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Air Quality Assessment Regime Review for the Fourth Daughter Directive 2004/107/EC

Version 1, September 2014



Llywodraeth Cymru
Welsh Government



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Glossary

Term	Definition/Meaning
AQD, Directive, Air Quality Directive	EU Ambient Air Quality Directive 2008/50/EC
DD4	EU Fourth Daughter Directive 2004/107/EC
UAT	Upper Assessment Threshold, defined in the Directives.
LAT	Lower Assessment Threshold, defined in the Directives.
TV	Target Value, defined in the Directives.
LV	Limit Value, defined in the Directives.
Pb	Lead
As	Arsenic
Cd	Cadmium
Ni	Nickel
TGM	Total Gaseous Mercury
PAH	Polycyclic Aromatic Hydrocarbons
B[a]P	Benzo[a]pyrene
AURN	Automatic Urban and Rural Network
NAEI	National Atmospheric Emissions Inventory
PCM	Pollution Climate Mapping

Term	Definition/Meaning
SA	Supplementary Assessment
UK-AIR	Defra's air quality website, http://uk-air.defra.gov.uk/
UB	Urban Background – monitoring station classification
UI	Urban Industrial – monitoring station classification
UT	Urban Traffic – monitoring station classification
RB	Rural Background – monitoring station classification
SB	Suburban Background – monitoring station classification
Micro and macroscale siting criteria	Criteria in the Air Quality Directive which are used to define the locations where monitoring is required and how monitoring stations should be sited.
CEN	European Committee for Standardization
Zones and agglomerations	Geographical areas which are defined for the purpose of air quality management and assessment, as required by the Air Quality Directive.

Executive Summary

An assessment regime review of the UK's air quality monitoring under the Fourth Daughter Directive 2004/107/EC (DD4) has been undertaken. This document sets out the proposed changes and provides details of the future monitoring network for the pollutants covered by the Directive.

The review concluded that changes in monitoring for urban and rural metals (arsenic, cadmium, nickel and lead) and PAHs (as represented by benzo[a]pyrene) would benefit the network by enabling a better assessment of DD4 pollutants for compliance assessment and enabling the networks to operate in a more streamlined and cost effective manner. Lead is regulated under the Ambient Air Quality Directive (2008/50/EC) but has been covered in this review because it is part of a suite of metals which are measured and analysed together.

DD4 pollutants are primarily associated to emissions from specific large point sources (with the exception of benzo[a]pyrene from domestic sources) and therefore are below the Lower Assessment Threshold for most areas of the UK. The changes recommended will allow a focussing of monitoring resources at locations where levels are above the Lower Assessment Threshold whilst maintaining the integrity of the network.

Changes to the metals networks: By considering the monitoring arrangements of the existing two metals networks together, recommendations are made that will enable a consolidation and streamlining of the networks in meeting the requirements of DD4 in a more efficient and cost effective way.

- Two locations were identified as requiring new monitoring stations, 1) a new site in the West Midlands Zone and 2) a replacement site for Sheffield Brinsworth (due to its micro-siting criteria).

Modelling shows that a new monitoring site in the West Midlands Zone should be installed to assess arsenic levels that are predicted to be above the lower assessment threshold. Sheffield Brinsworth site was identified as being poorly sited with respect to the DD4 micro-siting criteria requirements. Sheffield Tinsley ran in parallel with Sheffield Brinsworth for a period of 6 months during 2013 and nickel levels at the two sites were comparable. Sheffield Tinsley has since replaced Brinsworth on the network.

- 12 stations were identified for closure as they were either monitoring at levels below the LAT or are in zones/agglomerations that have additional sites measuring higher levels. Sites would not be recommended for closure if it formed part of a pair to assess a specific source or if the data provides useful input to modelling.

Changes to the PAH network: Eight zones were identified as requiring additional monitoring to assess benzo[a]pyrene levels that are modelled as being above the lower assessment threshold (LAT) due to emissions from domestic heating.

Two sites were identified for closure; 1) London Crystal Palace Parade; with London Marylebone Road and London Brent meeting the requirements for monitoring in London and 2) Hove; below the LAT and not required for modelling.

The planned changes to the networks are summarised in Table 1.

Table 1: Overview of Network and planned changes

Pollutant	Total number of stations in network pre 2013	Changes	Total number of stations in revised network
Metals	36	1 new monitoring station (West Midlands Zone) and 1 site relocation (movement of Sheffield Brinsworth station to Sheffield Tinsley) Closure of 12 stations (London Cromwell Road 2, Walsall Centre, Manchester Wythenshawe, Motherwell South, Cardiff Rumney, Cardiff Llandaff, Wytham Wood, Dartford Bean, Cockley Beck, Redcar Normanby, Redcar Dormanstown, Banchory)	25
Benzo[a]pyrene	30	8 new monitoring station locations (Sheffield Urban Area, Nottingham Urban Area, The Potteries, South West zone, West Midlands zone, North East Scotland zone, Scottish Borders zone, North Wales zone) Closure of 2 stations (London Crystal Palace Parade, Hove)	36

Introduction

A review of the UK's statutory air quality monitoring networks has been undertaken in accordance with the requirements of Article 4 (6) of the Fourth Daughter Directive (DD4)¹. This assessment review follows on from a Preliminary Assessment of the assessment requirements of the DD4 for polycyclic aromatic hydrocarbons (PAHs) and heavy metals in the UK² to determine the requirements on Ambient Air Quality Assessment and Management for monitoring. The review ensures that the monitoring remains compliant with the requirements of the legislation.

Lead (which is regulated under the Air Quality Directive (AQD³) rather than the DD4) has also been included in this assessment because it is part of a suite of metals measured and analysed together.

The UK is currently divided into forty-three zones and agglomerations for the purpose of air quality assessment, which is undertaken using a combination of fixed measurements and modelling. These zones and agglomerations have been classified against assessment thresholds outlined in Section I of Annex II of the DD4. Article 4 (6) of the DD4 requires this assessment to be reviewed at least once every five years. Data from the period 2006-2010 have been reviewed and a zone assessment threshold classification report has been published setting out further details of the classification process⁴.

