HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

6.2.18 ES Volume B - Introduction to the environmental assessments App B5-1 - Baseline Data Synopsis Report - air quality

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Contents

List of Figures

Executive Summary

The Wylfa Newydd Project has the potential to generate air quality and dust impacts on the surrounding area with nearby roads experiencing changes in traffic flows . Potential air quality impacts are required to be considered in light of the planning and regulatory frameworks and emissions may be subject to conditions in the planning consents and Environmental Permit.

In order to accurately assess the potential air quality impacts of the Wylfa Newydd Project, it is necessary to have an understanding of the existing air quality situation at the Wylfa Newydd Development Area, Off-Site Power Station Facilities and Associated Developments, the surrounding communities and at all other sensitive locations which could be affected by the Wylfa Newydd Project.

The pollutants considered in this review include oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2), fine particulate matter (referred to as PM_{10} and $PM_{2.5}$) and dust.

The review indicates that the background air quality in the vicinity of the Wylfa Newydd Development Area appears to be good and concentrations of pollutants are generally well within the relevant Air Quality Objectives (AQOs). This also applies to locations on Anglesey which are beyond the vicinity of the Wylfa Newydd Development Area, including at the Off-Site Power Station Facilities and Associated Development sites and nearby road network. The Isle of Anglesey County Council (IACC) has concluded that concentrations of air pollutants at locations representative of relevant long-term exposure locations, such as residential properties, are well within the annual mean AQO. The IACC has not declared any Air Quality Management Areas (AQMAs) and no detailed assessments are currently required as part of the Local Air Quality Management (LAQM) process.

Dust deposition measurements recorded in the vicinity of the Wylfa Newydd Development Area are representative of the relatively low levels found in rural, open country, locations and these would be broadly representative of the dust deposition in most rural locations on Anglesey which are not close to specific sources of dust.

Beyond Anglesey, air quality measurements undertaken by Gwynedd Council (GC), Conwy County Borough Council (CCBC), Denbighshire County Council (DCC) and Flintshire County Council (FCC) also indicate that concentrations of the relevant pollutants (NO_2 and PM_{10}) are currently within the relevant AQOs close to the main road network. Similar to the IACC, the relevant mainland Wales councils have not declared any AQMAs and no detailed assessments are currently required as part of the LAQM process.

This report examines the national and regional air quality trends and sets out the proposed approach as to how the available baseline data will be applied within the air quality modelling and assessments which will be carried out to support the various applications required for the Wylfa Newydd Project. In summary, the background air quality concentrations for the study areas on the Isle of Anglesey will be determined using a combination of measured data recorded by the IACC and 2013 and 2001 background mapping concentrations which, based on the analysis of likely air quality trends, assumes background concentrations will not decrease in future years. The availability of data and

data coverage using the proposed approach is considered to be sufficient to undertake a robust assessment of air quality and to inform the proposals for mitigation and management of air quality and dust effects during the construction and operation of the Wylfa Newydd Project.

Measurements of pollutants recorded by GC, CCBC, DCC and FCC would be used to determine the potential for significant air quality effects to occur at locations close to the affected road network on mainland Wales.

Where appropriate, many of the roadside measurements undertaken by the IACC, GC, CCBC, DCC and FCC will be utilised as part of the verification of the modelling of road traffic emissions undertaken as part of the air quality assessment.

If required, a further review of available measured data will be undertaken as it is produced by the local authorities. This report will be updated, if required, to reflect changes such as the publication of new guidance, or the outcome of consultation discussions with the relevant stakeholders up to submission of the Development Consent Order (DCO) application or Environmental Permit application.

1 Introduction

1.1 Overview

1.1.1 Horizon Nuclear Power Wylfa Limited (Horizon) is currently planning to develop a new nuclear power station, the 'Power Station', and associated development and facilities on Anglesey, North Wales, known as the Wylfa Newydd Project.

1.1.2 The Power Station would be located on a site identified by the UK Government through the National Policy Statement (NPS) for Nuclear Power Generation EN-6 [RD1]. The Power Station Site is located on the north coast of Anglesey adjacent to the Existing Power Station.

1.1.3 The Wylfa Newydd Project will require a number of applications to be made under separate legislation to different regulators. As a Nationally Significant Infrastructure Project under the *Planning Act 2008*, the construction and operation must be authorised by a Development Consent Order (DCO).

1.1.4 Jacobs UK Ltd (Jacobs) was commissioned by Horizon to undertake the air quality assessments to inform the various applications and permits that will be submitted for approval to construct and operate the Power Station, Off-Site Power Station Facilities and Associated Developments.

1.1.5 This report provides a review of the available air quality baseline data, and a discussion as to how these data will be applied within the air quality modelling and assessments, which will be carried out to support the various applications required for the Wylfa Newydd Project.

1.2 Proposed development

1.2.1 The Wylfa Newydd Project includes the works on the Wylfa Newydd Development Area (including the Power Station), Off-Site Power Station Facilities and Associated Development.

Wylfa Newydd Development Area

1.2.2 The Power Station includes two UK Advanced Boiling Water Reactors to be supplied by Hitachi-GE Nuclear Energy Ltd, associated plant and Ancillary Structures and features. In addition to the reactors, development on the Power Station Site would include steam turbines, control and service buildings, operational plant, radioactive waste storage buildings, ancillary structures, offices and coastal developments. The coastal developments would include a Cooling Water System and breakwater, and a Marine Off-Loading Facility.

1.2.3 The proposed Temporary Workers' Accommodation at the Wylfa Newydd Development Area would include campus-style temporary accommodation capable of housing up to 4,000 construction workers.

Off-Site Power Station Facilities

1.2.4 The Off-Site Power Station Facilities are an integral part of the Power Station. These facilities include the Mobile Emergency Equipment Garage (MEEG), Alternative Emergency Control Centre (AECC) and Environmental Survey Laboratory (ESL).

MEEG, AECC and ESL

1.2.5 The Power Station would require emergency facilities to implement appropriate arrangements for responding to conventional and radiological emergencies during the operational phase. The MEEG facility would enable the managed storage of vehicles and equipment for response to an emergency event.

1.2.6 The proposed AECC would facilitate and enable the strategic management of the response to a Power Station Site incident if the main Emergency Control Centre is untenable or if there is no access to the Power Station Site. The proposed ESL would facilitate the radiochemical analysis of samples (environmental and personal) for radiological dose and countermeasures assessment.

1.2.7 It is planned that the MEEG, AECC and ESL would be co-located on the same site at Llanfaethlu.

Associated Developments

1.2.8 The Associated Developments are those developments which support the delivery of the Power Station. The Associated Developments considered in this report are set out below.

A5025 On-line and Off-line Highway Improvements

1.2.9 Integral to the Wylfa Newydd Project is the delivery of a package of highway improvements to sections of the existing A5025 between Valley and the Wylfa Newydd Development Area.

1.2.10 These improvements range from minor modifications, such as new signage, resurfacing, localised widening and markings largely within the highway boundary (termed 'On-line Highway Improvements'), to more extensive changes requiring construction of new junction arrangements and sections of carriageway within adjacent land (termed 'Off-line Highway Improvements').

Park and Ride

1.2.11 The proposed Park and Ride would enable construction workers to travel to the Wylfa Newydd Development Area via a dedicated bus service.

Logistics Centre

1.2.12 A facility at which the deliveries can be managed and the timing of traffic movements to the Wylfa Newydd Development Area can be controlled during the construction of the Power Station.

1.3 Site descriptions

Wylfa Newydd Development Area

1.3.1 The Wylfa Newydd Development Area covers an area of approximately 380ha. It is bounded to the north by the coast and the Existing Power Station. To the east, it is separated from Cemaes by a narrow corridor of agricultural land. The A5025 and residential properties define part of the southeast boundary, with a small parcel of land spanning the road to the northeast of Tregele. To

the south and west, the Wylfa Newydd Development Area abuts agricultural land, and to the west it adjoins the coastal hinterland.

1.3.2 There is one designated site for nature conservation within the Wylfa Newydd Development Area: the Tre'r Gof Site of Special Scientific Interest (SSSI). It is also close to the Cae Gwyn SSSI; Cemlyn Bay Special Area of Conservation (SAC) and SSSI; Morwenoliaid Ynys Môn/Anglesey Terns SPA and Gogledd Môn Forol/North Anglesey Marine candidate SAC. There are local wildlife sites (known as Wildlife Sites) within 2km of the Wylfa Newydd Development Area, which are specified within the Joint Local Development Plan [RD2]. The nearest Wildlife Site is Arfordir Mynydd y Wylfa - Trwyn Penrhyn Wildlife Site, which is situated within the Wylfa Newydd Development Area. A number of other Wildlife Sites are within 2km of the Wylfa Newydd Development Area. Trwyn Pencarreg Wildlife Site is located approxaimtelty 40m to the west at its closest point and Cestyll Garden, which is a Registered Historic Park and Garden, is located adjacent to the Wylfa Newydd Development Area. There are also a number of ancient woodland sites within 2km of the Wylfa Newydd Development Area.

Off-Site Power Station Facilities

MEEG, AECC and ESL

1.3.3 The MEEG, AECC and ESL site encompasses an area of approximately 0.93ha and comprises an existing bus depot adjacent to the A5025, north of the village of Llanfaethlu. There are sensitive human receptors including residential dwellings in close proximity to the MEEG, AECC and ESL site and a new school currently under construction approximately 200m to the southwest.

1.3.4 There are no designated ecological sites in close proximity to the MEEG, AECC and ESL site.

Associated Developments

A5025 On-line and Off-line Highway Improvements

1.3.5 The section of carriageway associated with the A5025 proposals is approximately 18km long, commencing at the A5 trunk road at Valley and running northwards, broadly parallel to the west coast of Anglesey, towards the settlement of Cemaes. Between Valley and Cemaes, the section of route requiring improvement passes through or adjacent to the communities of Llanfachraeth, Llanfaethlu, Llanrhuddlad and Tregele. There are also several individual residential properties close to the A5025 road corridor between these communities. In addition, there is one SSSI (Beddmanarch-Cymyran SSSI) and a parcel of ancient woodland within 200m of the road corridor.

Park and Ride

1.3.6 The Park and Ride site covers an area of approximately 15.6ha. It is bounded to the north, east and west by open countryside with the A5 running broadly parallel to the southern boundary. There are intermittent residential dwellings to the north, northeast and east of the site.

1.3.7 There are five designated sites for nature conservation: Llyn Traffwll SSSI, Llynnau Y Fali SSSI and Llyn Dinam SAC and two Wildlife Sites: Rhostir a Phwll Caergeiliog Wildlife Site and Cors Plas Wildlife Site within 2km of the Park and Ride.

Logistics Centre

1.3.8 The Logistics Centre would be located approximately 2km south of the centre of Holyhead, and 250m south from existing industrial and commercial premises. The area of land for the proposed Logistics Centre and areas surrounding the site to the east, south and west are currently open countryside.

1.3.9 The site of the proposed Logistics Centre is bounded to the northeast by a small area of open countryside, beyond which is the A55 and existing industrial and commercial premises, including Penrhos Business Park, an aluminium works and sewage works. To the southwest, the site is bounded by a road, with agricultural land to the southeast. The northern site boundary of the Logistics Centre is on average approximately 70m from the nearest carriageway of the A55.

1.3.10 The closest ecological designation, Beddmanarch-Cymyran SSSI is approximately 1km south-east of the Logistics Centre site.

1.4 Study aims and objectives

1.4.1 The objective of the air quality baseline report is to review the baseline data and characterise the existing air quality environment. This will inform the various air quality assessments carried out to support the applications required to obtain permission to construct and operate the Power Station, Off-Site Power Station Facilities and Associated Developments.

1.4.2 This report sets out the relevant data and approach to characterising the baseline air quality in the vicinity of the Wylfa Newydd Development Area, Off-Site Power Station Facilities and Associated Developments. It also considers the baseline air quality in the vicinity of the road network which would experience changes in vehicle flows due to the Wylfa Newydd Project. This encompasses the A5025 and A55 on Anglesey and also the A55 and other connecting A roads on mainland Wales.

1.5 Terminology

Table 1-1: Air quality terminology

Term	Definition
A5025 Off-line Highway Improvements	Highway improvements that involve the construction of new sections of the A5025. These would involve the construction of new junctions, new sections of road to bypass local communities, and localised bend improvements generally beyond the existing highway boundaries.
Alternative Emergency Control Centre (AECC)	A component of the Off-Site Power Station Facilities which provides back-up command and communications facilities that would be used to

Term	Definition
	manage an incident at the Power Station Site in the extremely unlikely event that the primary facilities on the Power Station Site were not available.
Air Quality Management Area (AQMA)	Areas within a local authority's boundary that are identified as areas where Air Quality Objectives are not likely to be achieved.
Air Quality Objective (AQO)	Defined levels of air quality and maximum pollution limits as specified in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, 2007.
Associated Development	Works included in the DCO which facilitate the delivery of the NSIP, and which include: the Site Campus; Park and Ride; Logistics Centre; and the A5025 Off-line Highway Improvements.
Conventional discharges	Non-radiological discharges to atmosphere from the proposed Power Station.
Critical level	An air quality standard or guideline for ambient concentrations of a pollutant which applies at ecological receptors.
Critical load	A quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge. This is used to assess modelled nitrogen and acid deposition at ecological receptors.
Development Consent Order (DCO)	The consent for an NSIP required under Section 37 of the Planning Act 2008.
Environmental Impact Assessment (EIA)	The process in which the likely significant effects of a development on the environment are identified and assessed.
Environmental Permit (EP)	A permit required under the Environmental Permitting (England and Wales) Regulations 2016 for carrying out regulated activities. Environmental Permits must be sought from Natural Resources Wales in Wales and the Environment Agency in England.
Environmental Survey Laboratory (ESL)	A component of the Off-Site Power Station Facilities that performs a normal operating function for environmental monitoring and, as such, would contain facilities such as monitoring equipment to conduct radiological surveys in the local area.

Term	Definition
Existing Power Station	The existing Magnox nuclear power station at Wylfa.
Logistics Centre	A temporary secure facility from where deliveries to the Power Station Site during construction would be managed to reduce traffic on and impacts to the local road network.
Mobile Emergency Equipment Garage (MEEG)	A component of the Off-Site Power Station Facilities which would provide managed storage of vehicles and equipment for responding to any incidents that might arise during the operational phase of the Power Station.
Modelling	All assessment techniques that link emissions or activities to impacts or concentration in air and deposition to land from air.
Nationally Significant Infrastructure Project (NSIP)	A type of project listed in the Planning Act 2008, which must be consented by a DCO. These include proposals for power plants, large renewable energy projects, new airports and airport extensions and major road projects.
Off-Site Power Station Facilities	Comprising the AECC, ESL and MEEG.
Park and Ride	A temporary facility where workers could park their vehicles securely and transfer to shuttle buses, which would take them to the Power Station Site. The site is designed to include a zone for buses to collect and drop off passengers, with a management office and parking for staff (working at the Park and Ride).
Power Station	The proposed new nuclear power station at Wylfa, including two UK Advanced Boiling Water Reactors, the Cooling Water System, supporting facilities, buildings, plant and structures, radioactive waste and spent fuel storage buildings and the Grid Connection.
Power Station Site	The indicative areas of land and sea within which the majority of the permanent Power Station, Marine Works and other on-site development would be situated.
Receptor	These are the specific assessed locations which represent locations where there is relevant human exposure or there is a potentially sensitive ecological site.
Site Campus	A temporary facility that would house up to 4,000 construction workers in modular type accommodation blocks, providing an

Term	Definition
	independent living space for each worker, with shared campus-style amenities.
Wylfa Newydd Development Area (WNDA)	The indicative areas of land and sea including the Power Station Site and the surrounding areas that would be used for the construction and operation of the WNDA Development.
Wylfa Newydd Project	The Wylfa Newydd Project, the Licensable Marine Activities and the Enabling Works.
Wylfa Newydd Project	The elements of the Wylfa Newydd Project for which consent is being sought through the DCO comprising the construction and operation of the Power Station, other on-site development, the Marine Works, the Off-Site Power Station Facilities and the Associated Development.

2 Methodology

2.1 Introduction

2.1.1 'Background' air quality is a concept used to enable assessments of the effects of particular emission sources to air, without the need for all sources in the area and beyond to be considered explicitly within the air quality model.

2.1.2 Generally, the background concentration represents the ambient concentration of a particular pollutant which would exist in the absence of the emission source or sources being modelled. The modelled contribution from the assessed emission sources is added to the background concentration to provide the total concentration of the pollutant, which can then be compared to the relevant AQO and assessment criteria.

