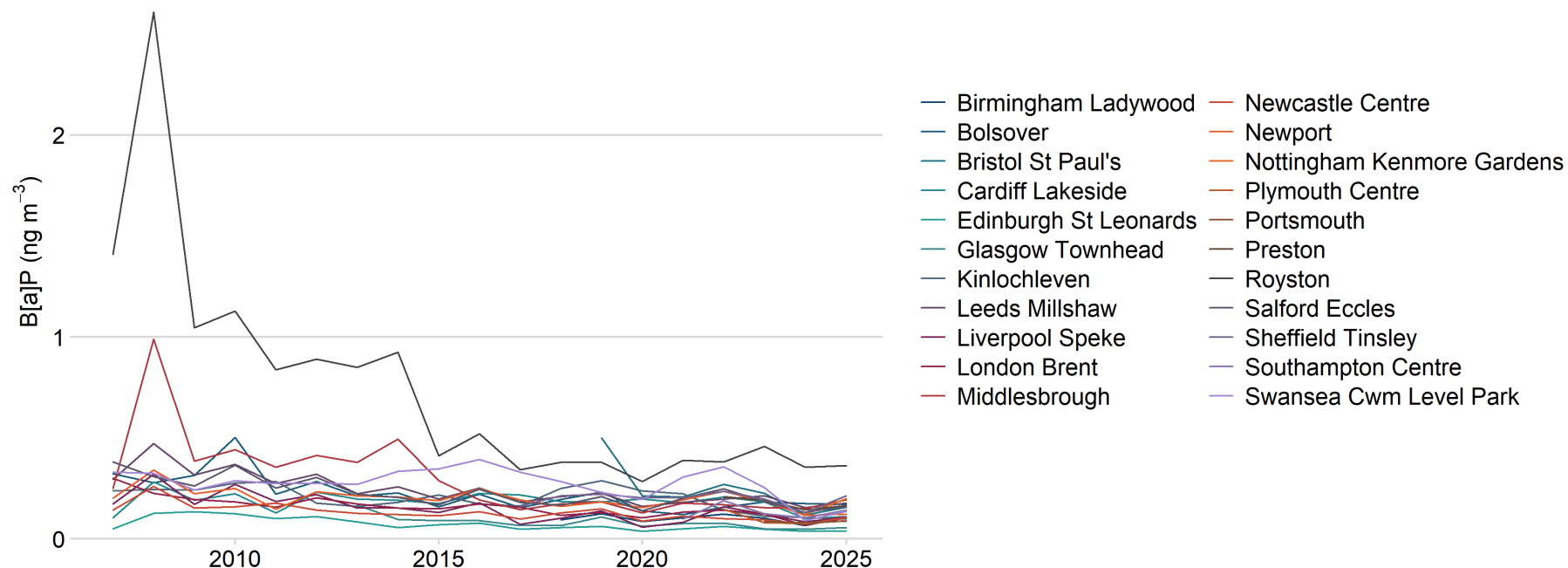


Figure 18: Annual average B[a]P concentrations at the Urban sites in Great Britain from 2007 to 2025.

Over the period 2007–2025, most urban background sites in Great Britain show a general downward trend in B[a]P concentrations. However, in recent years many sites have shown little further reduction, suggesting that local emission sources may now be relatively stable. As these sites are likely dominated by domestic and commercial combustion, this may indicate that emissions from solid fuel burning continue to persist.