Zone classification is the first stage in a complex process to review the number of monitoring stations required to ensure the assessment remains compliant. The classifications are then used in accordance with criteria in the DD4 to evaluate potential changes in the number of stations and their distribution over the network. Evaluating the target number of stations requires consideration of the UK approach to assessment using modelling. Fewer stations are required if a Member State uses supplementary assessment (modelling) as part of its annual compliance assessment but this requires professional judgement as to the number of stations needed for adequate model calibration.

In addition to the 5-yearly classification reviews, the existing network is kept under regular review to ensure the stations continue to meet the macroscale and microscale siting criteria set out in Annex III of the DD4.

¹ 2004/107/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:023:0003:0016:EN:PDF>

² http://uk-air.defra.gov.uk/reports/cat09/0801221218_dd4prelim_rep_issue1.pdf

³ 2008/50/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF>

⁴ UK zone Classification Report http://uk-air.defra.gov.uk/library/reports.php?report_id=772

The network was reviewed in 2012 and a report concluded that a number of stations did not meet the siting criteria in the Directive⁵:

- Cardiff Llandaff
- London Cromwell Road 2
- Sheffield Brinsworth

This review has taken into account this previous assessment and considered whether these stations need to be replaced or can be removed from the network.

As well as providing data on DD4 metals and PAHs for the purposes of statutory reporting and compliance assessment the networks also support the wider work of scientists, researchers and policy makers and fulfil the requirements to provide public information. The recommendations made take these factors into account.

The first chapter of this report summarises the UK air quality compliance monitoring networks. The report then outlines a review for each pollutant including the target number of stations, and detail of the planned changes for metals and PAHs (hereafter represented as B[a]P which is the marker species used for PAHs). Annex 1 provides a detailed overview of the proposed network and planned changes, including placeholder station references for proposed installations.

⁵ Fourth Daughter Directive Site Compliance Report http://uk-air.defra.gov.uk/library/reports?report_id=776

The UK Air Quality Compliance Monitoring Network

Existing network and approach

This review has been undertaken to ensure the monitoring network remains compliant with the requirement of DD4 and continues to serve its other evidence functions. The existing national monitoring network (i.e. the network in place prior to 2013) is the product of the previous monitoring regime assessment⁶ and legacy monitoring networks dating as far back as the 1950s. The purpose of the review is to:

- ensure that the monitoring network continues to provide a fit-for-purpose assessment under the DD4;
- retain monitoring required to support supplementary assessment techniques (air quality modelling);
- retain monitoring of specific scientific value; and
- ensure the network provides value for money.

The UK uses information from both measurements and atmospheric dispersion models (Defra's Pollution Climate Mapping (PCM) model⁷) to meet requirements under the DD4. In order to assess the monitoring requirements of DD4, each zone is classified using the data from measurements and models used for annual compliance assessment under the DD4 between 2006 and 2010. UK air quality zones are classified relative to DD4 assessment thresholds set out in Article 4 (6) for each pollutant, to assign a classification in each zone⁸. Once that classification is made each zone can be assessed relative to existing monitoring provision to establish if the appropriate monitoring resource is in place.

⁶ Bush, T. et al. (2010) Preliminary Assessment for the Ambient Air Quality Directive (2008/50/EC) for the United Kingdom (AEAT/ENV/R/2961 Issue 1) [http://uk-air.defra.gov.uk/reports/cat09/1101181027_Prelim_rpt_for_CAFE_\(8\).pdf](http://uk-air.defra.gov.uk/reports/cat09/1101181027_Prelim_rpt_for_CAFE_(8).pdf)

⁷ Brookes, D. et al. (2011) UK modelling under the Air Quality Directive (2008/50/EC) for 2010 covering the following air quality pollutants: SO₂, NO_x, NO₂, PM₁₀, PM_{2.5}, lead, benzene, CO, and ozone (AEAT/ENV/R/3215 Issue 1) http://uk-air.defra.gov.uk/reports/cat09/1204301513_AQD2010mapsrep_master_v0.pdf

⁸ Zone Classification Report http://uk-air.defra.gov.uk/library/reports.php?report_id=772

Measurement data, network and station metadata have been compiled from the UK-AIR database⁹ for all relevant pollutants with the exception of information from the UK rural metals network provided by the Centre for Ecology and Hydrology (CEH).

Supplementary Assessment

In accordance with Article 4(2) and (11) of the DD4, the UK utilises atmospheric dispersion model outputs (Defra's Pollution Climate Mapping, PCM model) as a source of supplementary assessment information (SA). This approach has several advantages. It provides a more comprehensive compliance assessment (covering each 1x1 km square of the UK) than fixed point monitoring alone. Air quality modelling also provides useful policy-relevant outputs to facilitate scenario evaluation and future projections which are associated with the results of the compliance assessment.

Supporting information on the models used is presented in a separate technical report to Defra¹⁰. The models utilised are compliant with the data quality objectives for model data set out by Annex IV of the DD4.

Applying supplementary assessment techniques in order to reduce the dependence on fixed measurement means that due consideration must be given to the value of monitoring stations above the minimum required for compliance with the DD4. For example, it is often prudent to retain more monitoring than the minimum required in a zone if that monitoring is valuable to the model calibration or checking of the model outputs. In carrying out this review the need for monitoring to support the modelling has been considered prior to any recommendation for station closures. This ensures that monitoring reductions and associated cost savings are made where appropriate but that these do not impact on the robustness of the quality of the model being used for supplementary assessment.

The metals models for supplementary assessment are not specifically calibrated using network monitoring data but monitoring data are important for model verification purposes. For B[a]P a calibration is performed for both the area source component and the point sources component of the model.

Point sources

Point sources are emissions sources at fixed locations and are typically industrial in nature. The monitoring requirements to assess contributions from point sources are provided in Annex III, Section V, Part B of the DD4. Existing stations in the UK network

⁹ <http://uk-air.defra.gov.uk/networks/>

¹⁰ Walker, H. L. et al. (2011) UK modelling under the Air Quality Framework Directive (96/62/EC) and Fourth Daughter Directive (2004/107/EC) for 2010 covering As, Cd, Ni and B(a)P (AEAT/ENV/R/3216 Issue 1) http://uk-air.defra.gov.uk/reports/cat09/1204301510_dd42010mapsrep_v0.pdf

that have been classified as urban industrial are used to assess contributions from both diffuse sources and contributions from point sources.