2.1.3 The background air quality is generally the concentration of a particular pollutant that is considered to be due to emissions from more distant sources, including long range or transboundary pollution from other regions or countries. It will also include a contribution due to emissions from natural sources, such as particulates from sea spray or from wind blowing across land, and emissions from other nearby fugitive sources such as urban areas which are not included within the model.

2.1.4 The main pollutants to be assessed are oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2) and fine particulate matter (referred to as PM_{10} and $PM_{2.5}$)[1]. In addition, construction activities have the potential to give rise to emissions of dust. These emissions have the potential to degrade air quality, affect human health and amenity and also affect protected and designated ecological habitats. Further information on these pollutants and associated terminology can be found in annex A.

2.2 Background air quality approach

2.2.1 In order to provide an assessment of the significance of any new development proposal (in terms of air quality), it is necessary to identify and understand the baseline air quality conditions at the assessed receptor locations within the study area. This provides a reference level against which any potential changes in air quality can be assessed. This would be achieved through determining the situation without the new development in place by modelling the relevant emission sources (e.g. a road) and adding the modelled concentrations at the assessed receptor locations to the background concentration. This would be repeated for the situation with the new development in place to determine the predicted change in concentrations of the assessed pollutants.

2.2.2 Sometimes the new development introduces an emission source where none existed previously and the background concentration alone may then be used to represent the baseline air quality conditions (i.e. the background concentration is directly representative of the baseline air quality conditions

[1] PM_{10} and $PM_{2.5}$ – particulate matter of less than 10µm and 2.5µm diameter, respectively.

and no modelling is required for the situation without the new development in place).

2.3 Receptor identification

2.3.1 The construction and operational air quality assessments will include consideration of the following sensitive receptors in the vicinity of the Wylfa Newydd Development Area, Off-Site Power Station Facilities and Associated Developments, including those sensitive receptors close to relevant road links experiencing changes in traffic flows due to the Wylfa Newydd Project.

Human receptors

2.3.2 Human receptors include residential dwellings, schools, hospitals, places of worship, recreational areas or other air quality sensitive locations such as footpaths and gardens or areas where members of the public have access. In general, the AQOs are not applicable at places of work where members of the public do not have regular access [RD3]; however, relevant receptor locations representing appropriate work places will be considered within the assessments.

2.3.3 A report was submitted to the IACC, Natural Resources Wales (NRW) and other councils on mainland Wales [RD4], which set out the proposed study areas and receptor selection methodology. The report includes a description of how the receptors representing sensitive areas or properties within the vicinity of the Wylfa Newydd Development Area (including Cemaes, Tregele and other villages or individual properties or relevant exposure locations) and respective Off-Site Power Station Facilities and Associated Development sites would be specified. It also describes how receptor locations in the proximity of the relevant road links which experience changes in traffic flows above the relevant thresholds for assessment would be identified and assessed. Other local authorities have also been contacted in relation to the assessment of road traffic emissions on mainland Wales. A summary of the study areas is provided below.

2.3.4 There are a number of different types of potential air quality effects or emission sources that require assessment, as well as different locations to consider. As a result, the air quality study area cannot be defined within a fixed boundary for all activities, but will necessarily vary between the different activities and sites.

2.3.5 The different study areas are discussed below for the following air quality effects:

- emissions of dust during construction activities;
- plant, machinery and marine vessel emissions during construction activities;
- road traffic emissions during the construction and operation phases; and
- combustion plant emissions during the operation phase.

2.3.6 For dust emissions, the assessment at human receptors focuses on areas extending up to 350m from the respective site boundary. This distance is based on Institute of Air Quality Management (IAQM) guidance for identifying when an assessment of dust effect is required [RD5].

2.3.7 For emissions from construction plant and machinery, the assessment focuses on areas up to 2km from the respective site boundaries. This 2km radius encompasses an area where the highest potential effects may occur due to emissions to air from the relevant sources within the respective sites.

2.3.8 For emissions from combustion plant such as boilers or diesel generators, where applicable, the study area for air quality assessment during the operational stage includes human receptors within 2km of the respective site boundaries.

2.3.9 The study area for the assessment of emissions from road traffic is based on identifying where the construction or operation phases of the Wylfa Newydd Project components would lead to a change in traffic flows on the road network which exceeds the relevant thresholds set out in the Environmental Protection UK (EPUK) and IAQM guidance [RD6]. Receptors up to 200m from the affected roads were specified for the assessment.

2.3.10 The key pollutants associated with the construction or operation of a Wylfa Newydd Project facility which will be modelled at human receptors include NO_2, PM_{10}, $PM_{2.5}$, SO_2 and CO. The key pollutants to be modelled at receptors where potential impacts are associated solely with vehicle traffic will be NO_2, PM_{10} and $PM_{2.5}$.

Ecological receptors

2.3.11 The ecological receptors will include designated ecological sites (e.g. SSSIs, SACs, SPAs (including a candidate SAC) and Ramsar Site) and other relevant sites (e.g. Wildlife Sites and ancient woodlands) which are sensitive to air pollution. Sites which are designated for geological reasons which are not sensitive to air pollution will not be included within the assessment. The assessment will consider all relevant designated sites including marine and coastal habitats, as well as other inland sites, which are within the respective study areas and which are sensitive to air pollution.

2.3.12 The key pollutants which will be modelled at the ecological receptors include NO_x and SO_2. Another aspect of the assessment requires consideration of the deposition of nutrient nitrogen and acid at the ecological receptors derived from the modelled ambient NO_x and SO_2 concentrations. The modelled concentrations and deposition rates will be compared to the relevant critical levels and critical loads, respectively (the critical levels are thresholds for the ambient concentration of a pollutant and the critical load is a limit on the deposition rate of a substance across a defined area). A description of nitrogen and acid deposition is provided in annex A.

2.3.13 The study area for ecological receptors is based on the Environment Agency risk assessment guidance [RD7] (adopted by NRW), which recommends 15km for European Designated Sites (i.e. SACs, SPAs and Ramsar Sites) and 2km for all other sites, including SSSIs, national nature reserves, local nature reserves, Wildlife Sites and ancient woodlands. This was applied to the assessment of all sources at the Wylfa Newydd Development Area.

2.3.14 For the assessment of sources at the Park and Ride, a study area of 2km was adopted. Study areas were not required to be defined for the assessment of pollutant emissions at the other Wylfa Newydd Project sites.

2.3.15 For the assessment of emissions from road traffic, a study area of 200m from the assessed roads was adopted. As discussed above for human receptors, the assessed roads were identified by comparing the change in traffic flows associated with the Wylfa Newydd Project to the thresholds set out in the EPUK/IAQM guidance [RD6].

2.3.16 A schedule of ecological sites which are within the various assessment study areas has been defined. A separate report has been produced which provides the details of the existing deposition rates and the relevant assessment criteria (known as critical loads) for the assessment of nitrogen and acid deposition at the ecological sites within the study areas described above. The report has been submitted to NRW and the IACC [RD8]. The baseline nitrogen and acid deposition rates are not discussed further in this report.

2.4 Data sources

2.4.1 The sources of data considered in the process of determining the background concentrations in the vicinity of the Wylfa Newydd Development Area, Off-Site Power Station Facilities and Associated Developments, including locations close to assessed road links such as the A55 and A5025 (or other relevant roads on mainland Wales), are as follows:

- measurements of air quality carried out by the IACC as part of the LAQM process[2] or to help inform its response to the DCO application;
- measurements of PM_{10} and $PM_{2.5}$ carried out by the IACC within or close to the Wylfa Newydd Development Area to help inform its response to the DCO application;
- measurements of air quality carried out by GC, Conwy County Borough Council (CCBC), Denbighshire County Council (DCC) and Flintshire County Council (FCC) as part of the LAQM process; and
- background mapping of air quality produced by Defra and the devolved administrations [RD9].

2.4.2 A supplementary air quality monitoring survey was also initiated by Horizon with the IACC in February 2016. The survey focuses on the key pollutant NO_2 and comprises passive diffusion tube measurements at locations in the vicinity of the Wylfa Newydd Development Area, various Off-Site Power Station Facilities and Associated Developments, as well as adjacent to the road network which would experience increases in traffic flows as a result of the Wylfa Newydd Project. The monitoring method and locations were discussed and agreed with the IACC. A technical memo was issued to the IACC prior to the commencement of the survey to facilitate these discussions [RD10]. The IACC undertook the monitoring survey, including tube placement, tube changes and managing the analysis of the exposed tubes via a third party laboratory (Environmental Scientifics Group Ltd). The monitoring survey was undertaken using the same approach and method as the other IACC NO_2 passive diffusion tube survey undertaken for the LAQM process including use of the same diffusion tube type and analysis by the same laboratory. This

[2] The *Environment Act 1995* introduced the system of LAQM in the UK. This requires local authorities to review and assess air quality within their boundaries regularly and systematically against the AQOs, and appraise development and transport plans against these assessments.

facilitated the use of the same approach as the IACC for specifying the bias adjustment factor to be applied to the measured concentrations.

2.4.3 The data obtained from the above data sources are discussed in more detail in section 3 of this report.

3 Data

3.1 AQOs

3.1.1 To provide context to the baseline data set out in this section, the AQOs for the protection of human health relevant to the assessment are set out in table 3-1.

Table 3-1: AQOs for the protection of human health

Pollutant	Concentration ($\mu g/m^3$)	Measured as
NO_2	40	Annual mean
	200	One-hour mean not to be exceeded more than 18 times per year (equivalent to the 99.8th percentile)
PM_{10}	40	Annual mean
	50	24-hour mean not to be exceeded more than 35 times per year (equivalent to the 90.4th percentile)
$PM_{2.5}$	25	Annual mean
SO_2	266	15-minute mean not to be exceeded more than 35 times per year (equivalent to the 99.9th percentile)
	350	One-hour mean not to be exceeded more than 24 times per year (equivalent to the 99.7th percentile)
	125	24-hour mean not to be exceeded more than three times per year (equivalent to the 99.2nd percentile)
CO	10,000	Maximum running eight-hour mean
	30,000	Maximum one-hour mean (Environmental Assessment Level set out in the Environment Agency risk assessment guidance (Environment Agency, 2016))

3.1.2 The AQOs and Environmental Assessment Levels for the protection of ecological receptors relevant to the assessment are set out in table 3-2.

Table 3-2: AQOs and Environmental Assessment Levels for the protection of ecological receptors

Pollutant	Concentration ($\mu g/m^3$)	Measured as
NO_x	30	Annual mean
	75	Maximum 24-hour mean (for sensitive lichen communities & bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystem's integrity) [1]
	200	Maximum 24-hour mean [1]
SO_2	10	Annual mean (for sensitive lichen communities and bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystem's integrity)
	20	Annual mean

Note 1: as agreed with NRW via the provision of a Technical Note [RD11] and subsequent communication with NRW [RD12].

3.2 Existing baseline conditions

IACC

3.2.1 The Wylfa Newydd Project is located within the jurisdiction of the IACC. As part of the LAQM process, the IACC undertakes an annual review of air quality in its area to determine whether the AQOs for a number of key air pollutants will be achieved. This review is undertaken on an ongoing basis, and is reported annually to Defra and the devolved administrations.

3.2.2 As part of this review process, the IACC has undertaken measurements of a number of pollutants in recent years, including NO_2, particulates (PM_{10} and $PM_{2.5}$) and SO_2. Although not covered by an AQO, the IACC has also carried out measurements of dust deposition. In addition, the IACC has undertaken measurements of some pollutants in the vicinity of the Wylfa Newydd Development Area and A5025 to help inform its response to the DCO application.

3.2.3 For the purposes of this report, a number of the air quality reports produced by the IACC as part of the LAQM process and data were obtained and reviewed [RD13; RD14; RD15; RD16; RD17; RD18; RD19; RD20]. In addition to these reports, a North Wales Combined Authority air quality report was obtained and reviewed [RD21]. The most recent reports (and previous reports) concluded that there is currently no risk of the AQOs being exceeded for any of the pollutants specified in table 3-1 on Anglesey.

3.2.4 Whilst the majority of measured NO_2 concentrations were shown to be below the relevant AQO, the reports identified one location where the measured annual mean NO_2 concentration was above the AQO value of $40\mu g/m^3$ in previous years. This was at a roadside site, adjacent to a layby on the A55 at Llanfair Pwllgwyngyll. There is no relevant long-term exposure as close to the

A55 as the roadside monitoring site, and the IACC concluded that there is no risk of the AQOs for NO_2 being exceeded due to road traffic emissions from the A55. This is discussed in more detail below.

3.2.5 The IACC has not declared any AQMAs, and no detailed assessments are currently required as part of the LAQM process.

3.2.6 The IACC reports indicate that air quality on Anglesey is considered to be good and background concentrations at locations away from pollution sources such as busy roads or other transport or industrial sources are relatively low and well below the relevant AQOs.

Measured data for key pollutants

3.2.7 Over the last several years, the IACC has undertaken measurements of NO_2, PM_{10} and $PM_{2.5}$ at different locations across the island and these are discussed below.

NO_2

3.2.8 A summary of the latest results obtained by the IACC for each location is set out in table 3-3, representing the concentration recorded over the period of a year.

Table 3-3: Summary of measured NO_2 data

Monitoring location	Co-ordinates		Site type	Year	Data capture (%)	Measured annual mean concentration (µg/m^3)
	E	N				
A55 at Llanfair Pwllgwyngyll (layby)	252527	372031	Roadside	2016	100	39.7
Bryn Cefni Ind. Est., Llangefni	246410	375080	Industrial	2012/ 2013	100	11[1]
W.R.Davis, Bryn Cefni Roundabout, Llangefni	246151	374654	Roadside	2014/ 2015	100	11.7[2]
Lon Tudur, Chapel Street, Llangefni	246534	375600	Roadside	2014/ 2015	100	14.1[2]
Park Mount, Glanhwfa Road, Llangefni	245678	374882	Roadside	2014/ 2015	100	11.9[2]
Bull Hotel, Bulkeley Square, Llangefni	245926	375688	Roadside	2016	50	28.0[6]
Ysgol-y-Bont, Llangefni	245262	375876	Specific	2014/ 2015	100	6.5[2]

Monitoring location	Co-ordinates		Site type	Year	Data capture (%)	Measured annual mean concentration (µg/m^3)
	E	N				
Lon Cildwrn, Llangefni	245294	375930	Roadside	2014/ 2015	100	9.8[2]
Near Capel Coch	245070	381120	Rural	2012	75	4.9
				2012/ 2013	100	7.3[1]
Llanfair Pwllgwyngyll Village	252986	371589	Roadside	2013/ 2014	100	12.2[3]
Newry Beach, Holyhead	224570	383169	Roadside	2010/ 2011	100	11.5[4]
RAF Valley (Gymnasium)	231473	376184	Rural (near airfield)	2013/ 2014	92	5.1[3]
A5025, Llanfachraeth	231506	382412	Roadside	2011/ 2012	75	7.3[5]
A5025, Llanfaethlu	231447	386901	Roadside	2011/ 2012	100	6.8[5]
A5025, Tregele	235774	392938	Roadside	2011/ 2012	100	6.8[5]
A5025, Cemaes	236932	393102	Roadside	2011/ 2012	100	7.2[5]

Note 1: Annual mean reported by the IACC based on 12 months of data (six months of data from 2012 combined with six months' data from 2013).

Note 2: Annual mean reported by the IACC based on 12 months of data (six months of data from 2014 combined with six months' data from 2015).

Note 3: Annual mean reported by the IACC based on 12 months of data (six months of data from 2013 combined with six months' data from 2014).

Note 4 Annual mean reported by the IACC based on 12 months of data (six months of data from 2010 combined with six months of data from 2011).

Note 5: Annual mean reported by the IACC based on 12 months of data (nine months of data from 2011 combined with three months of data from 2012).

Note 6: Annual mean concentration reported by the IACC (annualised).

3.2.9 A summary of the results from the supplementary NO_2 diffusion tube monitoring survey undertaken by the IACC are set out in table 3-4 [RD21].