4.5.3 GB rural background

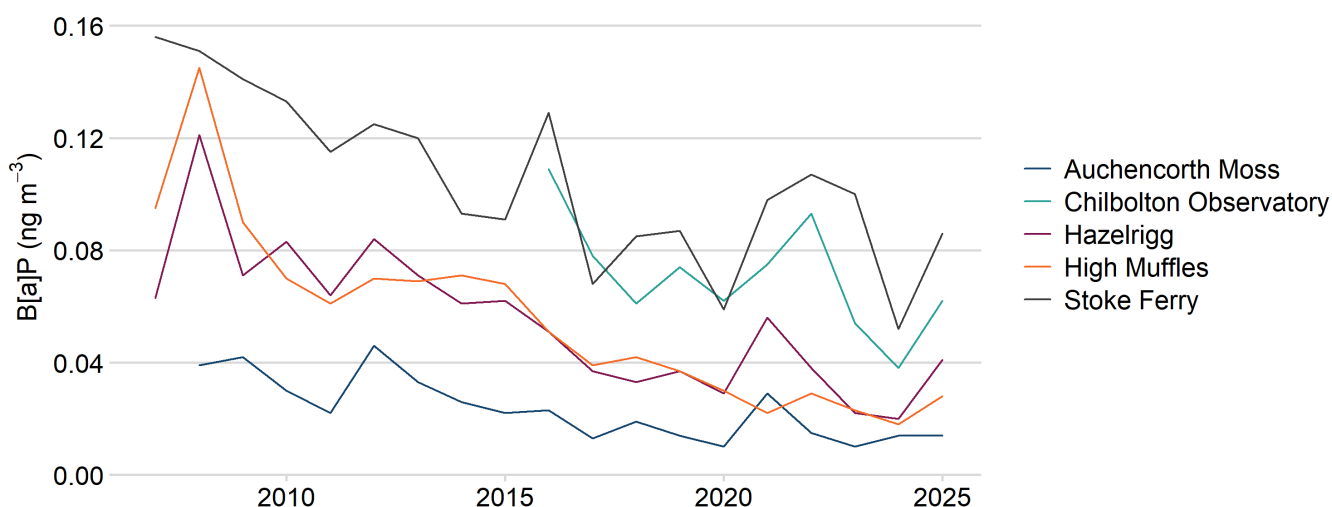


Figure 19: Annual average B[a]P concentrations at the Rural sites in Great Britain from 2007 to 2025.

Over the whole period 2007-2025 the rural background sites appear to show a slight downward trend in B[a]P concentration with the sites with lower concentrations showing smaller declines in the rates of change in concentration.

4.5.4 GB industrial

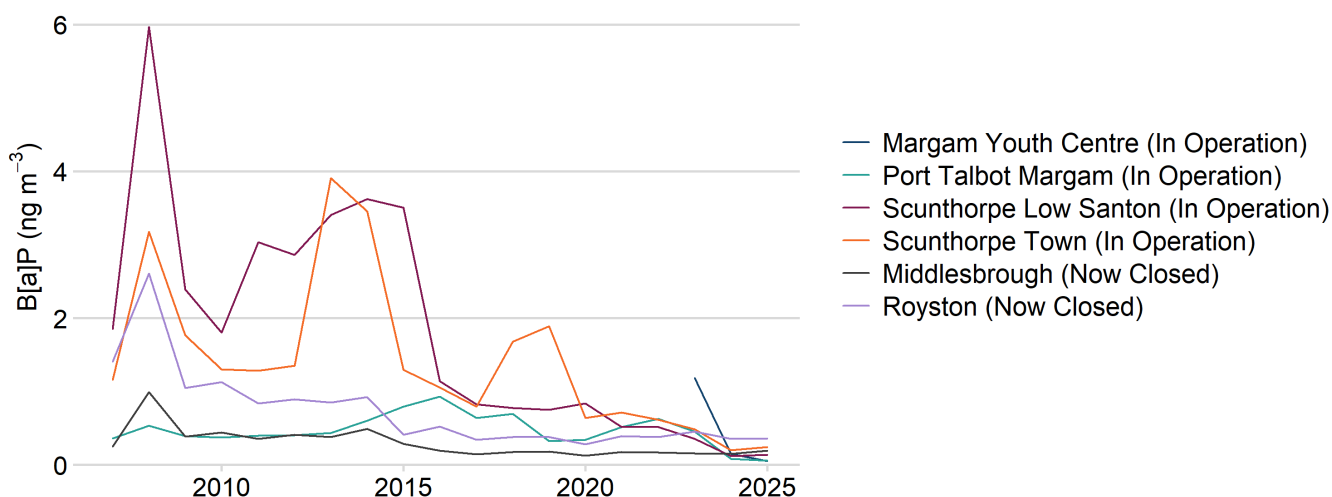


Figure 20: Annual mean B[a]P concentrations at operating industrial sites and those that are now closed from 2007 to 2025.

In recent years, industrial activity at the Scunthorpe and Port Talbot steelmaking sites has declined. At Scunthorpe, the coke oven plant closed in spring 2023, although the steelworks continue to operate. The site's 2 remaining blast furnaces remain in service following UK government legislation passed in April

2025 to prevent their shutdown. In contrast, the Port Talbot Steelworks has now fully closed its traditional steelmaking operations. Its coke oven plant closed in March 2024, followed by the shutdown of the 2 blast furnaces in June and September 2024. This marked the end of large scale primary steel production at the Port Talbot site in Wales.