Where industrial stations fall within the footprint of a point source they provide additional information on that point source. However supplementary assessment techniques are sufficiently robust to adequately assess contributions from point sources. Specific industrial stations are only recommended where already established or concentrations are high. Existing industrial stations will be retained for model calibration and verification and scientific purposes and to preserve long data records (where there are no extenuating circumstances forcing station closure for other reasons).

A review of the most up to date compliance assessment modelling data at the time that this analysis was undertaken (PCM model outputs for 2011 reporting) has been completed to assess modelled total concentrations of As, Cd, Ni, Pb and B[a]P and the relative contribution of point sources across each 1x1 km² in the UK. Table 2 summarises the maximum modelled total concentration, the maximum modelled point source contribution, the relevant Lower Assessment Threshold (LAT), Upper Assessment Threshold (UAT) and Target Value (TV) for each pollutant. For indicative purposes, the area exceeding the LAT and the percentage contribution to total concentrations from point sources is also presented.

For arsenic, cadmium, and lead there are no exceedances of the LAT that are related to significant point sources therefore for these species there are no sources that require specific upwind and downwind stations. For nickel, the only significant point source is located in Pontardawe and affects the S.Wales zone and Swansea Urban Area. The impact of this source has been quantified by local modelling and monitoring and incorporated into the annual compliance assessment. This exceedance of the LAT covers 3 km² but spans both zones. Two monitoring stations have already been established to assess concentrations in the vicinity of this source: Pontardawe Tawe Terrace (upwind) and Pontardawe Brecon Road (downwind).

There are 2329 km² across 25 zones calculated as exceeding the B[a]P LAT. These exceedances are caused by a combination of domestic emissions, particularly in rural areas off the gas grid where solid fuel burning is prevalent and industrial contributions from large point sources, as shown by the significant contribution from point sources (98.13%). The major point sources are all captured under the supplementary assessment (modelled explicitly using source emissions and parameters supplied by the Environment Agency). These point sources are also adequately represented by upwind and downwind monitoring stations within the existing network as shown in Table 3.

Table 2 Assessment of locations exceeding LAT as a result of point source contributions

Pollutant	Max modelled total concentration (ng m ⁻³)	Max modelled point source concentration (ng m ⁻³)	UAT (ng m ⁻³)	LAT (ng m ⁻³)	TV ¹¹ (ng m ⁻³)	Area exceeding LAT (km ²)	Max percentage contribution from point sources to LAT exceedance
Arsenic	5.1	1.28	3.6	2.4	6	816	4.8%
Cadmium	2.5	2.21	3	2	5	4	0.96%
Nickel	15.2	6.3	14	10	20	8* (local modelling: 3)	0.01%* (local modelling: 95.8%)
Lead	134.8	27.8	350	250	500	0	-----
Benzo(a)pyrene	4.6	4.55	0.6	0.4	1	2329	98.1%

* results from national scale assessment. Local modelling and monitoring shows 3 km² in S.Wales zone and Swansea Urban Area exceeding the LAT with 95.8% from local industry)

¹¹ Lead is a LV (0.5 µg m⁻³) under the Air Quality Directive (2008/50/EC)

Table 3 Monitoring stations associated with large B[a]P point sources

Source	Upwind station	Downwind station
Coke works, Scunthorpe	Scunthorpe Town	Low Santon
Coke works, Teesside	Middlesbrough	Exposure-appropriate siting impossible due to coastal location*
Coke works, Port Talbot	None, model provides upwind representation** Exposure-appropriate siting impossible due to coastal location	Port Talbot Margam
Coke works, Barnsley	Royston	South Hiendley
Aluminium production, Lynemouth	None, model provides upwind representation	Lynemouth 2

* Alternative siting has been considered in Seaton Carew as nearby residential settlement to the north but this falls well outside the modelled industrial footprint which falls over uninhabited scrubland and the sea where there is no population exposure.

** Exposure-appropriate siting impossible due to coastal location but model can provide a representation of upwind concentration.

Monitoring stations in the existing network are therefore appropriately capturing significant point source contributions to concentrations of metals and PAHs. These are further represented by supplementary modelling techniques which have the advantage of representing the footprint of the point source according to varying meteorology each year (unlike permanently situated upwind and downwind monitoring stations which may not always represent the maximum concentration or even be guaranteed to fall within the footprint at all).

Upwind and downwind representation of large point sources where they are required (B[a]P and nickel) is achieved with the use of supplementary assessment. However, there is substantial value in established upwind and downwind monitoring stations associated specific point sources for model calibration (B[a]P) or to provide additional local monitoring/modelling support for the compliance assessment (e.g. nickel).

Diffuse sources

Diffuse sources are emissions sources that cannot be represented by a defined set of location-specific release parameters, either because they are not known or they are too

numerous to be characterised effectively in this way. Examples are road traffic, domestic heating and small industry.

Article 4(2) of the DD4 requires Member States to measure in zones where concentrations are classified as above the Lower Assessment Threshold (LAT) and states that measurements may be supplemented by modelling techniques to provide an adequate level of information on air quality. The supplementary assessment used by the UK includes modelling concentrations at background locations. Emissions data from the UK's National Atmospheric Emissions Inventory (NAEI) demonstrates that emissions of metals and B[a]P from traffic sources are not deemed to be significant in the UK¹² so modelling at traffic locations is not undertaken as part of the UK compliance approach.

Article 4(11) details the impact that this application of supplementary assessment has on the required number of fixed monitoring stations and indicates that due to the modelling, the number of fixed measurement stations can be reduced. This approach has been followed in this review, and ensures that all zones above the LAT have at least one fixed measurement station where supplementary assessment is applied.