Table 3-4: Summary of measured NO_2 data (supplementary monitoring survey undertaken by the IACC)

Diffusion tube ID	Monitoring location	Co-ordinates		Site type	Measured average concentration[1] ($\mu g/m^3$)
		E	N		
A	A55 at Llanfair Pwllgwyngyll	253263	372367	Roadside	45.2
B	Adj to A55 nr J5 of the A55	237267	376129	Roadside	9.8
C2	Holyhead Road nr J4 of the A55 (adjacent to Park and Ride)	232573	378407	Roadside	11.3
D	A5025 in Valley	229588	379382	Roadside	15.3
E	A5025 in Llanfachraeth	231593	382274	Roadside	9.9
F	A5025 in Llanfaethlu	231555	387112	Roadside	9.5
G	A5025 near Cefn Coch	234152	390193	Roadside	7.0
H	A5025 in Tregele	235575	392545	Roadside	10.2
I	A5025 in Cemaes	236752	393090	Roadside	9.0
J	Maes Cynfor, Cemaes	236891	393381	Rural (in urban area)	6.7
K	A5025 in Amlwch near Stryd Mona junction	244130	392885	Roadside	12.7
L	A5025 in Amlwch near Salem Street junction	244270	392498	Roadside	11.2

Note 1: These data are based on an 11 month monitoring period between 9 Februray 2016 and 04 January 2017 as reported in the North Wales Combined Authoirty LAQM report [RD 21] (a bias adjustment factor of 0.78 was used).

3.2.10 The data set out in table 3-3 and table 3-4 indicate that the annual mean NO_2 concentrations in the vicinity of the Wylfa Newydd Development Area, sections of the A5025 On-line and Off-line Highway Improvements, other Associated Developments and Off-Site Power Station Facilities are low.

3.2.11 The nearest measurements of NO_2 to the Wylfa Newydd Development Area are the locations adjacent to the A5025 in Tregele and Cemaes and one location within Cemaes. The results showed that the measured annual mean concentrations were low, ranging from 6.8µg/m^3 to 7.2µg/m^3 during the

2011/2012 survey and from 6.7µg/m^3 to 10.2µg/m^3 during the 2016 survey. The measured concentrations are well within the annual mean AQO of 40µg/m^3. The measurements adjacent to the A5025 indicate that roadside concentrations are between approximately 2µg/m^3 to 5µg/m^3 higher than the rural background concentrations recorded during the IACC and supplementary surveys.

3.2.12 The measured concentrations adjacent to the A5025 from the junction with the A5 at Valley to the vicinity of the Wylfa Newydd Development Area range from 6.7µg/m^3 to 15.3µg/m^3, with the majority of measured concentrations between approximately 7µg/m^3 and 10µg/m^3. The measurement at Valley shows a higher than expected concentration. The IACC indicated that this is likely to be due to higher emissions from vehicles travelling north which accelerate away from the junction with the A5[3]. The measurements adjacent to the A5025 in the 2011/2012 survey were generally lower than those recorded in the 2016 survey. However, this is expected as the majority of the 2011/2012 survey tubes were located on the upwind side of the A5025 (i.e. on the west or south side of the A5025, which is upwind of the prevailing wind direction, depending on alignment of the A5025, from the southwest). The 2016 measurements adjacent to the A5025 were mostly located on the downwind side of the road (i.e. the east side) so would be expected to record higher annual mean concentrations. The Llanfechell location (Tube ID G) was located on the west side of the A5025 (i.e. upwind of the prevailing wind direction). The measured annual mean concentration of 7.0µg/m^3 is consistent with the 2011/2012 IACC measurements adjacent to the A5025, which ranged from 6.8µg/m^3 to 7.3µg/m^3.

3.2.13 Other measurements within urban areas, either within industrial areas or close to roads within the urban areas, range from 11.0µg/m^3 (measured at Bryn Cefni Industrial Estate, Llangefni during 2012/2013) to 28.0µg/m^3 (measured (and annualised) at Bull Hotel, Bulkeley Square, Llangefni during 2016)), which are considerably lower than the annual mean AQO of 40µg/m^3. The two locations adjacent to the A5025 in Amlwch recorded similar concentrations of 11.2µg/m^3 and 12.7µg/m^3.

3.2.14 The highest recorded concentrations are those measured adjacent to the A55. The IACC Llanfair Pwllgwyngyll bypass monitoring location is within 1m of the kerb of the A55 and close to a lay-by. The latest annual mean concentration of 39.7µg/m^3 recorded in 2016 is within the annual mean AQO of 40µg/m^3, although measured annual mean concentrations from 2001 to 2013 have exceeded 40µg/m^3. However, there are no nearby relevant exposure locations such as residential properties at this location. The nearest residential property to the A55 is approximately 30m from the kerbside in this area of the A55 [RD21]; air pollution concentrations decrease rapidly further away from the road source. The IACC estimated that the concentration at 30m from the kerbside would be much lower, at approximately 20µg/m^3 [RD21]. An annual mean concentration of 45.2µg/m^3 was recorded at diffusion tube A (the supplementary survey) located adjacent to the A55 at Llanfair Pwllgwyngyll. This location is approximately 3m from the A55 carriageway and approximately 780m northeast of the IACC LAQM monitoring location as described above.

[3] Based on observations at the measurement location made by the IACC (discussed in a meeting held with the IACC on 10 February 2017).

The nearest residential property to the A55 near this location is approximately 24m from the kerbside, and therefore the concentration at this property would be well within the annual mean AQO of 40µg/m^3.

3.2.15 Measurements recorded by other councils adjacent to the A55 on mainland Wales are discussed in more detail later in this section. However, these show that the concentrations recorded adjacent to the A55 at Llanfair Pwllgwyngyll are higher than those recorded on mainland Wales, even though traffic flows are lower than on the mainland. This may be due to local effects, including the alignment of the A55 with the prevailing wind direction (i.e. wind blowing from the southwest) at the Llanfair Pwllgwyngyll monitoring locations.

3.2.16 A map showing the relevant IACC NO_2 monitoring locations, including those locations selected for the supplementary monitoring survey, is provided in figure 12, within section 8 of this report.

PM_{10} and $PM_{2.5}$

3.2.17 The IACC undertook measurements of PM_{10} and $PM_{2.5}$ at the Wylfa Newydd Development Area between 22 March 2013 and 13 January 2014 (E 235519, N 393315). The results show that the measured concentrations were 14.4µg/m^3 and 7.8µg/m^3 for PM_{10} and $PM_{2.5}$, respectively. This indicates PM_{10} and $PM_{2.5}$ concentrations are well within the relevant annual mean AQOs (40µg/m^3 and 25µg/m^3, respectively) in the vicinity of the Wylfa Newydd Development Area. There were no 24-hour periods where the average PM_{10} concentration was higher than 50µg/m^3 (35 exceedances of 50µg/m^3 are allowed per year by the AQO).

3.2.18 In December 2015, the IACC commenced measurements of PM_{10} and $PM_{2.5}$ at a residential property immediately to the west of the Wylfa Newydd Development Area (E 234355, N 393310). The measured annual average concentration for 2016 was 14.9µg/m^3 and 7.4µg/m^3 for PM_{10} and $PM_{2.5}$, respectively. The measured data indicate PM_{10} and $PM_{2.5}$ concentrations are well within the relevant annual mean AQOs (40µg/m^3 and 25µg/m^3, respectively) in the vicinity of the Wylfa Newydd Development Area. There were no 24-hour periods where the average PM_{10} concentration was higher than 50µg/m^3 (35 exceedances of 50µg/m^3 are allowed by the AQO). The measured annual mean concentrations are similar to the concentrations recorded nearby in 2013/2014 as discussed above.

3.2.19 Other measurements of PM_{10} and $PM_{2.5}$ have been carried out by the IACC at locations close to specific sources of particulate emissions, such as quarries and a composting site (Llynfaes, Brynteg and Penhesgyn). PM_{10} and $PM_{2.5}$ measurements have also been recorded at an urban background location in Llangefni. A summary of the PM_{10} and $PM_{2.5}$ results for each location is set out in table 3-5 and table 3-6, respectively. These were obtained from the latest IACC LAQM monitoring reports [RD17; RD18; RD19] and North Wales Combined Authority report [RD20], data issued by the IACC [RD22; RD23; RD24] and from the Air Quality in Wales website [RD25] for $PM_{2.5}$.

Table 3-5: Summary of measured PM_{10} data

Monitoring location	Site type	Measured annual mean concentration ($\mu g/m^3$)						
		2010	2011	2012	2013	2014	2015	2016
Llynfaes	Near quarry	17.9	19.8	25.4	19.2	13.8	17.2	18.8
Brynteg	Near quarry	13.2	18.2	15.6	15.2	17.6	13.1	8.1[4,5]
Wylfa Newydd Development Area	Near Existing Power Station	-	-	-	14.4[2]		-	-
Llangefni	Urban background	-	16.8	14.6	16.8	12.9	13.8[3]	-
Penhesgyn	Near composting site	-	16.2[1]	14.3[1]	-	9.8	10.4	9.1[5]
Felin Cafnan	Near Wylfa Newydd Development Area	-	-	-	-	-	-	14.9

Note 1: Different monitoring location at same site compared to 2014 onwards location.
Note 2: Monitoring period from March 2013 to January 2014.
Note 3: Monitoring period from January 2015 to May 2015.
Note 4: Potential data quality issues raised by the IACC.
Note 5: Annual mean concentration reported by the IACC annualised.

Table 3-6: Summary of measured $PM_{2.5}$ data

Monitoring location	Site type	Measured annual mean concentration ($\mu g/m^3$)						
		2010	2011	2012	2013	2014	2015	2016
Llynfaes	Near quarry	6.8	7.8	7.6	7.8	6.4	7.2	6.1
Brynteg	Near quarry	6.2	8.5	7.9	7.2	6.9	6.0	4.0 [4,5]
Wylfa Newydd Development Area	Near Existing Power Station	-	-	-	7.8[2]		-	-
Llangefni	Urban background	-	-	-	-	-	8.7[3]	-
Penhesgyn	Near composting site	-	9.0[1]	7.0[1]	-	5.4	6.5	5.4[5]
Felin Cafnan	Near Wylfa Newydd Development Area	-	-	-	-	-	-	7.4

Note 1: Different monitoring location at same site compared to 2014 location.

Note 2: Monitoring period from March 2013 to January 2014.

Note 3: Monitoring period from January 2015 to May 2015.

Note 4: Potential data quality issues raised by the IACC.

Note 5: Annual mean concentration reported by the IACC (annualised).

3.2.20 The data indicate that PM_{10} concentrations are slightly higher near to the quarry location at Llynfaes, and less so for Brynteg. However, these locations are not considered representative of the Wylfa Newydd Project air quality assessment study areas. For $PM_{2.5}$, table 3-6 indicates the measured $PM_{2.5}$ concentrations are well within the annual mean AQO of $25\mu g/m^3$.

3.2.21 A map showing the relevant IACC particulate monitoring locations is provided in figure 12 within section 8 of this report.

SO_2 and CO

3.2.22 Measurements of SO_2 were carried out in 2009/10 by the IACC at Holyhead train station. These showed that there were no exceedances of the 15-minute, one-hour or 24-hour mean AQO values. No information on the annual mean concentration was included within the 2010 Progress Report [RD13], and no further monitoring has been recorded.

3.2.23 In common with most local authorities across the UK, no measurements of CO have been undertaken by the IACC.

3.2.24 In general, concentrations of these pollutants are relatively low and are highly unlikely to exceed the AQOs. Most local authorities across the UK do not monitor these pollutants unless there is a specific requirement such as the presence of a significant industrial source.

Measured dust deposition data

3.2.25 The IACC has also carried out dust deposition monitoring at several locations in the vicinity of the Wylfa Newydd Development Area. The resulting data will be used to inform the assessment of dust from construction activities but will not be utilised quantitatively in the manner described for the key air pollutants. The dust deposition data would be used to inform the setting of the site action levels/thresholds for any future dust deposition monitoring undertaken during the Enabling Works and Main Construction activities within the Wylfa Newydd Development Area. The measured annual average dust deposition values, calculated from monthly samples recorded over the period of a year, are presented below in table 3-7. The reports setting out the description of the monitoring locations and other relevant details were provided by the IACC [RD26; RD27] and the average dust deposition rates were obtained from the IACC's 2014 Air Quality Progress Report [RD17] or provided by the IACC [RD23].

Table 3-7: Summary of measured dust deposition data

Monitoring location	Description	Co-ordinates		Year	Measured average dust deposition ($mg/m^2/day$)
		E	N		
Cemlyn	To west and north of the Wylfa Newydd Development Area	234493	393112	2012	33.9
Cemaes	To east of the Wylfa Newydd Development Area	236021	393012		26.4
Tregele	To east and south of the Wylfa Newydd Development Area	235616	392715		26.1
Wylfa	Within the Wylfa Newydd Development Area	235519	393315	2013	33.3
Anglesey Felin Cafnan	Adjacent to the Wylfa Newydd Development Area	234385	393306	2016	25.8
Tyddyn Sydney	To west of the Wylfa Newydd Development Area	233569	392979	2016	35.8

3.2.26 The results of the surveys were indicative of the dust deposition levels for 'open country' as described in the IACC reports, which are based on the suggested guidelines for deposited ambient dust in work undertaken by Stockholm Environment Institute at York [RD28]. The measurements recorded in 2016 in close proximity to the Wylfa Newydd Development Area were similar to those recorded in 2012 and 2013, indicating little variation in background dust deposition over time.

3.2.27 A map showing the relevant IACC dust deposition monitoring locations is provided in figure 12 within section 8 of this report.

Mainland Wales (GC, CCBC, DCC and FCC)

Measured data for key pollutants

3.2.28 As with the IACC, the local authorities on mainland Wales (GC, CCBC, DCC and FCC) have also undertaken measurements of NO_2 at different locations over recent years as part of the LAQM process. Some measurements of PM_{10} have also been recorded. As part of the LAQM process, the latest air quality reports produced by GC, CCBC, DCC, FCC and the North Wales Combined Authority report were obtained and reviewed [RD21; RD29; RD30; RD31; RD32]. GC, CCBC, DCC and FCC have not declared any AQMAs within their local authority areas and no detailed assessments required as part of the LAQM process are currently planned.

3.2.29 The NO_2 and PM_{10} monitoring locations described below are shown in figure 13 within section 8 of this report.

NO_2

3.2.30 A summary of the latest results for measurements of NO_2 close to the main road network within each council area (specifically those roads which may conceivably experience the largest changes in traffic flows above the relevant assessment thresholds and would require assessment) are set out in table 3-8, table 3-9 and table 3-10. The road which is anticipated to experience changes in traffic flows above the relevant assessment thresholds and would require assessment is the A55 and the measurements are discussed below. Measurements for the A487 and A5 within the GC area are also included for information.

Table 3-8: Summary of measured NO_2 data close to the A55

Council	Monitoring reference and location	Co-ordinates		Distance to edge of A55	Measured annual mean concentration (µg/m^3)					
		E	N		2011	2012	2013	2014	2015	2016
GC	GCC/038, A55 Bangor	254982[1]	369725[1]	2m (2011 – 2012)	38.3	36.9	28.3	29.9	27.5	28.6
	GCC/039, A55 Bangor (co-located)			N/A (2012 – 2015)[1]	38.5	35.1	26.5	28.0	27.7	28.4
CCBC	CBC-017[2]	284526	379417	24m	18.7	20.3	19.6	18.1	19.1	19.0
	CBC-018[3]	295049	378144	9m	21.8	23.0	21.8	19.4	22.6	20.9
	CBC-021[4]	268572	375472	25m	16.1	17.4	16.2	15.2	16.8	17.7
	CBC-022[5]	282362	378757	38m	19.7	19.8	19.9	18.9	19.3	20.7
	CBC-033[6]	286677	378645	18m	17.6	18.7	17.1	16.8	15.5	13.8
DCC	DBR5, A55 St Asaph	302938	374638	38m	13.9	16.1	15.3	14.0	14.0	15.5
	DBR8, A55 St Asaph	303270	374640	132m	16.9	17.1	16.9	15.1	14.7	15.5
	DBR9, A55 St Asaph	303197	374830	56m	23.1	23.6	21.3	21.8	21.2	21.1
	DBR10, A55 St Asaph	303263	374867	64m	16.7	16.8	16.2	16.4	14.5	16.1
FCC	Site 46, A55 Northop	325136	368397	53m	20.8	18.6	15.1	11.6	12.5	12.7
	Site 49, A55 Broughton	333531	363028	15m	31.8	25.6	19.4	19.3	17.8	16.9

Note 1: From March 2011 until July 2012 the two tubes were located at E 256871, N 369493 approximately 4m from the A55 (at a layby). From September 2012 onwards the two tubes were located at E 254982, N 369725 (on a bridge above the A55 at Penrhos Road, to the east of junction 9 of the A55).

Note 2: Previously CCBC5, Kingsway, Colwyn Bay.

Note 3: Previously CCBC6, A55 Pensarn.

Note 4: Previously CCBC11, A55 Llanfairfechan.

Note 5: Previously CCBC12, Bryn Marl, Mochdre.

Note 6: Previously CCBC13, Beach Ave Old Colwyn.