Scunthorpe steel works is the UK's only operational primary steelmaking route, using the basic oxygen steelmaking (BOS) process. Raw materials are processed by a sinter plant which produces an iron rich feedstock from heating fine particles of iron ore, limestone and coke (a carbon rich material) to procedure larger pieces called sinter. These pieces and additional coke are used in the blast furnaces

A substantial reduction in pollutant concentrations observed at the Scunthorpe monitoring sites in 2016 is likely linked to the closure of one of the coke ovens and reduced overall operations during that year. Although the Scunthorpe Town site exceeded the annual mean Target Value of 1 ng/m³ in 2018 and 2019, both Scunthorpe monitoring sites (Scunthorpe Low Santon and Scunthorpe Town) have remained below the Target Value since 2020, with concentrations continuing to decline.

At Port Talbot, both the Margam and Margam Youth Centre monitoring sites have shown decreasing concentrations in recent years. This downward trend is consistent with the closure of the coke ovens in March 2024 and the subsequent shutdown of the blast furnaces in June and September 2024.

As expected, sites experiencing reduced emissions due to industrial closures have shown corresponding declines in B[a]P concentrations.

- Port Talbot: Port Talbot Steel works closure in September 2024.
- Middlesbrough: Redcar Steel works closure in 2015.
- Royston and South Hiendley: Royston Coking plant closure at the end of 2014.

4.5.5 GB urban traffic

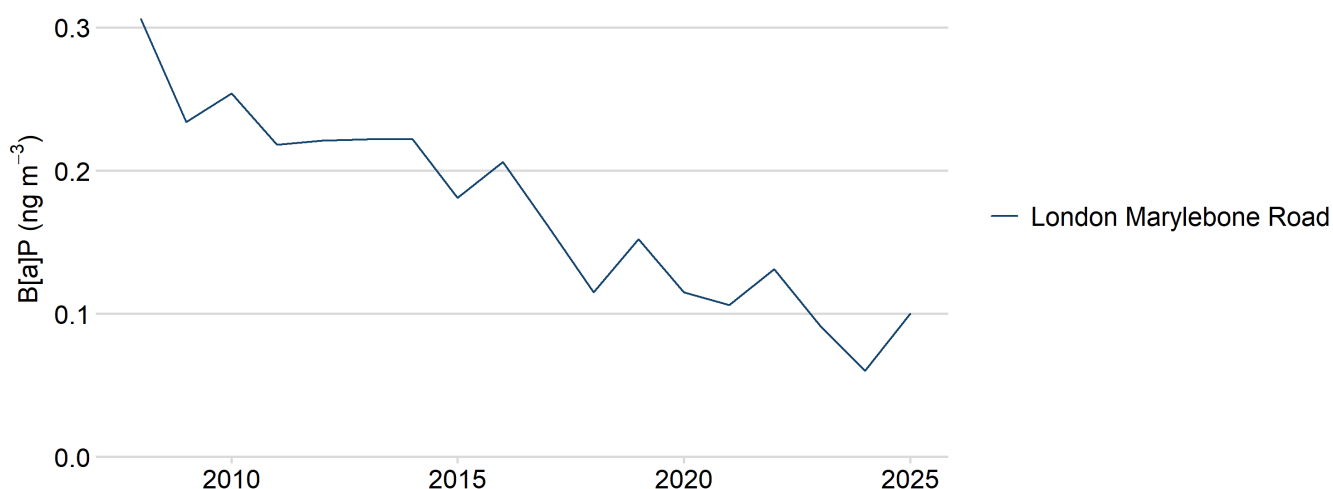


Figure 21: Annual average B[a]P concentrations at the London Marylebone Road site from 2007 to 2025.

The only urban traffic site with long term PAH measurements is London Marylebone Road, the site shows a steady decreasing trend since installation. The decrease in concentration is thought to be due to changes in domestic and commercial combustion rather than vehicle emissions.

4.6 Trend Assessment at the UK PAH Network sites

To summarise the long-term trend at each monitoring site, the slope of the trend for each site was calculated using the TheilSen() function in the openair (R package), which is a free and open-source programming language. The outputs are summarised in Figure 22 which displays the significant trends on the right and insignificant trends on the left of the figure. Sites with a positive slope means that there is an increasing trend of B[a]P annual mean, and a negative slope means a decreasing trend. The slope of each site's B[a]P concentration over time was also calculated with its 95% confidence interval (shown as red bars), which indicates the uncertainty of the slope coefficient. It should be noted that sites which have not been installed for very long have not been included due to the limited number of data points.