Deposition of metals and PAHs

Article 9 of the DD4 requires at least one station per 100,000 km² to measure total deposition of arsenic, cadmium, nickel and mercury and of B[a]P and other PAHs. Two stations have been established in the UK for this purpose (Auchencorth Moss in Central Scotland zone and Harwell in South East zone). Additional monitoring of metals deposition at stations other than these is not required for compliance assessment. The Rural metals network is optimised to provide deposition data in order to perform UK-Wide deposition mapping but this is not required under the DD4 and therefore may stop.

Mercury monitoring

Article 9 of the DD4 requires at least one station per 100,000 km² to measure total gaseous mercury (TGM). Two stations have been established in the UK for this purpose (Auchencorth Moss in Central Scotland zone and Harwell in South East zone). Measurements at these two sites utilise automated measurement systems that provide hourly values. This monitoring goes beyond the scope required under DD4 and provides additional information regarding sources of mercury beyond that provided by TGM. Additional data of this sort is useful in establishing sources of mercury in the UK.

¹² Walker, H. L. et al. (2011) UK modelling under the Air Quality Framework Directive (96/62/EC) and Fourth Daughter Directive (2004/107/EC) for 2010 covering As, Cd, Ni and B(a)P (AEAT/ENV/R/3216 Issue 1) (section 2.3 and 3.3) http://uk-air.defra.gov.uk/reports/cat09/1204301510_dd42010mapsrep_v0.pdf

Additional monitoring of total gaseous mercury (TGM) at stations other than these 2 background sites is not required for compliance assessment. UK wide TGM is therefore not required for DD4 but TGM measurements are useful at sites where there is a need to assess specific localised sources.

There is no requirement under the DD4 to measure mercury in PM₁₀ and existing measurements within the metals monitoring network could be stopped.

Calculated station requirements and existing monitoring

Summary tables have been compiled for each pollutant to show the existing monitoring network compared with the DD4 requirements.

These summary tables are presented in each chapter:

- Table 4 (Metals)
- Table 6 (B[a]P)

Metals have been assessed and presented together for strategic purposes because they are measured and analysed as a suite of pollutants. Therefore, the requirement to measure one species effectively dictates the measurement of the others for compliance reporting. Lead is a pollutant regulated under the AQD but has been included in this assessment as one of the suite of metals analysed along with arsenic, nickel and cadmium. All zones in UK are below the LAT for lead indicating no requirement to measure it. However, because it is one of the species in the analysis suite for other metals, there remain lead measurements within the urban and rural metals networks at stations which are required for other metals. These lead concentrations are reported within the UK compliance assessment and also serve to support lead modelling which is also incorporated into the compliance assessment as SA.

The tables present this information by zone. The information contained within these tables also includes the zone classification relative to the assessment thresholds and the target number of monitoring stations calculated for the diffuse sources criteria.

The existing monitoring is presented as the number of stations at urban background, urban traffic and other classifications (e.g. suburban, industrial, rural) with the station name and the specific classification being shown in adjacent columns. A column is included to show in terms of plus (+) and minus (-) values, what the target number of monitors is, and how this compares with the current network.

Review of approach to station classification

Since the previous assessment regime review, station classifications have been reviewed as has been required by the 2011 Commission Decision on the reciprocal exchange of information and reporting on ambient air quality (2011/850/EU)¹³. The overall classification for each station has been determined based on source apportionment information from the Pollution Climate Mapping model. Where a station has been classified as industrial for any pollutant, the classification is industrial for this station for all pollutants and all traffic stations must be within 10 metres of the kerb. Some station classifications have been updated as a result of this review. Further information is available in a report summarising the approach and new classifications¹⁴.

¹³ 2011/850/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:335:0086:0106:EN:PDF>

¹⁴ Station Classification Report http://uk-air.defra.gov.uk/library/reports?report_id=765

Metals

Overview of Changes

Table 4 shows the current urban and rural metals network configuration compared with the target station numbers according to the DD4. This shows that the existing network could be reconfigured by removing some of the stations that are not required for compliance.

Of the stations in the existing metals network, details of which stations are proposed to be retained and the justification for the proposed action are shown in Table 5. In total 11 stations are proposed to be removed from the national networks: 8 from the urban network (including 2 stations which do not meet the siting requirements in the DD4) and 3 from the rural metals network.

- A new monitoring stations will be established in West Midlands zone to increase the number of monitoring stations to the number of stations required by the Directive.
- In addition a station has already been established in Sheffield Urban Area (Sheffield Tinsley) to replace the Sheffield Brinsworth station. The two sites were run concurrently for 6 months during 2013 to ensure that the new site was located appropriately to assess nickel concentrations comparable to that measured at Sheffield Brinsworth. Sheffield Tinsley has now replaced Sheffield Brinsworth.

Appropriate locations for the new station in West Midlands Zone will be explored during the 2014 with a view to a new station being operational during Q3/Q4 of 2014. The site will be equipped with instrumentation from existing stations that are to be removed from the network. The stations identified in Table 5 will be removed from the network during 2014.

Table 4 Existing metals monitoring networks (rural and urban) compared with DD4 requirements

Zone code	Zone name	Assessment Threshold classification				Required (diffuse) (any metal)*	Existing monitoring**						Stations (name, classification, urban/rural network)	(+/-) to Meet Target
		As	Cd	Ni	Pb		Rural Background	Urban Background	Urban Industrial	Urban Traffic	Suburban Industrial	Suburban Background		
UK0001	Greater London Urban Area	<LAT	<LAT	<LAT	<LAT		0	1	0	2	0	0	London Marylebone Road (UT) (Urban); London Westminster (UB) (Urban); London Cromwell Road 2 (UT) (Urban)	-3
UK0002	West Midlands Urban Area	<LAT	LAT-UAT	LAT-UAT	<LAT	1	0	1	1	0	0	0	Walsall Centre (UB) (Urban); Walsall Bilston Lane (UI) (Urban)	-1
UK0003	Greater Manchester Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	1	0	0	Manchester Wythenshawe (UT) (Urban)	-1
UK0004	West Yorkshire Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0005	Tyneside	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0006	Liverpool Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0007	Sheffield Urban Area	<LAT	<LAT	LAT-UAT	<LAT	1	0	1	1	0	0	0	Sheffield Centre (UB) (Urban); Sheffield Brinsworth (UI) (Urban)	-1
UK0008	Nottingham Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0009	Bristol Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0010	Brighton/Worthing/Littlehampton	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0011	Leicester Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0012	Portsmouth Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0