3.2.31 The measured concentrations recorded by GC in close proximity to the A55 in 2011 and 2012 were lower than those measured by the IACC adjacent to the A55, despite traffic flows on the A55 being higher at the A55 Bangor measurement location than at the A55 Llanfair Pwllgwyngyll bypass location

(based on traffic flow data provided by the Department for Transport [RD33]). The measurements undertaken by CCBC demonstrate that concentrations generally reduce as distance increases from the A55 and are relatively consistent beyond 15m. All measurements are well within the annual mean AQO of 40µg/m^3.

Table 3-9: Summary of measured NO_2 data close to the A487

Council	Monitoring location	Co-ordinates		Distance to edge of A487	Measured annual mean concentration (µg/m^3)					
		E	N		2011	2012	2013	2014	2015	2016
GC	GCC/002, A487 Caernarfon	248147	363112	1m	42.6	40.4	33.9	34.3	31.1	31.4
	GCC/005, A487 Caernarfon	248892	364120	1m	21.5	33.1	32.0	33.0	29.6	27.6
	GCC/015, A487 Llanwnda	247770	358663	2m	24.9	26.2	24.2	23.9	21.4	24.8

3.2.32 The measurements adjacent to the A487 which have been carried out by GC indicate that measured concentrations in close proximity to the A487 are currently within the annual mean AQO of 40µg/m^3. Measurements at GCC/002 have previously exceeded the AQO; however, GC concluded that concentrations at a distance of 10m from the A487, where the nearest relevant exposure occurs at the monitoring location, were considerably lower, being between 23µg/m^3 and 24µg/m^3, and within the AQO [RD34, RD35]. Concentrations recorded at GCC/002 from 2013 to 2016 were below the AQO.

Table 3-10: Summary of measured NO_2 data close to the A5

Council	Monitoring location	Co-ordinates		Distance to edge of A5	Measured annual mean concentration (µg/m^3)					
		E	N		2011	2012	2013	2014	2015	2016
GC	GCC/013, A5 Bethesda	261529	367380	10m	22.1	22.2	20.7	21.0	19.6	21.9

3.2.33 The measurements adjacent to the A5 which have been carried out by GC indicate that measured concentrations in close proximity to the A5 are currently well within the annual mean AQO of 40µg/m^3.

PM_{10}

3.2.34 PM_{10} monitoring has been carried out by CCBC in close proximity to the A55, near the location of the NO_2 diffusion tube CCBC6 at Pensarn. No other measurements have been carried out close to the considered roads. The PM_{10} monitoring data are summarised in table 3-11.

Table 3-11: Summary of measured PM_{10} data close to the A55

Council	Monitoring location	Co-ordinates		Distance to edge of A55	Measured annual mean concentration (µg/m^3)	
		E	N		2014	2015
CCBC	CCBC PM10/3, A55 Pensarn	295033	378174	9.5m	18.1	16.6[2]

Note 1: Annual mean concentration annualised by CCBC as data capture was less than 75% (data for January to August).

3.2.35 The measurements adjacent to the A55 carried out by CCBC indicate that measured PM_{10} concentrations in close proximity to the A55 are currently well within the annual mean AQO of 40µg/m^3.

Defra background mapping data

3.2.36 Defra and the devolved administrations provide empirically derived background maps, which give estimates of background pollutant concentrations on a 1km by 1km grid square resolution across the UK. These represent the average concentration across the 1km by 1km square (i.e. the background map concentrations do not provide the concentrations at a specific location, for example adjacent to a road source). The data were obtained from the Defra UK-Air Information Resource website [RD9]. The data for NO_x, NO_2, PM_{10} and $PM_{2.5}$ are based on maps with a base year of 2013 from which future years can be projected generally based on a decreasing trend. Maps are also available for SO_2 and CO, and these are based on maps with a base year of 2001.

3.2.37 The data for Anglesey were reviewed and showed that the modelled air quality concentrations are all relatively low at most locations across Anglesey, including in the vicinity of the Wylfa Newydd Development Area, Off-Site Power Station Facilities and Associated Development sites.

3.2.38 Where appropriate, a cross-check against the measured data was undertaken to understand how representative the background maps were for determining the background concentrations in the vicinity of the Wylfa Newydd Development Area, Off-Site Power Station Facilities and Associated Development sites. These are discussed in section 5.

4 Evolution of the air quality baseline methodology

4.1 Introduction

4.1.1 An integral part of the air quality assessment is the specification of background concentrations for the future modelled scenarios. Before considering how the air quality baseline will change into the future, it is necessary to understand how air quality has changed over the last two decades on both a national and local level and the primary reasons for this. The last two decades of air quality trends can be used to understand how the baseline air quality may evolve in the future.

4.2 Long term trends – UK wide

4.2.1 Generally, over the long term, air quality is anticipated to improve as emissions from road traffic, the main source of air pollution in the UK, are reduced through improved vehicle technology and exhaust control measures, and emissions from industrial sources also decline, due to progressive tightening of regulatory standards. However, in the last decade or so, the downward trend in NO_2 air pollution has not matched the anticipated reduction, and in many places, particularly roadside locations in urban areas, there is a flat trend. This has been attributed to a number of factors, but primarily to the discrepancy between the emissions measured during real-world driving versus those measured during vehicle testing in laboratories for compliance with the European Vehicle Emission test standards, particularly for diesel engines. It is expected that the introduction of the more stringent Euro 6/IV engine emission standards, combined with stricter testing regimes will lead to future reductions in vehicle emissions, although the effectiveness of Euro 6/IV emissions standards remains uncertain due to continuing issues with real-world on-road performance.

4.2.2 The latest reports summarising air quality in the UK, produced by Defra and the devolved administrations [RD36; RD37] shows that, generally, ambient concentrations of NO_2 have decreased except for some busy roadside locations where concentrations have remained relatively constant between the late 1990s and 2010, despite reductions in the emissions of NO_x from road vehicles over the same period. There has been some decrease in NO_2 concentrations at these roadside sites observed since 2010, but it is not known if this is a short-term variation or part of a longer-term decreasing trend.

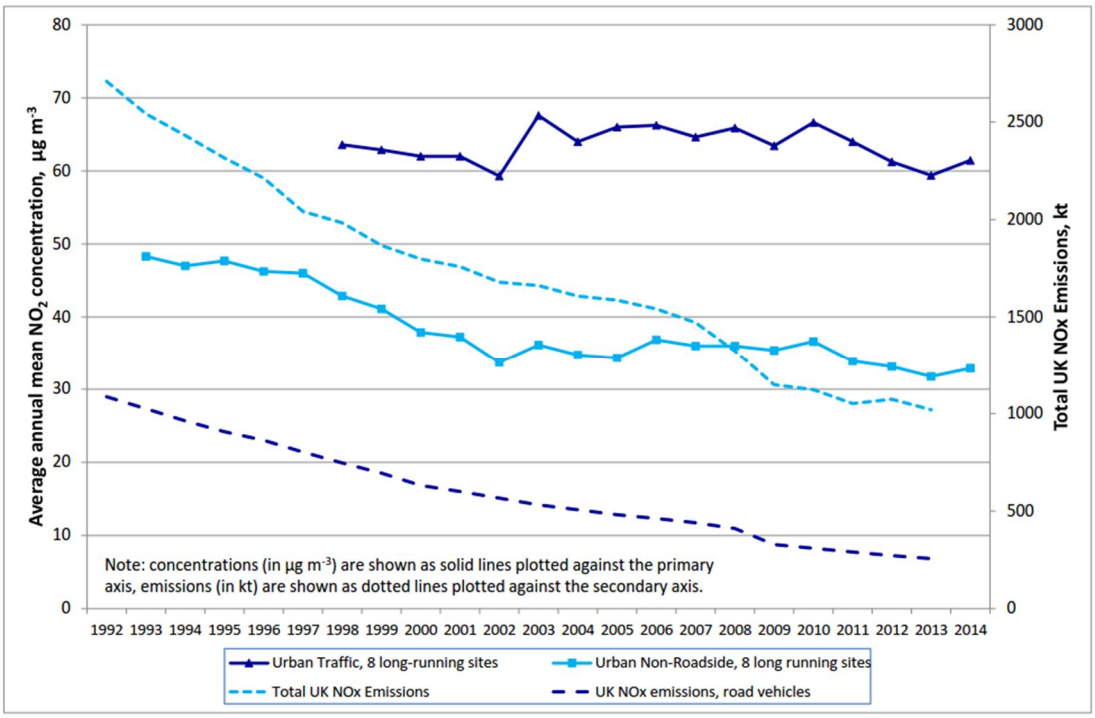
4.2.3 The following graphs have been reproduced from the 2015 and 2017 Defra reports [RD36; RD37] to highlight the historical changes in pollutant concentrations across the UK.

4.2.4 Figure 1 shows the change in average annual mean NO_2 concentrations between 1992 and 2014 across the UK. It also presents the annual emissions in kilotonnes over the same period.

4.2.5 Figure 1 indicates that the average annual mean NO_2 concentration as an average across the eight urban background (non-roadside) sites across the UK has generally declined, reflecting a general decrease in NO_x emissions until 2002. Since 2002, the decrease in ambient concentrations has slowed

compared to the decrease in total UK or road vehicle NO_x emissions. No apparent decreasing trend is observed for the eight long-running sites located at roadsides within urban areas.

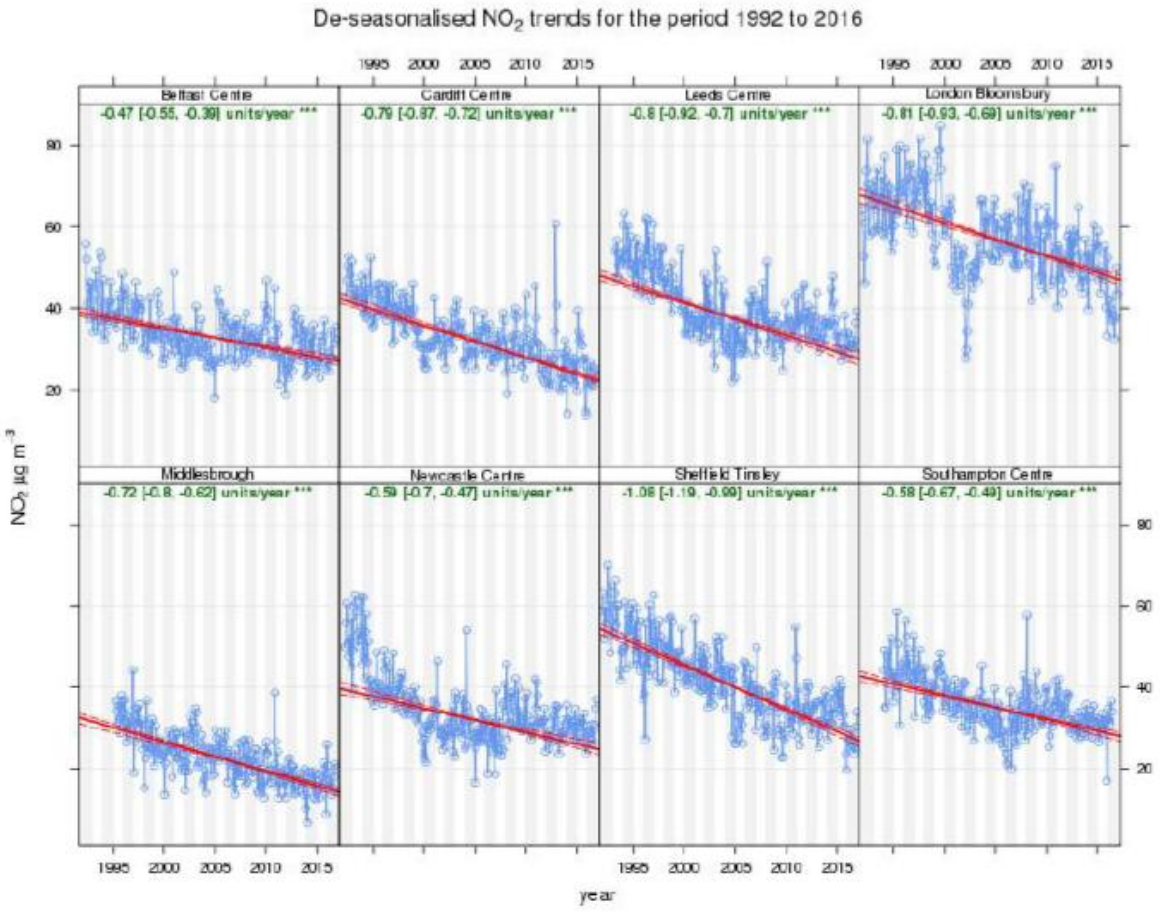
Figure 1: Average annual mean NO_2 concentration: background urban and traffic urban sites [RD36]



4.2.6 A figure from the 2017 Defra report [RD37] is reproduced in figure 2, which summarises the changes in average annual mean NO_2 concentrations between 1992 and 2016 as measured by the Automatic Urban and Rural Network (AURN) at eight urban background sites across the UK.

4.2.7 Figure 2 indicates that all eight long-running urban non-roadside sites show a decreasing trend in NO_2, although the magnitude of the year-on-year decrease varies (ranging from -0.5µg/m^3 to -1.1µg/m^3 per year) between each site.

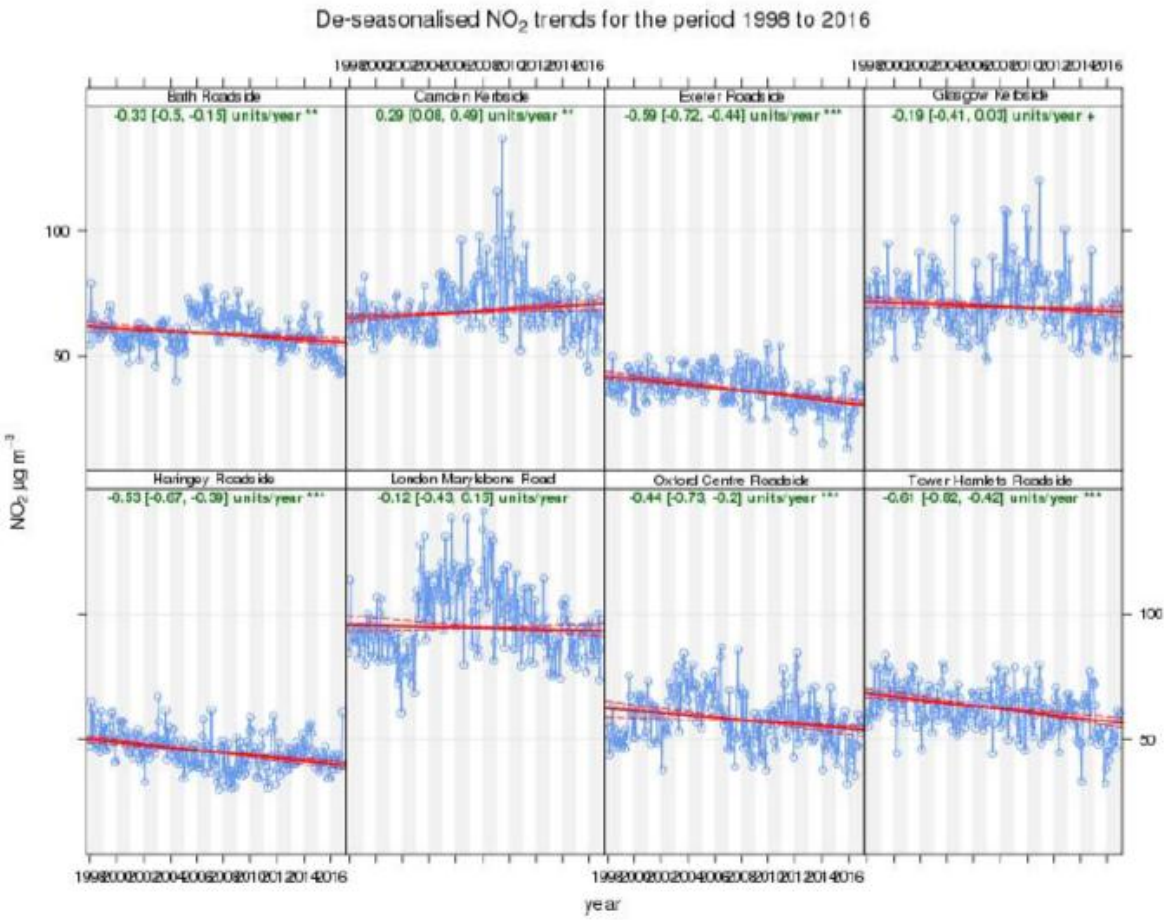
Figure 2: Average annual mean NO_2 concentration: trend analysis for eight long-running urban background AURN sites 1992 – 2016 (de-seasonalised) [RD37]



4.2.8 Figure 3 [RD37] summarises the changes in average annual mean NO_2 concentrations at eight urban traffic sites operating between 1998 and 2016.