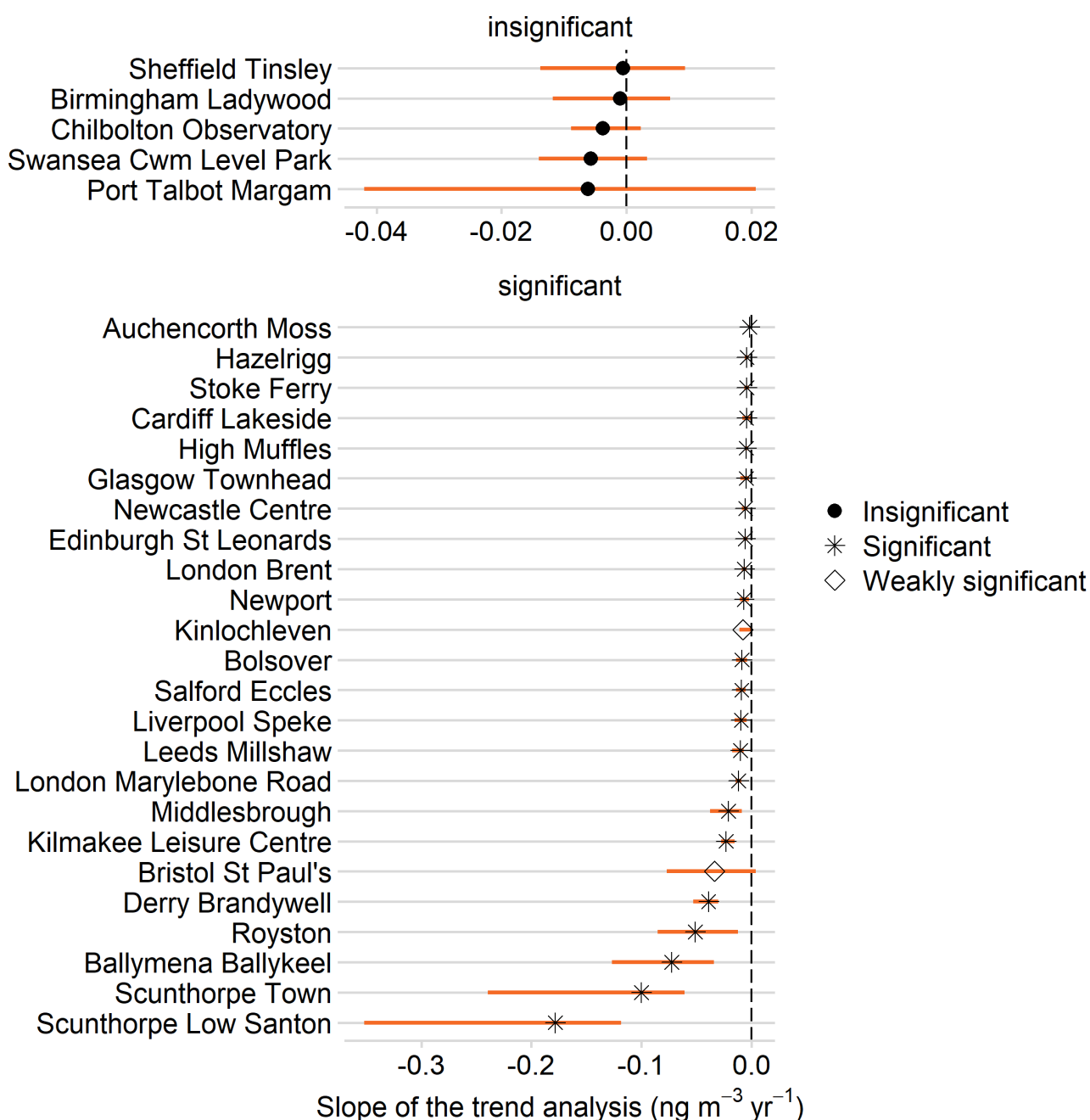


Figure 22: B[a]P concentration trend ($\text{ng m}^{-3} \text{yr}^{-1}$) from 2008 to 2025.

The slope of the trend calculated for many of the monitoring sites did not show a large decreasing or increasing trend. This was either because there was very little change in the annual concentrations (i.e. a slope was not significantly different from zero) or there were large variations between years but not in a consistent direction (as indicated by the large confidence intervals shown as red bars).