Zone code	Zone name	Assessment Threshold classification				Required (diffuse) (any metal)*	Existing monitoring**						Stations (name, classification, urban/rural network)	(+/-) to Meet Target
		As	Cd	Ni	Pb		Rural Background	Urban Background	Urban Industrial	Urban Traffic	Suburban Industrial	Suburban Background		
UK0013	Teesside Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0014	The Potteries	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0015	Bournemouth Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0016	Reading/Wokingham Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0017	Coventry/Bedworth	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0018	Kingston upon Hull	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0019	Southampton Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0020	Birkenhead Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0021	Southend Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0022	Blackpool Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0023	Preston Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0024	Glasgow Urban Area	<LAT	<LAT	<LAT	<LAT		0	1	0	0	0	0	Motherwell South (UB) (Urban)	-1
UK0025	Edinburgh Urban Area	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0026	Cardiff Urban Area	<LAT	<LAT	<LAT	<LAT		0	1	0	1	0	0	Cardiff Rumney (UB) (Urban); Cardiff Llandaff (UT) (Urban)	-2
UK0027	Swansea Urban Area	<LAT	<LAT	>UAT	<LAT	1	0	1	2	1	1	0	Port Talbot Margam (UI) (Urban); Swansea Morrision (UT) (Urban); Swansea Coedgwilym (UB) (Urban); Pontardawe Brecon Road (SI) (Urban); Pontardawe Tawe Terrace (UI) (Urban)	-4

Zone code	Zone name	Assessment Threshold classification				Required (diffuse) (any metal)*	Existing monitoring**						Stations (name, classification, urban/rural network)	(+/-) to Meet Target
		As	Cd	Ni	Pb		Rural Background	Urban Background	Urban Industrial	Urban Traffic	Suburban Industrial	Suburban Background		
UK0028	Belfast Metropolitan Urban Area	<LAT	<LAT	<LAT	<LAT		0	1	0	0	0	0	Belfast Centre (UB) (Urban)	-1
UK0029	Eastern	<LAT	<LAT	>UAT	<LAT	1	2	1	0	0	0	0	Heigham Holmes (RB) (Rural); Monkswood (RB) (Rural); Chadwell St Mary (UB) (Urban)	-2
UK0030	South West	LAT-UAT	<LAT	<LAT	<LAT	1	1	0	0	0	0	0	Yarner Wood (RB) (Rural)	0
UK0031	South East	LAT-UAT	<LAT	<LAT	<LAT	1	3	1	0	0	0	0	Harwell (RB) (Rural); Wytham Wood (RB) (Rural); Detling (RB) (Rural); Dartford Bean (UB) (Urban)	-3
UK0032	East Midlands	LAT-UAT	<LAT	LAT-UAT	<LAT	1	1	0	0	0	0	0	Beacon Hill (RB) (Rural)	0
UK0033	North West & Merseyside	LAT-UAT	<LAT	<LAT	<LAT	1	1	0	1	0	0	0	Cockley Beck (RB) (Rural); Runcorn Weston Point (UI) (Urban)	-1
UK0034	Yorkshire & Humberside	>UAT	<LAT	<LAT	<LAT	1	0	0	2	0	0	0	Scunthorpe Town (UI) (Urban); Scunthorpe Low Santon (UI) (Urban)	-1
UK0035	West Midlands	LAT-UAT	<LAT	<LAT	<LAT	1	0	0	0	0	0	0		1
UK0036	North East	<LAT	<LAT	<LAT	<LAT		0	1	0	0	0	1	Redcar Normanby (UB) (Urban); Redcar Dormanstown (SB) (Urban)	-2
UK0037	Central Scotland	<LAT	<LAT	<LAT	<LAT		1	0	0	0	0	0	Auchencorth Moss (RB) (Rural)	-1
UK0038	North East Scotland	<LAT	<LAT	<LAT	<LAT		1	0	0	0	0	0	Banchory (RB) (Rural)	-1

Zone code	Zone name	Assessment Threshold classification				Required (diffuse) (any metal)*	Existing monitoring**						Stations (name, classification, urban/rural network)	(+/-) to Meet Target
		As	Cd	Ni	Pb		Rural Background	Urban Background	Urban Industrial	Urban Traffic	Suburban Industrial	Suburban Background		
UK0039	Highland	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0040	Scottish Borders	LAT-UAT	<LAT	<LAT	<LAT	1	1	0	0	0	0	0	Eskdalemuir (RB) (Rural)	0
UK0041	South Wales	<LAT	<LAT	>UAT	<LAT	1	1	0	0	0	0	0	Cwmystwyth (RB) (Rural)	0
UK0042	North Wales	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
UK0043	Northern Ireland	<LAT	<LAT	<LAT	<LAT		0	0	0	0	0	0		0
Totals						12	12	10	7	5	1	1		-24

* Requirement for monitoring associated with any zone where concentrations are above the LAT for any metal (because all metals species are analysed as a suite therefore the need for one species also provides for the other species).