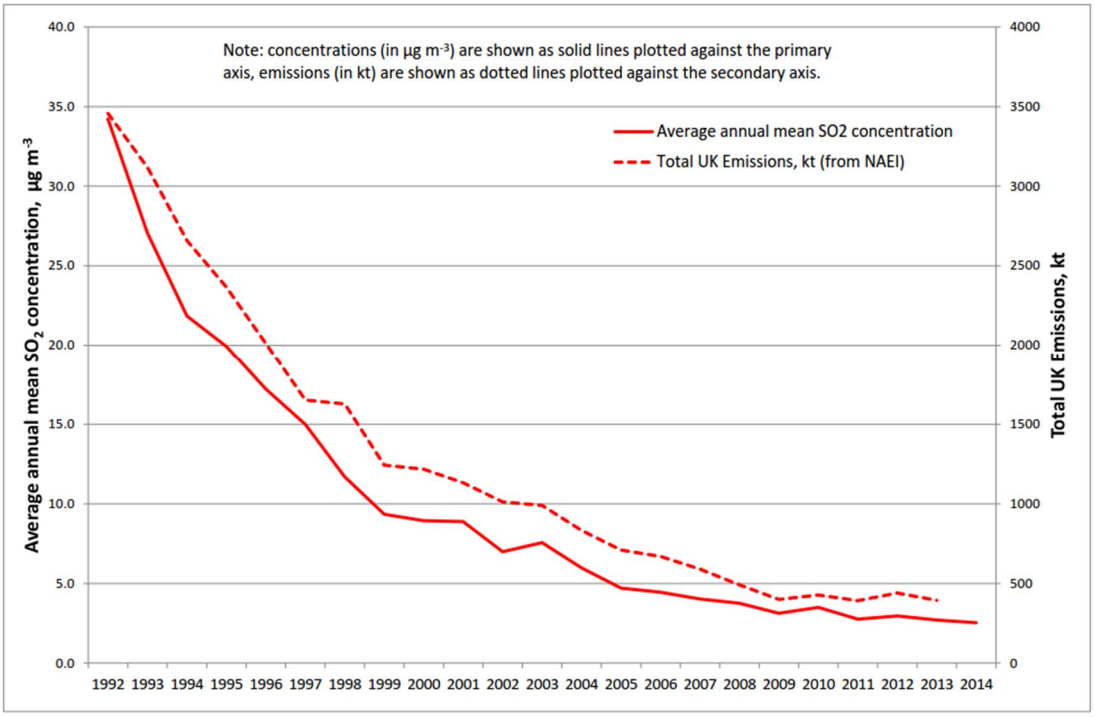
4.2.9 Unlike the statistical trend identified in figure 2 for the urban background locations, the trend pattern is less consistent with six of the eight sites showing a statistically significant downward trend.

Figure 3: Average annual mean NO_2 concentration: trend analysis for eight long-running urban traffic AURN sites 1998 – 2016 (de-seasonalised) [RD37]



4.2.10 For SO_2 there has been a large decrease in measured concentrations over the last two decades. A graph taken from a Defra [RD36] report is displayed in figure 4, which summarises the historical changes in average annual mean SO_2 concentrations and presents the annual emissions in kilotonnes over the same period.

Figure 4: Annual mean SO_2 concentration: all urban non-traffic AURN sites between 1992 –- 2014 [RD36]

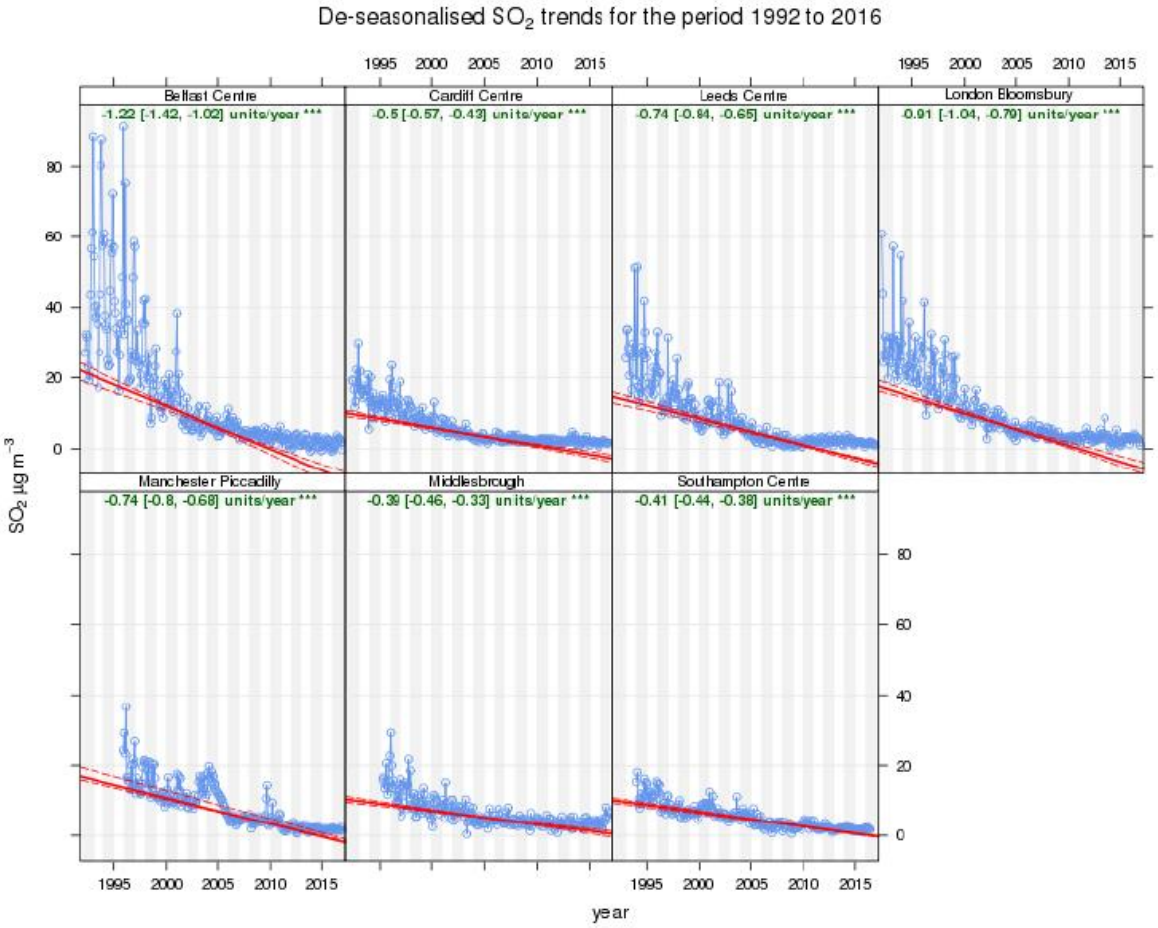


4.2.11 Figure 4 indicates that the average annual mean SO_2 concentration as an average of all sites across the UK has declined from approximately 35µg/m^3 to 2.5µg/m^3 from 1992 to 2014, which is a reduction of approximately 93% over 22 years.

4.2.12 Figure 5, taken from the Defra 2017 report [RD37], summarises the annual mean SO_2 concentrations recorded at seven AURN sites between 1992 and 2016.

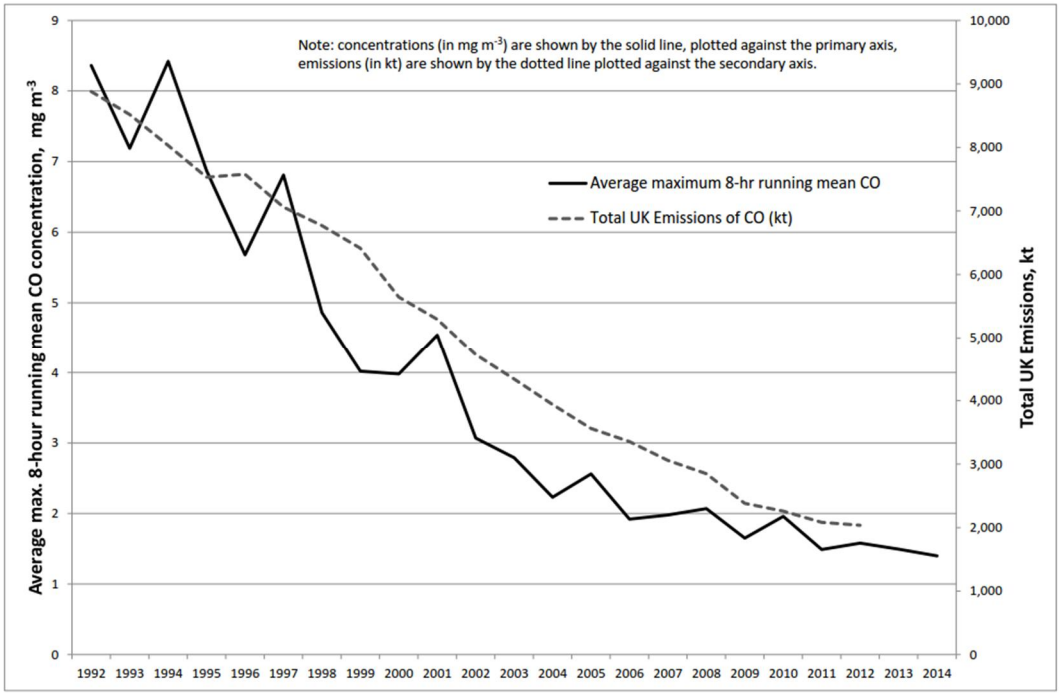
4.2.13 Figure 5 indicates that, although there has been a significant downward trend in SO_2 concentrations, the trend has not been linear, and at the majority of the sites, the downward trend is steepest from the 1990s to the early 2000s. Since approximately 2007, most sites show a less significant downward trend.

Figure 5: Annual mean SO_2 concentration: de-seasonalised trends in SO_2 concentration, 1992 – 2016 at seven long-running AURN sites [RD37]



4.2.14 Similar to SO_2, there has also been a large decrease in measured concentrations of CO over the last two decades. A graph and figure taken from the Defra 2015 and 2017 reports [RD36; RD37] are displayed in figure 6 and figure 7, respectively, which summarise the changes in average maxium eight-hour mean CO concentrations across the UK between 1992 and 2014 and at six AURN sites between 1992 and 2016.

Figure 6: Time series graph of average maximum eight-hour running mean CO concentration: all AURN sites [RD36]



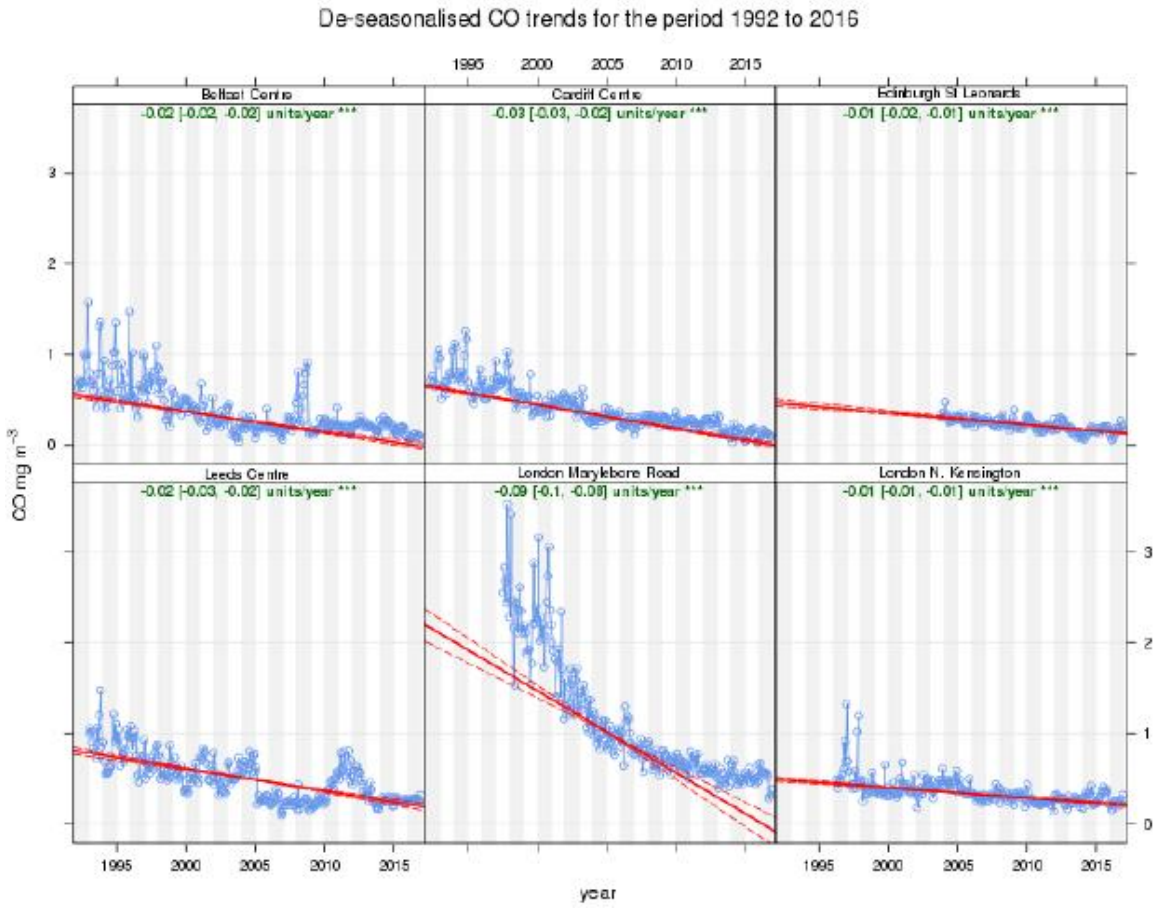
4.2.15 Figure 6 indicates that the average maximum eight-hour running mean CO concentration as an average of all sites across the UK has declined from approximately 8.3mg/m^3 to 1.4mg/m^3 from 1992 to 2014, a reduction of approximately 83% over 22 years, which is relatively consistent with the reduction in CO emissions over the same period.

4.2.16 The decreasing trend for CO is levelling off at the current low levels and is unlikely to decrease significantly in the future.

4.2.17 Figure 7 summarises how ambient concentrations have changed over the period 1992 to 2016, at six AURN monitoring stations.

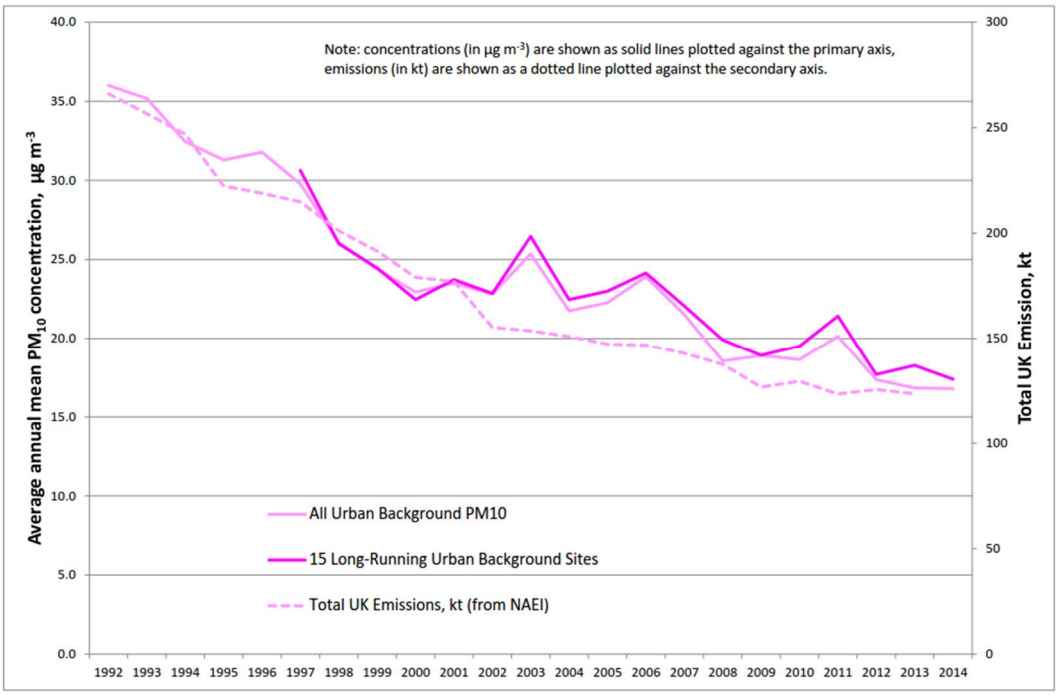
4.2.18 Figure 7 indicates that there is a de-seasonalised significant downward trend at all six AURN sites between 1992 and 2016 with regard to the measured annual mean concentration.