Sites showing significant decreasing trend are shown on the right-hand side plot of Figure 22 with the Scunthorpe Low Santon, Scunthorpe Town, Ballymena Ballykeel, Royston, Derry Brandywell and Bristol St Paul's showing the most significant decreases in concentrations. These sites all appear to have decreasing trends in B[a]P concentrations, but some sites have large uncertainties in the trends due to the inter-year variability shown by the length of the red bars.

5. Conclusions

The network average data capture of the operational sites in 2025 was 99% which is in line with data capture in recent years.

In 2025 the AQSR target value for Benzo[a]pyrene (B[a]P) (annual mean concentration of 1 ng/m³) was not exceeded at any of the UK PAH Network sites in the UK.

The annual mean B[a]P concentrations observed at the UK networks during 2025 continued to vary greatly between sites with the Derry Brandywell measurement site recorded the highest concentration of 0.48 ng/m³.

Most UK sites show seasonality with the higher concentrations being observed in winter with the highest monthly concentration of B[a]P found at the Royston site (1.4 ng/m³ in January) and similar concentrations recorded in January at Armagh Roadside, Ballymena Ballykeel and at Derry Brandywell in both January and December, all with a concentration of 1.1 ng/m³.

Sites in areas where Guy Fawkes Night is celebrated observed elevated concentrations of PAH in November 2025.

6. References

- BSI, 2014a. [PD CEN/TS 16645:2014 ambient air method for the measurement of benz\[a\]anthracene, benzo\[b\]fluoranthene, benzo\[j\]fluoranthene, benzo\[k\]fluoranthene, dibenz\[a,h\]anthracene, indeno\[1,2,3-cd\]pyrene and benzo\[ghi\]perylene.](#)
- BSI, 2014b. [BS EN 12341:2014 Ambient air. Standard gravimetric measurement method for the determination of the PM10 or PM2.5 mass concentration of suspended particulate matter.](#)
- BSI, 2011. [BS EN 15980:2011 Air quality. Determination of the deposition of benz\[a\]anthracene, benzo\[b\]fluoranthene, benzo\[j\]fluoranthene, benzo\[k\]fluoranthene, benzo\[a\]pyrene, dibenz\[a,h\]anthracene and indeno\[1,2,3-cd\]pyrene.](#)
- BSI, 2008. [Air quality. Standard method for the measurement of the concentration of benzo\(a\)pyrene in ambient air. BS EN 15549:2008.](#)
- DAERA, 2020. [The Air Quality \(Amendment\) \(Northern Ireland Protocol\) \(EU Exit\) \(No. 2\) Regulations 2020.](#)
- DAERA, 2018. [The Air Quality \(Amendment, etc.\) Regulations \(Northern Ireland\) 2018.](#)
- DAERA, 2017. [Air Quality Standards \(Northern Ireland Amendment\) Regulations.](#)
- DAERA, 2010. [Air Quality Standards \(Northern Ireland\) Regulations.](#)
- Defra, 2019. [Clean Air Strategy 2019.](#)
- EC, 2001. [Ambient air pollution by Polycyclic Aromatic Hydrocarbons \(PAH\) Position Paper.](#)
- IARC, 2012. [IARC monographs on the evaluation of carcinogenic risks to humans, volume 100F. Chemical agents and related occupations.](#)
- IARC, 2010. [IARC monographs on the evaluation of carcinogenic risks to humans, volume 92. Some non-heterocyclic polycyclic aromatic hydrocarbons and some related exposures.](#)
- OSPAR, 1992. [Convention for the protection of the marine environment of the North-east Atlantic.](#)
- Scottish Government, 2016. [Air Quality Standards \(Scotland Amendment\) Regulations.](#)
- Scottish Government, 2010. [Air Quality Standards \(Scotland\) Regulations 2010.](#)
- UK Government, 2019. [The Air Quality \(Amendment of Domestic Regulations\) \(EU Exit\) Regulations 2019.](#)
- UK Government, 2016. [UK Air Quality Standards \(Amendment\) Regulations 2016.](#)
- UK Government, 2010. [UK Air Quality Standards Regulations 2010.](#)
- UNECE, 1979. [1979 Convention on long-range transboundary air pollution.](#)
- Welsh Government, 2019. [The Air Quality Standards \(Wales\) \(Amendment\) \(EU Exit\) Regulations 2019.](#)
- Welsh Government, 2010. [Air Quality Standards \(Wales\) Regulations](#)

7. Appendix 1: PAH Deposition

Table 3: PAH deposition for B[a]P in 2025. Missing values displayed as NA correspond to samples which were damaged between sampling and extraction.