** Includes stations identified as non-compliant but operational in 2013

Table 5 Metals monitoring changes (rural and urban networks)

Zone code	Zone name	Station	Station Classification	Network	Keep	Action (justification)
UK0001	Greater London Urban Area	London Cromwell Road 2	UT	Urban Metals		Non-compliant – remove, replacement not needed.
		London Marylebone Road	UT	Urban Metals	1	Keep – many co-located measurements of different pollutants and useful for modelling support
		London Westminster	UB	Urban Metals	1	Keep – useful for modelling support
UK0002	West Midlands Urban Area	Walsall Bilston Lane	UI	Urban Metals	1	Keep – need for compliance if Walsall Centre is removed – this station measures higher concentrations of all metals than Walsall Centre.
		Walsall Centre	UB	Urban Metals		Remove – Bilston Lane preferred to be kept in this zone as it has higher concentrations for all metals.
UK0003	Greater Manchester Urban Area	Manchester Wythenshawe	UT	Urban Metals		Remove – historically useful to monitor impact of lead in petrol measures but this is no longer an issue.
UK0007	Sheffield Urban Area	Sheffield Brinsworth	UI	Urban Metals	1	Non-compliant – replace as valuable station for nickel source. Replacement planned at Sheffield Tinsley.
		Sheffield Centre	UB	Urban Metals	1	Keep - needed for compliance
UK0024	Glasgow Urban Area	Motherwell South	UB	Urban Metals		Remove – not needed for compliance reporting or modelling.
UK0026	Cardiff Urban Area	Cardiff Llandaff	UT	Urban Metals		Non-compliant – remove and no need to replace

Zone code	Zone name	Station	Station Classification	Network	Keep	Action (justification)
		Cardiff Rumney	UB	Urban Metals		Remove – not needed for compliance reporting or modelling.
UK0027	Swansea Urban Area	Pontardawe Brecon Road	SI	Urban Metals	1	Keep – downwind station for nickel (alloy works)
		Pontardawe Tawe Terrace	UI	Urban Metals	1	Keep – upwind station for nickel (alloy works)
		Port Talbot Margam	UI	Urban Metals	1	Keep – downwind station for coke works
		Swansea Coedgwilym	UB	Urban Metals	1	Keep - important in representing geographical distribution of nickel concentrations in this zone of complex metals sources
		Swansea Morrision	UT	Urban Metals	1	Keep - important in representing geographical distribution of nickel concentrations in this zone of complex metals sources
UK0028	Belfast Metropolitan Urban Area	Belfast Centre	UB	Urban Metals	1	Keep – useful for modelling support and only metals station in N.Ireland
UK0029	Eastern	Chadwell St Mary	UB	Urban Metals	1	Keep – useful for modelling support
		Heigham Holmes	RB	Rural Metals	1	At least one station required in zone for compliance, useful for model verification, proposed retain (Reported under the OSPAR Convention ¹⁵)

¹⁵ http://www.ospar.org/content/content.asp?menu=00010100000000_000000_000000

Zone code	Zone name	Station	Station Classification	Network	Keep	Action (justification)
		Monkswood	RB	Rural Metals		Remove – not needed for compliance reporting or modelling if retain Heigham Holmes
UK0030	South West	Yarner Wood	RB	Rural Metals	1	Required for compliance, required for model verification
UK0031	South East	Dartford Bean	UB	Urban Metals		Remove – not needed for compliance reporting or modelling.
		Detling	RB	Rural Metals	1	Not required for compliance because zone has other rural stations but measures highest rural concentrations, so proposed retain for model verification
		Harwell	RB	Rural Metals	1	Not required for compliance because zone has other rural stations but is EMEP supersite
		Wytham Wood	RB	Rural Metals		Not required for compliance because zone has other rural stations, close to Harwell not do not need to retain for model verification
UK0032	East Midlands	Beacon Hill	RB	Rural Metals	1	Required for compliance, required for model verification
UK0033	North West & Merseyside	Cockley Beck	RB	Rural Metals		Not required for compliance because zone also has an urban metals station assuming it is retained, not required
		Runcorn Weston Point	UI	Urban Metals	1	Required for compliance, useful for model verification
UK0034	Yorkshire & Humberside	Scunthorpe Low Santon	UI	Urban Metals	1	Keep – downwind station for coke works
		Scunthorpe Town	UI	Urban Metals	1	Keep – upwind station for coke works

Zone code	Zone name	Station	Station Classification	Network	Keep	Action (justification)
UK0036	North East	Redcar Dormanstown	SB	Urban Metals		Remove – not needed for compliance reporting or modelling.
		Redcar Normanby	UB	Urban Metals		Remove – not needed for compliance reporting or modelling.
UK0037	Central Scotland	Auchencorth Moss	RB	Rural Metals	1	Central Scotland: Required for measurement of wide range of species for compliance, useful for model verification
UK0038	North East Scotland	Banchory	RB	Rural Metals		Remove – not needed for compliance reporting or modelling.
UK0040	Scottish Borders	Eskdalemuir	RB	Urban Metals	1	Keep – long data record, scientific value.
UK0041	South Wales	Cwmystwyth	RB	Rural Metals	1	Required for compliance, useful for model verification

Benzo[a]pyrene

Overview of Changes

A total of 8 new stations will be established in order to achieve target numbers according to Table 6. These consist of a new station in each of the following zones:

- Sheffield Urban Area (UK0007)
- Nottingham Urban Area (UK0008)
- The Potteries (UK0014)
- South West zone (UK0030)
- West Midlands zone (UK0035)
- North East Scotland zone (UK0038)
- Scottish Borders zone (UK0040)
- North Wales zone (UK0042)

Table 6 shows that the existing network could be reconfigured to save money by removing some stations that are deemed to be of lowest value and relocating these instruments to zones (as listed above) where new monitoring is to be established.

Of the stations in the existing PAHs network, the results of the review to determine which stations will be retained and the justification for the action are shown in Table 7. In total 2 stations (London Crystal Palace Parade and Hove) are proposed to be removed from the network and relocated to new monitoring stations. The Glasgow Centre instrument which was present prior to 2012 has been removed as part of changes under the AQD pollutant network review and is currently in storage awaiting redeployment to another zone. A further 5 stations are proposed to be established with new instruments.

Work to establish appropriate locations for new sites will be undertaken during the first half of 2014 with a view to new sites being installed and operational during Q3/Q4 2014.