Figure 7: Trends in CO concentration, 1992 – 2016, at six AURN sites (de-seasonalised) [RD37]



4.2.19 This downward trend is also evident for average measured annual mean urban background concentrations of PM_{10}. A graph taken from the 2015 Defra report is displayed in figure 8, which summarises the changes in average annual mean PM_{10} concentrations between 1992 and 2014 across the UK.

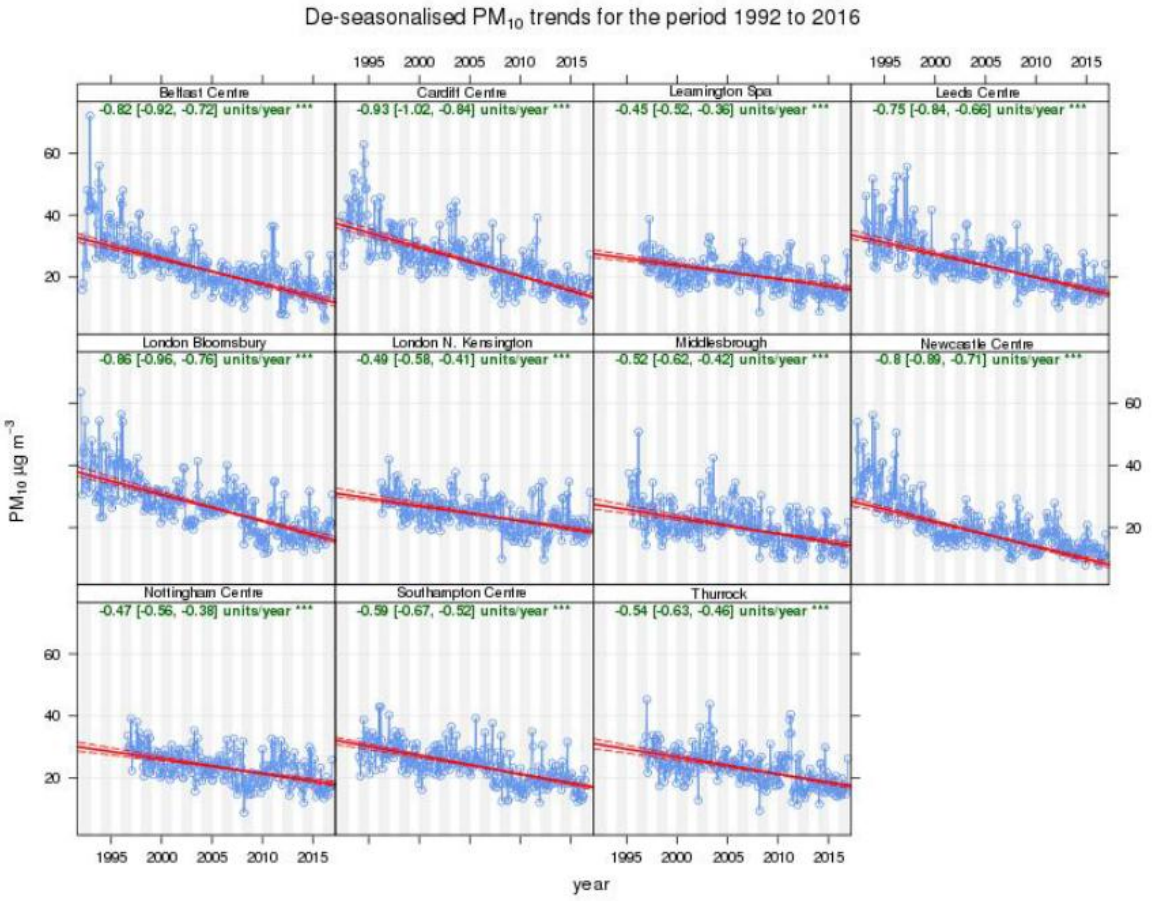
Figure 8: Annual mean ambient PM_{10} concentration and total annual emissions [RD36]



4.2.20 Figure 8indicates that the average annual mean PM_{10} concentrations as an average of all urban background sites across the UK have declined from approximately 36µg/m^3 to 17µg/m^3 from 1992 to 2014, a reduction of approximately 53% over 22 years. Some levelling off is observed after the year 2000, but the trend continues to show an overall small reduction to 2014.

4.2.21 Figure 9 shows de-seasonalised trends in ambient PM_{10} concentrations based on 11 urban background AURN sites, which have been operating since 1992.

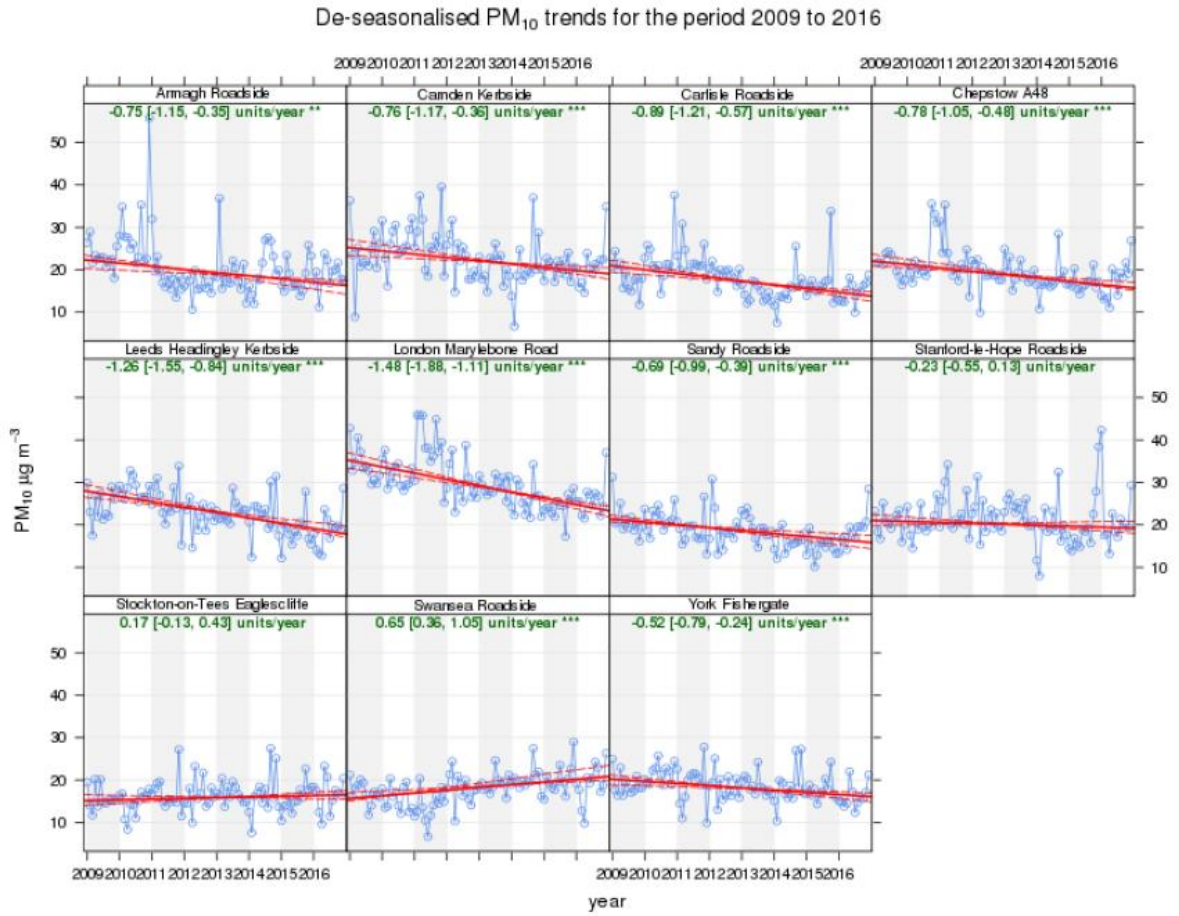
Figure 9: Trends in ambient PM_{10}, 11 long-running urban background AURN sites 1992 – 2016 (de-seasonalised) [RD37]



4.2.22 Figure 9 indicates that the average annual mean PM_{10} concentrations at all 11 sites show a downward trend for PM_{10} over their period of operation, although the trend varies between each site.

4.2.23 Figure 10 shows de-seasonalised trends in ambient PM_{10} concentration between 2009 and 2016, based on 11 urban traffic AURN sites.

Figure 10: Trends in ambient PM_{10}, 11 urban traffic AURN sites 2009 - 2016 (de-seasonalised) [RD37]



4.2.24 With the exception of Stanford-le-Hope Roadside, Stockton-On-Tees Eaglescliffe and Swansea Roadside, the remaining sites show a statistically significant downward trend in PM_{10} concentration between 2009 and 2016.

4.2.25 For $PM_{2.5}$, there is a much smaller dataset, as up to 2008, routine monitoring of $PM_{2.5}$ within the AURN was confined to a small number of sites in London. As such, measurements across the UK only commenced in 2009. The limited dataset for 2009 to 2016 shows that the majority of the 12 long-running urban background AURN sites show a statistically significant downward trend [RD37]. Overall emissions of $PM_{2.5}$ show a similar pattern to PM_{10}, with a steady decrease from the early 1990s and levelleling off from around 2003 and then no consistent decrease from 2009 onwards.

4.2.26 In conclusion, the latest reports summarising air quality in the UK produced by Defra indicates that ambient concentrations of NO_2, SO_2, CO and PM_{10} have decreased significantly over the period between 1990 and 2016. The exception is for NO_2 at roadside locations where concentrations have remained relatively constant between the late 1990s and 2010, but with indications of a decreasing trend since 2010. For $PM_{2.5}$, as discussed previously, the limited dataset shows that there is some decrease in $PM_{2.5}$ concentrations, despite overall emissions of $PM_{2.5}$ remaining relatively constant over the same period.

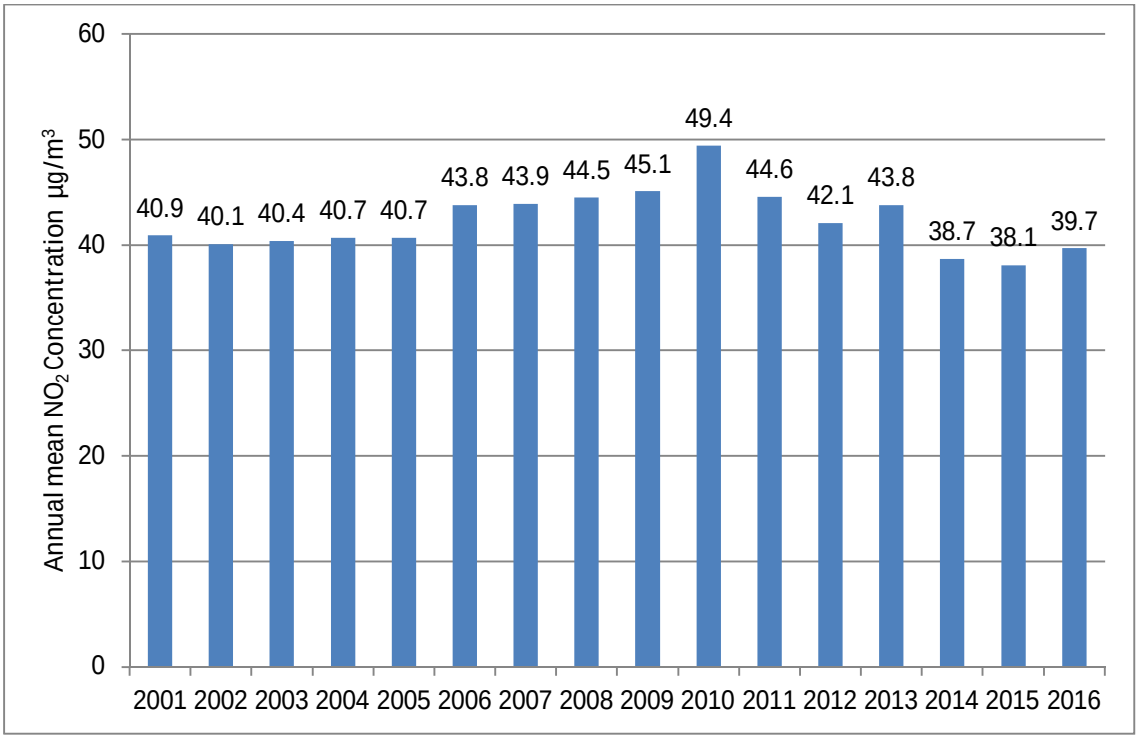
4.2.27 The 2007 report produced by the Air Quality Expert Group [RD38], indicated that the winter season may become windier with less stable weather conditions

by the end of the century and summer seasons are anticipated to become hotter and sunnier, with an increase in stable weather conditions which lead to poor dispersion of air pollutants by the 2040s. The net effect of these anticipated changes on the baseline air quality is difficult to establish, but is unlikely to significantly alter the baseline air quality to an extent that it would affect the outcome of this assessment. Other factors such as changes to technology and the move away from combusting fossil fuels driven by climate change mitigation are likely to lead to decreases in emissions of the key pollutants considered in this assessment.

4.3 Long term trends – Anglesey

4.3.1 There is limited historic baseline air quality monitoring data available for the Isle of Anglesey. The NO_2 diffusion tube measurements undertaken by the IACC at the key single roadside location adjacent to the A55 between 2001 and 2016 are displayed in figure 11.

Figure 11: Trend in annual mean NO_2 concentrations measured adjacent to A55 Llanfair Pwllgwyngyll [RD19, RD20 and RD21]



4.3.2 Figure 11 shows that annual mean NO_2 concentrations have shown an increasing trend from 2001 to 2010 and a decreasing trend from 2010 to 2016, with the last three years' recording concentrations less than 40µg/m^3. From 2010, the overall decrease in annual mean NO_2 concentrations is similar to the national trend shown in figure 1. This could be indicative of the trend in NO_2 concentrations at all roadside locations on Anglesey, but as there are no other long-term measurements at a single fixed location, it is not possible to confirm this. The decrease in concentrations also coincides with a decrease in traffic flows on the A55 which have been decreasing since 2007 [RD19].

4.3.3 For PM_{10}, all the long-term monitoring locations on Anglesey in a fixed position are influenced by nearby industrial sources, but the five years of measured data at Llangefni Library (urban background location) show no discernible

increase or decrease in PM_{10} concentrations between 2011 and 2015 (values of 16.8µg/m^3, 14.6µg/m^3, 16.8µg/m^3, 12.9µg/m^3 and 13.8µg/m^3 for each year, respectively).

4.3.4 Less analysis has been undertaken of the trends and likely future concentrations of pollutants in the rural locations that represent the majority of the study area within the vicinity of the Wylfa Newydd Development Area, Associated Developments, Off-Site Power Station Facilities and local road network. The concentrations in rural areas are generally well below the relevant AQOs and there is no risk of any exceedances. Comparison of the more recent measurements of NO_2, PM_{10} and $PM_{2.5}$ at the Wylfa Newydd Development Area or close to the A5025 to measurements undertaken three to five years ago indicate that there is no clear increasing or decreasing trend. Evidence suggests that it is likely that concentrations of pollutants in rural areas will experience similar trends to those described above for future years, i.e. slightly decreasing or a flat trend.

5 Discussion

5.1 Selection of background concentrations

5.1.1 This section sets out the intended approach for the quantification of the air quality background concentrations to be used in the assessment. The preference for the air quality modelling and assessment is to use measured data where this is available and appropriate, and to supplement this with other sources of data. Although there were many NO_2 measurements, these were recorded at roadside locations such as the A5025 and A55 or were in urban areas. These would not be representative of the background NO_2 concentrations at rural locations away from any road sources, which represents much of the study area. These were not appropriate to use as background concentrations as the road sources would be modelled as part of the air quality assessment, leading to double counting. The background concentrations were derived from the background map data in these cases, which were generally more representative of the rural background concentration in the absence of the modelled road source.

5.1.2 Based on the analysis of likely air quality trends, it was assumed that the background concentrations selected from the available monitored or mapped data representing recent or historical years will not decrease in future years. This is considered to be a conservative approach.

Wylfa Newydd Development Area

5.1.3 The background air quality concentrations for the Wylfa Newydd Development Area were based on the data sources set out in table 5-1. These sources were used to specify the background concentrations to which the modelled contributions from the activities undertaken on the Wylfa Newydd Development Area and from road traffic emissions on the nearby A5025 were added to determine the total concentrations.