Station name	Start date	End date	Measurement (ng/m ² /day)
Auchencorth Moss	22/1/2025	19/02/2025	<9.2
Auchencorth Moss	19/02/2025	19/03/2025	<9.2
Auchencorth Moss	19/03/2025	16/04/2025	9.3
Auchencorth Moss	16/04/2025	14/05/2025	<9.2
Auchencorth Moss	14/05/2025	11/06/2025	<9.2
Auchencorth Moss	11/06/2025	09/07/2025	NA
Auchencorth Moss	09/07/2025	06/08/2025	18
Auchencorth Moss	06/08/2025	03/09/2025	9.2
Auchencorth Moss	03/09/2025	01/10/2025	9.2
Auchencorth Moss	01/10/2025	29/10/2025	9.2
Auchencorth Moss	29/10/2025	26/11/2025	9.2
Auchencorth Moss	26/11/2025	24/12/2025	9.3
Auchencorth Moss	24/12/2025	21/01/2026	9.2
Chilbolton Observatory	22/1/2025	19/02/2025	35
Chilbolton Observatory	19/02/2025	19/03/2025	18
Chilbolton Observatory	19/03/2025	16/04/2025	59
Chilbolton Observatory	16/04/2025	14/05/2025	9.2
Chilbolton Observatory	14/05/2025	11/06/2025	NA
Chilbolton Observatory	11/06/2025	09/07/2025	9.2
Chilbolton Observatory	09/07/2025	06/08/2025	18
Chilbolton Observatory	06/08/2025	03/09/2025	9.3
Chilbolton Observatory	03/09/2025	01/10/2025	9.2
Chilbolton Observatory	01/10/2025	29/10/2025	9.2
Chilbolton Observatory	29/10/2025	26/11/2025	9.2
Chilbolton Observatory	26/11/2025	23/12/2025	10
Chilbolton Observatory	23/12/2025	21/01/2026	10

8. Appendix 2 Environment Agency, Monitoring Laboratory Service PAH Analysis

27 PAH are currently measured for both particulate and deposition measurements in the UK PAH measurement network, these are detailed in Table A2.

Analyses of particulate samples are carried out in accordance with BS EN 15549:2008. Samples are bulked into monthly batches and extracted by sonication in an ultrasonic bath using dichloromethane as the extraction solvent. The extracts are cleaned for particulates, reduced in volume and analysed using gas chromatography – mass spectrometry (GC-MS). The GC-MS is calibrated using a series of calibration standards containing all the PAH reported at a range of concentrations covering the concentrations expected in the samples.

Analysis of deposition samples is carried out in accordance with BS EN 15980:2011. In summary, the deposition samples collected over a fortnightly period are bulked into a 4 week period and extracted using liquid-liquid extraction. The resulting extract is dried, reduced to a volume then analysed using GC-MS.

The limits of detection of the GC-MS method are determined by running a series of blank filter papers and solvent blanks that were fortified with a low-level spike of PAHs to achieve the required minimum reporting values. Typical detection limits for the measurement in the PAH network are 0.04 ng/m³ and 9 ng/m²/day for particulate and deposition respectively.

Table 4: PAH analysed by Environment Agency, Monitoring Laboratory Service in Deposition and particulate samples.

PAH number	Compound
1	Phenanthrene
2	Anthracene
3	Fluoranthene
4	Pyrene
5	Retene
6	Benzo[b]naphtho[2,1-d]thiophene
7	Benzo[c]phenanthrene
8	Benzo[a]anthracene
9	Cyclopenta[c,d]pyrene

PAH number	Compound
10	Chrysene
11	5-Methylchrysene
12	Benzo[b]Fluoranthene
13	Benzo[k]Fluoranthene
14	Benzo[j]Fluoranthene
15	Benzo[e]pyrene
16	Benzo[a]pyrene
17	Perylene
18	Dibenzo[a,c]anthracene
19	Dibenzo[a,h]anthracene
20	Indeno[1,2,3-cd]pyrene
21	Benzo[ghi]perylene
22	Anthanthrene
23	Dibenzo[a,l]pyrene
24	Dibenzo[a,e]pyrene
25	Coronene
26	Dibenzo[a,i]pyrene
27	Dibenzo[a,h]pyrene