Table 6 Existing B[a]P monitoring network compared with DD4 requirements

Zone code	Zone name	Assessment Threshold classification	Required (diffuse)	Existing monitoring					Stations (name, classification)	(+/-) to Meet Target
				Rural Background	Urban Background	Urban Industrial	Urban Traffic	Suburban Industrial		
UK0001	Greater London Urban Area	LAT-UAT	1	0	1	0	2	0	London Marylebone Road (UT); London Crystal Palace Parade (UT); London Brent (UB)	2
UK0002	West Midlands Urban Area	>UAT	1	0	1	0	0	0	Birmingham Tyburn (UB)	0
UK0003	Greater Manchester Urban Area	LAT-UAT	1	0	1	0	0	0	Salford Eccles (UB)	0
UK0004	West Yorkshire Urban Area	LAT-UAT	1	0	1	0	0	0	Leeds Millshaw (UB)	0
UK0005	Tyneside	LAT-UAT	1	0	1	0	0	0	Newcastle Centre (UB)	0
UK0006	Liverpool Urban Area	LAT-UAT	1	0	0	1	0	0	Liverpool Speke (UI)	0
UK0007	Sheffield Urban Area	LAT-UAT	1	0	0	0	0	0		-1
UK0008	Nottingham Urban Area	LAT-UAT	1	0	0	0	0	0		-1
UK0009	Bristol Urban Area	<LAT	0	0	0	0	0	0		0
UK0010	Brighton/Worthing/Littlehampton	<LAT	0	0	1	0	0	0	Hove (UB)	1
UK0011	Leicester Urban Area	<LAT	0	0	0	0	0	0		0
UK0012	Portsmouth Urban Area	<LAT	0	0	0	0	0	0		0
UK0013	Teesside Urban Area	>UAT	1	0	0	1	0	0	Middlesbrough (UI)	0
UK0014	The Potteries	>UAT	1	0	0	0	0	0		-1
UK0015	Bournemouth Urban Area	<LAT	0	0	0	0	0	0		0
UK0016	Reading/Wokingham Urban Area	<LAT	0	0	0	0	0	0		0
UK0017	Coventry/Bedworth	<LAT	0	0	0	0	0	0		0

Zone code	Zone name	Assessment Threshold classification	Required (diffuse)	Existing monitoring					Stations (name, classification)	(+/-) to Meet Target
				Rural Background	Urban Background	Urban Industrial	Urban Traffic	Suburban Industrial		
UK0018	Kingston upon Hull	<LAT	0	0	0	0	0	0		0
UK0019	Southampton Urban Area	<LAT	0	0	0	0	0	0		0
UK0020	Birkenhead Urban Area	<LAT	0	0	0	0	0	0		0
UK0021	Southend Urban Area	<LAT	0	0	0	0	0	0		0
UK0022	Blackpool Urban Area	<LAT	0	0	0	0	0	0		0
UK0023	Preston Urban Area	<LAT	0	0	0	0	0	0		0
UK0024	Glasgow Urban Area	<LAT	0	0	0	0	0	0		0
UK0025	Edinburgh Urban Area	<LAT	0	0	1	0	0	0	Edinburgh St Leonards (UB)	1
UK0026	Cardiff Urban Area	LAT-UAT	1	0	1	0	0	0	Cardiff Lakeside (UB)	0
UK0027	Swansea Urban Area	>UAT	1	0	1	1	0	0	Port Talbot Margam (UI); Swansea Cwm Level Park (UB)	1
UK0028	Belfast Metropolitan Urban Area	>UAT	1	0	1	0	0	0	Kilmakee Leisure Centre (UB)	0
UK0029	Eastern	<LAT	0	1	0	0	0	0	Stoke Ferry (RB)	1
UK0030	South West	>UAT	1	0	0	0	0	0		-1
UK0031	South East	>UAT	1	1	0	0	0	0	Harwell (RB)	0
UK0032	East Midlands	>UAT	1	0	1	0	0	0	Bolsover (UB)	0
UK0033	North West & Merseyside	>UAT	1	1	0	0	0	0	Hazelrigg (RB)	0

Zone code	Zone name	Assessment Threshold classification	Required (diffuse)	Existing monitoring					Stations (name, classification)	(+/-) to Meet Target
				Rural Background	Urban Background	Urban Industrial	Urban Traffic	Suburban Industrial		
UK0034	Yorkshire & Humberside	>UAT	1	1	0	4	0	0	High Muffles (RB); Scunthorpe Town (UI); Royston (UI); South Hiendley (UI); Scunthorpe Low Santon (UI)	4
UK0035	West Midlands	>UAT	1	0	0	0	0	0		-1
UK0036	North East	>UAT	1	0	0	0	0	1	Lynemouth 2 (SI)	0
UK0037	Central Scotland	>UAT	1	1	0	0	0	0	Auchencorth Moss (RB)	0
UK0038	North East Scotland	>UAT	1	0	0	0	0	0		-1
UK0039	Highland	>UAT	1	0	1	0	0	0	Kinlochleven (UB)	0
UK0040	Scottish Borders	LAT-UAT	1	0	0	0	0	0		-1
UK0041	South Wales	>UAT	1	0	1	0	0	0	Newport (UB)	0
UK0042	North Wales	>UAT	1	0	0	0	0	0		-1
UK0043	Northern Ireland	>UAT	1	0	2	0	0	0	Ballymena Ballykeel (UB); Derry Brandywell (UB)	1
Totals			27	5	15	7	2	1		27

Table 7 B[a]P monitoring changes

Zone code	Zone name	Station	Station Classification	Keep	Action (justification)
UK0001	Greater London Urban Area	London Marylebone Road	UT	1	Keep – supersite and useful to have a UT and UB (London Brent) for London
		London Crystal Palace Parade	UT		Remove – kept Marylebone Road instead as strategically more important
		London Brent	UB	1	Keep - useful to have a UT (Marylebone Road) and UB for London
UK0002	West Midlands Urban Area	Birmingham Tyburn	UB	1	Keep – required for compliance
UK0003	Greater Manchester Urban Area	Salford Eccles	UB	1	Keep – required for compliance
UK0004	West Yorkshire Urban Area	Leeds Millshaw	UB	1	Keep – required for compliance
UK0005	Tyneside	Newcastle Centre	UB	1	Keep – required for compliance
UK0006	Liverpool Urban Area	Liverpool Speke	UI	1	Keep – required for compliance
UK0010	Brighton/Worthing/Littlehampton	Hove	UB		Remove – not needed for compliance reporting or modelling
UK0013	Teesside Urban Area	Middlesbrough	UI	1	Keep – required for compliance
UK0025	Edinburgh Urban Area	Edinburgh St Leonards	UB	1	Keep - represents large urban area in Scotland
UK0026	Cardiff Urban Area	Cardiff Lakeside	UB	1	Keep – required for compliance
UK0027	Swansea Urban Area	Port Talbot Margam	UI	1	Keep – downwind station for coke works
		Swansea Cwm Level Park	UB	1	Keep – above air quality strategy objective.
UK0028	Belfast Metropolitan Urban Area	Kilmakee Liesure Centre	UB	1	Keep – required for compliance