Table 5-1: Background concentrations at locations in the vicinity of the Wylfa Newydd Development Area

Pollutant	Background concentration source	Background concentration ($\mu g/m^3$)
NO_2	Background map data representative of the locations of each assessed receptor. 2013 map value used, no reduction in future year concentrations has been assumed.	4.1 – 6.7
NO_x		5.1 – 8.9
PM_{10}	Highest measured concentration from the 2013/2014 or 2016 surveys recorded at or close to the Wylfa Newydd Development Area. Used for future year modelling scenarios, no reduction in future year concentrations has been assumed.	14.9
$PM_{2.5}$		7.8

Pollutant	Background concentration source	Background concentration ($\mu g/m^3$)
SO_2	Background map data representative of the locations of each assessed receptor. It should be noted an SO_2 concentration of 16µg/m^3 is specified for the 1km x 1km grid square encompassing the Existing Power Station and is derived from combustion emissions from boilers and standby generators. However, as the Existing Power Station will not be operational for the future year assessment scenarios, these sources will not be in operation and the relevant 1km x 1km grid square has been removed from further consideration of the background concentration. The background map concentration for that grid square was replaced with the average concentration for all adjoining grid squares. The 2001 map value used as a conservative approach, as the trend shows decreasing concentrations since 2001 for SO_2 and CO.	1.3 – 3.3
CO		134 – 141

5.1.4 The 2013 background map NO_2 concentrations presented in table 5-1 are relatively consistent with the rural measurements recorded by the IACC, including the measurement on the western side of Cemaes (supplementary survey monitoring location J).

5.1.5 The 2013 background map PM_{10} concentrations for the assessed human receptors in the vicinity of the Wylfa Newydd Development Area range from 9.8µg/m^3 to 11.6µg/m^3. These are lower than the measured concentrations of 14.4µg/m^3 and 14.9µg/m^3 recorded within or close to the Wylfa Newydd Development Area. The 2013 background map PM_{10} concentrations for the whole of the Isle of Anglesey ranges from 9.0µg/m^3 to 12.6µg/m^3, indicating that the background map concentrations are generally lower than the measured concentrations of PM_{10} recorded by the IACC, particularly in the vicinity of the Wylfa Newydd Development Area.

5.1.6 The 2013 background map $PM_{2.5}$ concentrations for the assessed human receptors in the vicinity of the Wylfa Newydd Development Area range from 6.6µg/m^3 to 8.3µg/m^3. These are relatively consistent with the measured concentrations of 7.8µg/m^3 and 7.4µg/m^3 recorded within or close to the Wylfa Newydd Development Area. The 2013 background map $PM_{2.5}$ concentrations for the whole of the Isle of Anglesey ranges from 6.0µg/m^3 to 8.5µg/m^3, indicating that the background map concentrations are generally consistent with the measured concentrations of $PM_{2.5}$ recorded by the IACC at various locations on Anglesey.

5.1.7 Although the AQOs for SO_2 are based on short-term averaging periods of 15 minutes (266µg/m^3), one hour (350µg/m^3) and 24 hours (125µg/m^3), the

annual mean concentration range of 1.4µg/m^3 to 3.3µg/m^3 from the 2001 background map indicates that there is no risk of the AQOs being exceeded.

5.1.8 Similar to SO_2, the AQO for CO (10,000µg/m^3) is based on a short-term rolling average period of eight hours and the annual mean concentration range presented in table 5-1 indicates that there is no risk of the AQO being exceeded.

5.1.9 Based on the above, the background map data are useful for identifying the background concentrations of NO_2, SO_2 and CO. This would also apply to determining the background concentrations of NO_x at ecologically sensitive sites, as this dataset is consistent with the NO_2 dataset.

5.1.10 For PM_{10}, the measured concentrations at the Wylfa Newydd Development Area (14.9µg/m^3) was higher than the respective background map concentrations representative of the assessed receptor locations and also the range specified for the Isle of Anglesey. For $PM_{2.5}$, the measured concentration at the Wylfa Newydd Development Area is generally in line with the respective background map values. It was considered appropriate to use these measured concentrations of PM_{10} and $PM_{2.5}$ at this location to represent background concentrations for the assessment of air quality effects at receptors in the vicinity of the Wylfa Newydd Development Area.

Off-Site Power Station Facilities

5.1.11 The background air quality concentrations for the Off-Site Power Station Facilities were determined using the approach set out below. These sources were used to specify the background concentrations to which the modelled contributions from road traffic emissions on the nearby A5025 were added to determine the total concentrations.

Table 5-2: Background concentrations at locations in the vicinity of the MEEG, AECC and ESL

Pollutant	Background concentration source	Background concentration (µg/m^3)
NO_2	Background map data representative of the site location and adjacent 1km x 1km grid squares. 2013 map value used, no reduction in future year concentrations has been assumed.	4.8
NO_x		6.2
PM_{10}	Highest measured concentration from the 2013/2014 or 2016 surveys recorded at or close to the Wylfa Newydd Development Area. Used for future year modelling scenarios, no reduction in future year concentrations has been assumed.	14.9
$PM_{2.5}$	Background map data representative of the site location and adjacent 1km x 1km grid squares. 2013 map value used, no reduction in future year concentrations has been assumed.	7.5
SO_2	Background map data representative of the site location and adjacent 1km x 1km grid squares The 2001 map value used as a conservative approach, as the trend	1.9

Pollutant	Background concentration source	Background concentration ($\mu g/m^3$)
CO	shows decreasing concentrations since 2001 for SO2 and CO.	138

5.1.12 As described previously, the background map concentrations were used as a cross-check against the measured data described in section 3 of this report to understand how representative they were for determining the background concentrations in the vicinity of the proposed Off-Site Power Station Facilities.

5.1.13 The NO_2 background map concentration of 4.8µg/m^3 is similar to some of the IACC rural measurements and is approximately 2µg/m^3 lower than the concentration of 6.8µg/m^3 recorded by the IACC in 2011/2012 at a nearby location adjacent to the A5025. The background map concentration is approximately 4.7µg/m^3 lower than the indicative annual mean concentration of 9.5µg/m^3 measured at a nearby location during the supplementary air quality monitoring survey in 2016/2017 (Tube ID F). This diffusion tube was located on the downwind side of the A5025 (i.e. on the east side of the A5025, which is downwind of the prevailing wind direction from the southwest). The 2011/2012 IACC measurement at Llanfaethlu was located on the upwind side of the road (i.e. the south side) and explains why there is a difference between the two measurements.

5.1.14 As discussed previously, the 2013 background map concentration would generally be representative of the rural background concentration in the absence of the A5025. The contribution from the A5025 would be included within the dispersion modelling of the road traffic emissions and added to this background concentration as part of the assessment.

5.1.15 As discussed in section 5.1.6, the background map $PM_{2.5}$ concentrations are broadly representative of measured concentrations across the Isle of Anglesey.

5.1.16 Based on the above, the background map data are likely to be useful in identifying the background concentrations of NO_2 and $PM_{2.5}$. This would also apply to determining the background concentrations of NO_x, as this dataset is consistent with the NO_2 dataset. The background maps are also suitable for identifying the existing concentrations of SO_2 and CO.

5.1.17 For PM_{10}, the measured concentration at the Wylfa Newydd Development Area (14.9µg/m^3) is proposed to be used to represent background concentrations at the Off-Site Power Station Facilities site. The background map value of 10.5µg/m^3 is similar to the background map concentrations in the vicinity of the Wylfa Newydd Development Area. Adopting the measured value recorded at the Wylfa Newydd Development Area is considered to be more appropriate.

Associated Development

A5025 On-line and Off-line Highway Improvements

5.1.18 The background air quality concentrations for the study areas encompassing the A5025 On-line and Off-line Highway Improvements were based on the data sources set out in table 5-3. These sources were used to specify the background concentrations to which the modelled contributions from the A5025 were added to determine the total concentrations.

Table 5-3: Background concentrations at locations in the vicinity of the A5025 On-line and Off-line Highway Improvements

Pollutant	Background concentration source	Background concentration ($\mu g/m^3$)
NO_2	Background map data representative of the locations of each assessed receptor. 2013 map value used, no reduction in future year concentrations has been assumed.	4.3 – 6.1
NO_x		5.6 – 8.0
PM_{10}	Highest measured concentration from the 2013/2014 or 2016 surveys recorded at or close to the Wylfa Newydd Development Area. Used for future year modelling scenarios, no reduction in future year concentrations has been assumed.	14.9
$PM_{2.5}$	Background map data representative of the locations of each assessed receptor. 2013 map value used, no reduction in future year concentrations has been assumed.	6.8 – 7.5
SO_2	Background map data representative of the locations of each assessed receptor. The 2001 map value used as a conservative approach, as the trend shows decreasing concentrations since 2001 for SO_2 and CO.	1.5 – 1.9
CO		138 – 144

5.1.19 The 2013 background map NO_2 concentration range presented in table 5-3 at receptor locations adjacent to the A5025 Highway Improvements are similar to the IACC rural measurements and consistent with the assumed background concentrations for the Wylfa Newydd Development Area and Off-Site Power Station Facilities site, which are both adjacent to the A5025.

5.1.20 The range of indicative annual mean concentrations recorded during the supplementary survey at the relevant locations was 15.3µg/m^3 (Tube ID D, Valley), 9.9µg/m^3 (Tube ID E, Llanfachraeth), 9.5µg/m^3 (Tube ID F, Llanfaethlu) and 7.0µg/m^3 (Tube ID G, near Cefn Coch). The higher-than-expected concentration recorded at Valley is understood to be attributed to increased emissions from vehicles accelerating away from the junction with the A5 (as discussed during a meeting with the IACC on 10 February 2017). The above measurements, and the 2011/2012 IACC measurements adjacent to the A5025 at Llanfachraeth (7.3µg/m^3) and Llanfaethlu (6.8µg/m^3) indicate the background map NO_2 concentrations are broadly representative of the

background concentration which would exist in the absence of road traffic emissions on the A5025.

5.1.21 As discussed previously, the roadside measurement data contain a contribution from the road source which would be included as an emission source within the dispersion modelling. Consequently, and based on the above, the background map data are generally considered appropriate for use as the background concentration at receptor locations in the vicinity of the A5025 Highway Improvements.

5.1.22 The background maps are also suitable for identifying the existing concentrations of SO_2 and CO.

5.1.23 As discussed in section 5.1.6, the background map $PM_{2.5}$ concentrations are broadly representative of measured concentrations across the Isle of Anglesey.

5.1.24 For PM_{10}, the measured concentration at the Wylfa Newydd Development Area (14.9µg/m^3) is considered to be more representative of background concentrations than the background map concentrations, which are generally lower than the measurements at the Wylfa Newydd Development Area.

Park and Ride

5.1.25 The background air quality concentrations for the Park and Ride were based on the data sources set out in table 5-4. These sources were used to specify the background concentrations to which the modelled contributions from the nearby A55, A5, local access roads and on-site car park emission sources were added to determine the total concentrations.

Table 5-4: Background concentrations at locations in the vicinity of the Park and Ride

Pollutant	Background concentration source	Background concentration (µg/m^3)
NO_2	Background map data representative of the locations of each assessed receptor. 2013 map value used, no reduction in future year concentrations has been assumed.	4.7 – 5.8
NO_x		6.1 – 7.9
PM_{10}	Highest measured concentration from the 2013/2014 or 2016 surveys recorded at or close to the Wylfa Newydd Development Area. Used for future year modelling scenarios, no reduction in future year concentrations has been assumed.	14.9
$PM_{2.5}$	Background map data representative of the locations of each assessed receptor. 2013 map value used, no reduction in future year concentrations has been assumed.	6.9 – 7.2
SO_2	Background map data representative of the locations of each assessed receptor. The 2001 map value used as a conservative approach, as the trend shows decreasing concentrations since 2001 for SO_2 and CO.	1.3 – 1.6
CO		140 – 144

5.1.26 The background map NO_2 concentration range presented in table 5-4 is generally in line with the nearest rural IACC NO_2 monitoring which was undertaken at RAF Valley approximately 3km to the southwest of the proposed Park and Ride. The measurement in 2013/2014 recorded an annual mean concentration of 5.1µg/m^3. During the supplementary air quality monitoring survey in 2016, the measured concentration in close proximity to the Park and Ride (Tube ID C2) was 11.3µg/m^3. This would contain a contribution from the nearby road sources (i.e. the A5 and A55) which would be modelled as part of the air quality assessment.

5.1.27 As the contribution from the A5 and A55 would be included within the dispersion modelling of the road traffic emissions and added to the background map concentration, the use of the 2013 background map data are considered to be representative of the background concentration in the vicinity of the Park and Ride, in the absence of these sources.

5.1.28 Based on the above, the background map data are likely to be useful in identifying the background concentrations of NO_2 and $PM_{2.5}$. This would also apply to determining the background concentrations of NO_x, as this dataset is consistent with the NO_2 dataset. The background maps are also suitable for identifying the existing concentrations of SO_2 and CO.

5.1.29 For PM_{10}, the measured concentration at the Wylfa Newydd Development Area (14.9µg/m^3) is higher than the background map concentrations on Anglesey and, therefore, was used to represent background concentrations at the Park and Ride.

Logistics Centre

5.1.30 The background air quality concentrations for the Logistics Centre were based on the data sources set out in table 5-5. These sources were used to specify the background concentrations to which the modelled contributions from the nearby A55 and local access roads and on-site vehicle emission sources were added to determine the total concentrations.

Table 5-5: Background concentrations at locations in the vicinity of the Logistics Centre

Pollutant	Background concentration source	Background concentration ($\mu g/m^3$)
NO_2	Background map data representative of the site location and adjacent 1km x 1km grid squares. 2013 map value used, no reduction in future year concentrations has been assumed.	7.7
NO_x		10.1
PM_{10}	Highest measured concentration from the 2013/2014 or 2016 surveys recorded at or close to the Wylfa Newydd Development Area. Used for future year modelling scenarios, no reduction in future year concentrations has been assumed.	14.9
$PM_{2.5}$	Background map data representative of the site location and adjacent 1km x 1km grid squares. 2013 map value used, no reduction in future year concentrations has been assumed.	7.9
SO_2	Background map data representative of the site location and adjacent 1km x 1km grid squares. The 2001 map value used as a conservative approach, as the trend shows decreasing concentrations since 2001 for SO_2 and CO.	2.1
CO		146

5.1.31 The background map NO_2 concentration range presented in table 5-5 is generally in line with the nearest rural IACC NO_2 monitoring which was undertaken at RAF Valley approximately 6km to the southeast of the proposed Logistics Centre. The measurement in 2013/2014 recorded an annual mean concentration of 5.1µg/m^3.

5.1.32 As the contribution from the A55 would be included within the dispersion modelling of the road traffic emissions and added to the background map concentration, the use of the 2013 background map data are considered to be representative of the background concentration in the vicinity of the Logistics Centre, in the absence of this source.

5.1.33 Based on the above, the background map data are likely to be useful in identifying the background concentrations of NO_2 and $PM_{2.5}$. This would also apply to determining the background concentrations of NO_x, as this dataset is consistent with the NO_2 dataset. The background maps are also suitable for identifying the existing concentrations of SO_2 and CO.

5.1.34 For PM_{10}, the measured concentration at the Wylfa Newydd Development Area (14.9µg/m^3) is higher than the background map concentrations on Anglesey and, therefore, was used to represent background concentrations.

Road traffic emissions associated with the Wylfa Newydd Project

5.1.35 The background air quality concentrations for the assessment of road traffic emissions on the Isle of Anglesey road network which would be affected by the Wylfa Newydd Project were based on the data sources set out in table 5-6. These sources were used to specify the background concentrations to which the modelled contributions from the modelled road network were added to determine the total concentrations.

Table 5-6: Background concentrations at locations in the vicinity of 'affected roads' on the Isle of Anglesey

Pollutant	Background concentration source	Background concentration ($\mu g/m^3$)
NO_2	Background map data representative of the locations of each assessed receptor. 2013 map value used, no reduction in future year concentrations has been assumed.	4.3 – 8.5
NO_x		5.5 – 11.2
PM_{10}	Highest measured concentration from the 2013/2014 or 2016 surveys recorded at or close to the Wylfa Newydd Development Area. Used for future year modelling scenarios, no reduction in future year concentrations has been assumed.	14.9
$PM_{2.5}$	Background map data representative of the locations of each assessed receptor. 2013 map value used, no reduction in future year concentrations has been assumed. For receptors that are also within the study area for the Wylfa Newydd Development Area (see section Wylfa Newydd Development Area), the background concentration would be based on the measured $PM_{2.5}$ concentration ($7.8\mu g/m^3$).	6.8 – 8.1

5.1.36 The approach set out in table 5-6 is consistent with the approach adopted for the other Wylfa Newydd Project elements described above. As discussed, these would generally represent the background concentration in the absence of the modelled road sources. As shown from measurement data (see section 3.2.1 and 3.2.2), the concentrations of NO_2 are likely to be very close or exceeding the annual mean AQO of $40\mu g/m^3$ in close proximity to the A55 (i.e. within 3m of the edge of the road), depending on the location and prevailing wind direction (i.e. concentrations on the north side of the A55 would generally be higher than concentrations on the south side due to the prevailing south and south-westerly wind directions. On this basis, the annual mean NO_x concentrations are also likely to be above the annual mean AQO at sections of ecological receptors which are relatively close to the A55 (e.g. within approximately 20m).