Zone code	Zone name	Station	Station Classification	Keep	Action (justification)
UK0029	Eastern	Stoke Ferry	RB	1	Keep – useful for regional background assessment
UK0031	South East	Harwell	RB	1	Keep – required for compliance
UK0032	East Midlands	Bolsover	UB	1	Keep – required for compliance
UK0033	North West & Merseyside	Hazelrigg	RB	1	Keep – required for compliance
UK0034	Yorkshire & Humberside	High Muffles	RB	1	Keep – useful for regional background assessment and also for comparison with collocated Andersen instrument. Reported under the OSPAR Convention ¹⁶
		Scunthorpe Town	UI	1	Keep – upwind station for coke works
		Royston	UI	1	Keep – upwind station for coke works
		South Hiendley	UI	1	Keep – downwind station for coke works
		Scunthorpe Low Santon	UI	1	Keep – downwind station for coke works
UK0036	North East	Lynemouth 2	SI	1	Keep – required for compliance
UK0037	Central Scotland	Auchencorth Moss	RB	1	Keep – required for compliance
UK0039	Highland	Kinlochleven	UB	1	Keep – required for compliance
UK0041	South Wales	Newport	UB	1	Keep – required for compliance
UK0043	Northern Ireland	Ballymena Ballykeel	UB	1	Keep – PAH assessment important in N Ireland. Concentrations in zone well above UAT
		Derry Brandywell	UB	1	Keep – PAH assessment important in N Ireland. Concentrations in zone well above UAT

¹⁶ http://www.ospar.org/content/content.asp?menu=00010100000000_000000_000000

Annex 1

Future monitoring network

Proposed Composition of future monitoring network for DD4 pollutants

Zone	Zone name	Station name	Station classification	Pollutants				
				As	Cd	Ni	Pb	BaP
UK0001	Greater London Urban Area	London Brent	UB					1
		London Marylebone Road	UT	1	1	1	1	1
		London Westminster	UB	1	1	1	1	
UK0002	West Midlands Urban Area	Birmingham Tyburn	UB					1
		Walsall Bilston Lane	UI	1	1	1	1	
UK0003	Greater Manchester Urban Area	Salford Eccles	UB					1
UK0004	West Yorkshire Urban Area	Leeds Millshaw	UB					1
UK0005	Tyneside	Newcastle Centre	UB					1
UK0006	Liverpool Urban Area	Liverpool Speke	UI					1
UK0007	Sheffield Urban Area	Sheffield Centre	UB	1	1	1	1	
		Sheffield Tinsley	UI	1	1	1	1	1
UK0008	Nottingham Urban Area	UK0008_1	UB					1
UK0013	Teesside Urban Area	Middlesbrough	UI					1
UK0014	The Potteries	UK0014_1	UB					1
UK0025	Edinburgh Urban Area	Edinburgh St Leonards	UB					1
UK0026	Cardiff Urban Area	Cardiff Lakeside	UB					1
UK0027	Swansea Urban Area	Pontardawe Brecon Road	SI	1	1	1	1	

Zone	Zone name	Station name	Station classification	Pollutants				
				As	Cd	Ni	Pb	BaP
		Pontardawe Tawe Terrace	UI	1	1	1	1	
		Port Talbot Margam	UI	1	1	1	1	1
		Swansea Coedgwilym	UB	1	1	1	1	
		Swansea Cwm Level Park	UB					1
		Swansea Morrision	UT	1	1	1	1	
UK0028	Belfast Metropolitan Urban Area	Belfast Centre	UB	1	1	1	1	
		Kilmakee Leisure Centre	UB					1
UK0029	Eastern	Chadwell St Mary	UB	1	1	1	1	
		Heigham Holmes	RB	1	1	1	1	
		Monkwood	RB	1	1	1	1	
		Stoke Ferry	RB					1
UK0030	South West	Yarner Wood	RB	1	1	1	1	
		UK0030_1	UB					1
UK0031	South East	Detling	RB	1	1	1	1	
		Harwell	RB	1	1	1	1	2*
UK0032	East Midlands	Beacon Hill	RB	1	1	1	1	
		Bolsover	UB					1
UK0033	North West & Merseyside	Hazelrigg	RB					1
		Runcorn Weston Point	UI	1	1	1	1	
UK0034	Yorkshire & Humberside	High Muffles	RB					1
		Royston	UI					1
		Scunthorpe Low Santon	UI	1	1	1	1	1
		Scunthorpe Town	UI	1	1	1	1	1
		South Hiendley	UI					1
UK0035	West Midlands	UK0035_1	UB	1	1	1	1	1

Zone	Zone name	Station name	Station classification	Pollutants				
				As	Cd	Ni	Pb	BaP
UK0036	North East	Lynemouth 2	SI					1
UK0037	Central Scotland	Auchencorth Moss	RB	1	1	1	1	2*
UK0038	North East Scotland	UK0038_1	UB					1
UK0039	Highland	Kinlochleven	UB					1
UK0040	Scottish Borders	Eskdalemuir	RB	1	1	1	1	
		UK0040_1	UB					1
UK0041	South Wales	Cwmystwyth	RB	1	1	1	1	
		Newport	UB					1
UK0042	North Wales	UK0042_1	UB					1
UK0043	Northern Ireland	Ballymena Ballykeel	UB					1
		Derry Brandywell	UB					1

* includes Digital and Digital with PUF sampler to measure a wider suite of PAHs (other than BaP)