5.1.37 A different approach is proposed to be adopted for the assessment of road traffic emissions on mainland Wales, as the assessment would be based on the predicted increase in concentrations of the above pollutants due to the

Wylfa Newydd Project traffic. These predicted increases would be considered in relation to specific measurements of NO_2 (and NO_x derived from the NO_2 measurements) and PM_{10} recorded close to the A55 (the only affected road on the mainland) to determine the likelihood of a significant effect occurring. The specific measurements used for the assessment are described within the assessment report that accompanies the DCO application (see appendix C4-2 Assessment of Road Traffic Emissions – Mainland Wales, Application Reference Number: 6.3.28). These include those on mainland Wales that are close to the A55 as set out in table 3-8.

5.1.38 The background NO_x and NO_2 concentrations used for determining modelled concentrations for comparison with monitored concentrations as part of the road traffic emissions verification process, both on Anglesey and mainland Wales, were based on the background map data. The background PM_{10} concentrations for the verification process on mainland Wales were also based on the background map data.

6 Conclusions

6.1.1 A review of the available air quality baseline concentration data has been undertaken. The review indicates that the background air quality in the vicinity of the Wylfa Newydd Development Area appears to be good and concentrations of pollutants are generally well within the relevant AQOs for the protection of human health. The concentrations of NO_x and SO_2 are well within the relevant AQOs and Environmental Assessment Levels for the protection of ecological sites.

6.1.2 This also applies to locations on Anglesey that are beyond the vicinity of the Wylfa Newydd Development Area, including at the Off-Site Power Station Facilities and Associated Development sites and nearby road network. The exception is locations close to the A55, as evidenced by measurements of NO_2 adjacent to the A55 near Llanfair Pwllgwyngyll, where the latest annual mean NO_2 concentrations recorded at two locations were close to or exceed the AQO of 40µg/m^3. However, these monitoring locations are in very close proximity to the A55 and do not represent relevant long-term human exposure. The IACC has concluded that concentrations of NO_2 at distances further from the A55 which are representative of relevant long-term exposure locations (approximately 20m or more), such as residential properties, are much lower and well within the annual mean AQO. For ecological receptors that are in close proximity to the A55 (i.e. closer than 20m), it is likely that the annual mean NO_x concentrations are close to or already exceeding the annual mean AQO of 30µg/m^3. The available data indicates that NO_x concentrations would decrease to concentrations lower than 30µg/m^3 at locations more than 20 – 50m from the A55 and would be much lower than 30µg/m^3 at ecological receptors in rural locations.

6.1.3 The IACC has not declared any AQMAs and no detailed assessments are currently required as part of the LAQM process.

6.1.4 Dust deposition measurements recorded in the vicinity of the Wylfa Newydd Development Area are representative of the relatively low levels found in rural, open country, locations and these would be broadly representative of the dust deposition in most rural locations on Anglesey which are not close to specific sources of dust.

6.1.5 Beyond Anglesey, air quality measurements undertaken by GC, CCBC, DCC and FCC also indicate that concentrations of the relevant pollutants (NO_2 and PM_{10}) are currently within the relevant AQOs close to the main road network. Some historical measurements in very close proximity to the A487 in Caernarfon were above the AQO. However, concentrations at relevant exposure locations are well within the AQO. Similar to the IACC, the relevant mainland Wales councils have not declared any AQMAs and no detailed assessments are currently required as part of the LAQM process. Based on measurements within 10m of the A55, it is likely that annual mean NO_x concentrations are close to or already exceeding the annual mean AQO of 30µg/m^3 at the closest sections of ecological receptors that are of similar distance or closer to the A55. As discussed above, concentrations of NO_x are likely to decrease to rural background concentrations as distance from the A55 increases from the edge of the A55.

6.1.6 This report examined the national and regional air quality trends and set out the proposed approach as to how the available baseline data will be applied within the air quality modelling and assessments, which will be carried out to support the various applications required for the Wylfa Newydd Project. In summary, the background air quality concentrations for the study areas on the Isle of Anglesey will be determined using a combination of measured data recorded by the IACC and 2013 / 2001 background mapping concentrations. Based on the analysis of likely air quality trends, it is assumed that background concentrations will not decrease in future years, which is considered to be a conservative approach. The availability of data and data coverage using the proposed approach is considered to be sufficient to undertake a robust assessment of air quality and to inform the proposals for mitigation and management of air quality and dust effects during the construction and operation of the Wylfa Newydd Project.

6.1.7 Measurements of pollutants recorded by GC, CCBC, DCC and FCC would be used to determine the potential for significant air quality effects to occur at locations close to the affected road network on mainland Wales.

6.1.8 Where appropriate, many of the roadside measurements undertaken by the IACC, GC, CCBC, DCC and FCC will be utilised as part of the verification of the modelling of road traffic emissions, which will be undertaken as part of the air quality assessment.

6.1.9 If required, a further review of available measured data will be undertaken as it is produced by the local authorities. This report will be updated, if required, to reflect changes such as the publication of new guidance, or the outcome of consultation discussions with the relevant stakeholders up to submission of the relevant DCO application or Environmental Permit application.

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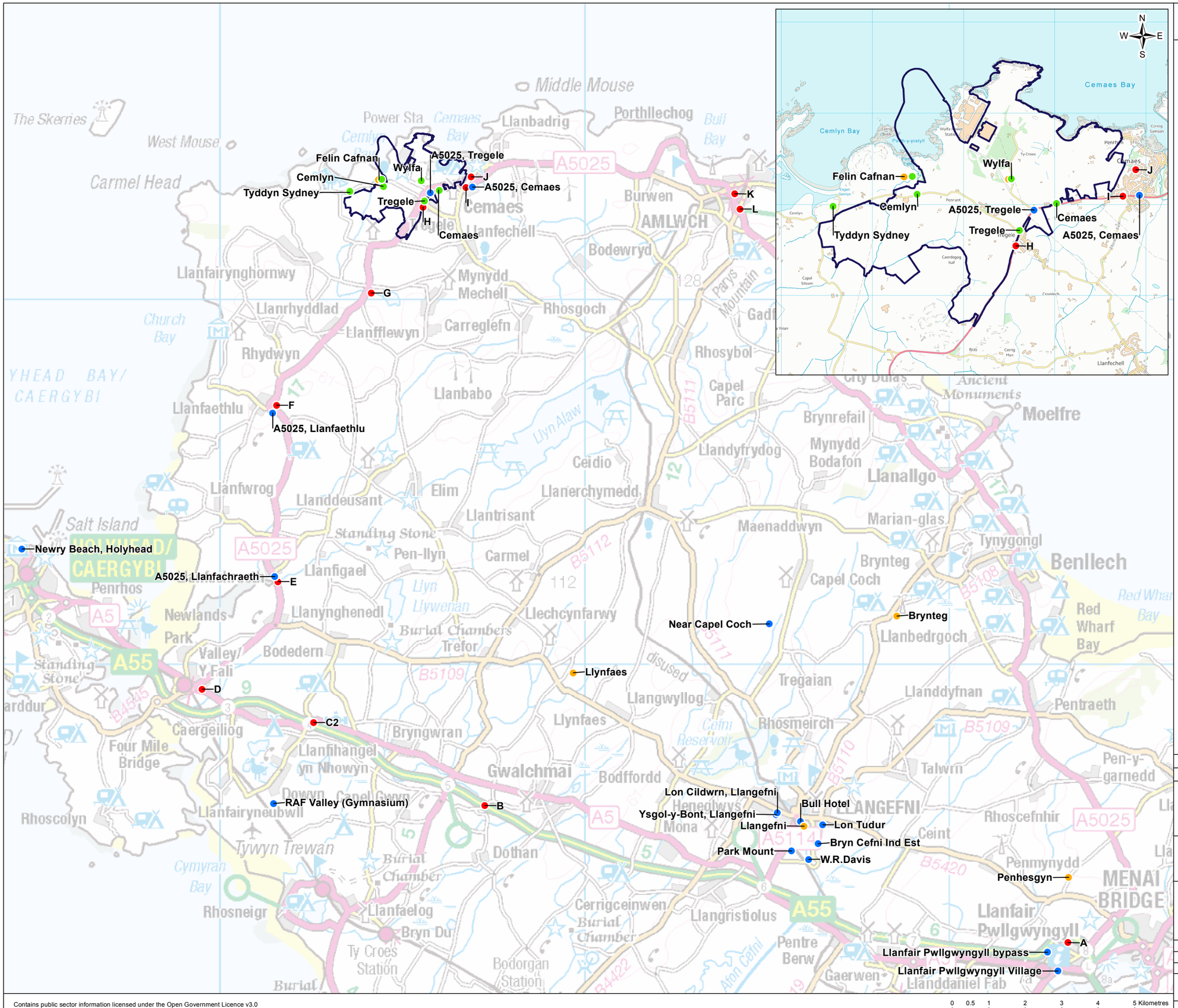
8 Figures

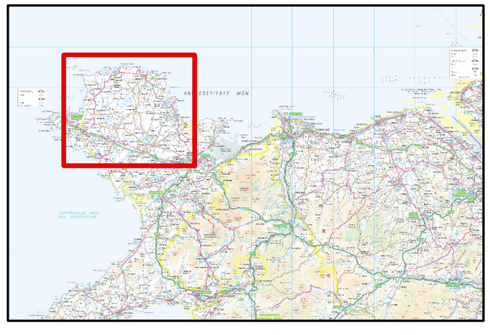
FIGURE 12



Legend

- Wylfa Newydd Development Area
- IACC NO_2 measurement Location
- IACC NO_2 supplementary diffusion tube survey location
- IACC PM_{10} and $PM_{2.5}$ monitoring location
- IACC dust deposition monitoring location

Note:
IACC - Isle of Anglesey County Council



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	JUN 17	Initial Issue	AD	DH	GW	RB

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
AIR QUALITY - BASELINE DATA SYNOPSIS REPORT

Drawing Title: ISLE OF ANGLESEY COUNTY COUNCIL MONITORING LOCATIONS

Scale @ A3	1:100,000	DO NOT SCALE
Jacobs No.	60PO8077	
Client No.		

Drawing No. 60PO8077_DCO_AQB_12

0 0.5 1 2 3 4 5 Kilometres

FIGURE 13

Legend

- CCBC NO_2 measurement location
- CCBC PM_{10} monitoring location
- DCC NO_2 Measurement Location
- FCC NO_2 measurement location
- GC NO_2 measurement location

Note:
CCBC - Conwy County Borough Council
DCC - Denbighshire County Council
FCC - Flintshire County Council
GC - Gwynedd Council

0 1 2 4 6 8 10 Kilometres

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
1.0	MAR 18	DCO Submission	LT	DH	SB	RB

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
AIR QUALITY - BASELINE DATA SYNOPSIS REPORT

Drawing Title

RELEVANT GWYNEDD COUNCIL, CONWY COUNTY BOROUGH COUNCIL, DENBIGHSHIRE COUNTY COUNCIL AND FLINTSHIRE COUNTY COUNCIL AIR QUALITY MONITORING LOCATIONS

Scale @ A3	1:300,000	DO NOT SCALE
Jacobs No.	60PO8077	
Client No.		

Drawing No.

60PO8077_DCO_AQB_13

Annex A - Information on Pollutants

This annex provides information on the air pollutants considered in this report.

Nitrogen dioxide and oxides of nitrogen

Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen (NO_x). NO_2 has been shown to have adverse health effects including causing respiratory irritation in asthmatics. There is believed to be a threshold above which it has an impact. It is formed principally from the oxidation of NO through the action of ozone in the atmosphere. Combustion in air forms mainly NO, with some NO_2 from the combination of atmospheric nitrogen and oxygen. NO_x is emitted from internal combustion engines as well as other forms of combustion and is also formed from natural sources such as lightning.

The main source of NO_x in the UK is road transport, accounting for approximately one-third of the UK's emissions, with energy production in power stations and similar facilities accounting for approximately one-quarter of the UK's emissions.

High levels of NO_x can also have an adverse effect on vegetation, including leaf or needle damage and reduced growth.

Carbon monoxide

Carbon monoxide (CO) is produced when fuels containing carbon are burned with insufficient oxygen to convert all carbon inputs to carbon dioxide (CO_2). Therefore, CO emissions are a measure of combustion completion as higher values of CO indicate more combustion that is incomplete or less oxidation of CO to CO_2. CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues.

Road transport is the most significant source of CO within the UK. However, CO emissions from petrol-engine road vehicles have been greatly reduced by the introduction of catalytic converters over recent years.

Sulphur dioxide

Sulphur dioxide (SO_2) primarily arises from anthropogenic activities and, more specifically, combustion of fuels containing sulphur and sulphur compounds. SO_2 is emitted in negligible quantities during the combustion of natural gas but generally at higher concentrations for liquid fuels which have a higher sulphur content, although legislation has significantly reduced the permissible quantity of SO_2 in fuels. SO_2 can affect the pulmonary function and lead to respiratory symptoms.

The largest UK source of SO_2 is currently power generation. Other important sources include industry and commercial fuel use.

High concentrations of SO_2 can produce acute injury to vegetation in the form of foliar necrosis. Longer-term exposure to much lower concentrations can reduce growth. SO_2 can also modify the response of plants to other

environmental stresses, such as pathogens or other physical and chemical changes, often exacerbating their adverse impacts.

Particulate matter/dust

Nuisance dust emissions are generally variable in nature, and their potential impact is primarily dependent on the type of construction traffic and activity, ground conditions and weather conditions at the time.

Dust is the generic term used to describe particulate matter in the size range 1µm to 75µm in diameter. Particles greater than 75µm in diameter are often termed 'grit' rather than dust. The effects of dust are linked to particle size and two main categories are usually considered:

PM_{10} and $PM_{2.5}$ particles: particulate matter with aerodynamic diameter of 10 microns and 2.5 microns or less, respectively. PM_{10} and $PM_{2.5}$ particles can remain suspended in the air for long periods and are small enough to be inhaled and so can potentially impact on health.

Nuisance dust: generally larger than 10µm, which fall out of the air quite quickly and can soil surfaces (e.g. a car, window sill, laundry).

Fine particulate matter such as PM_{10} or $PM_{2.5}$, although emitted in negligible quantities during the combustion of natural gas, is emitted in higher quantities during the combustion of liquid fuels. The range of potential health effects from exposure to PM_{10} or $PM_{2.5}$ is broad, but is predominantly linked to respiratory and cardiovascular systems.

The main source of particulate matter emissions in the UK is combustion, e.g. vehicles and power stations. Other anthropogenic sources include mining, quarrying and industrial processes. Natural sources include wind-blown dust, soil particles and sea salt. Road transport becomes an increasingly important sector as the particle size decreases ($PM_{2.5}$). Particulate matter has a residence time of several days in the atmosphere, so pollution events occur in the UK when polluted air is blown from the continent.

Dust deposited onto vegetation in sufficient quantities can inhibit photosynthesis, respiration and transpiration as well as obstructing diffusion due to the blocking of stomata. Dust can also affect the chemical properties of soils depending on the composition of the dust particles.

Acid and nutrient nitrogen deposition

Nutrient nitrogen emissions and acid deposition on vegetation can have detrimental impacts on species and habitats, particularly on more nitrogen-sensitive ecosystems. Deposition is the key pathway for extracting pollutants from the atmosphere, through both dry and wet deposition.

Dry deposition is the direct input of atmospheric pollutants onto the earth's surface or uptake by plants upon interaction with the ground; this pathway is important for uptake of gases and particles. Wet deposition is the removal of airborne pollutants from the atmosphere to the earth's surface through precipitation, e.g. acid rain.

Acid deposition is the atmospheric input to ecosystems of pollutants which may acidify soils and freshwater bodies; this includes species derived from SO_2, NO_x and ammonia emissions, as well as a number of other minor pollutants (e.g. hydrogen chloride or hydrogen fluoride). Acid deposition is more general than acid rain, since it includes both wet deposition and dry deposition.