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Subject:	Wylfa Newydd DCO Deadline 3 Submissions (Email 7 of 8) [NOT PROTECTIVELY MARKED]
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Attachments:	51 Air Quality Mitigation Quantification Report.pdf

Good Evening

This is the seventh in a series of 8 e-mails for the Wylfa Newydd DCO Examination Deadline 3 deliverables.

The list below provides a complete list of all documents attached to this e-mail and we will also be delivering 2x USB pen drives containing all of our Deadline 3 submission to your offices at 10:00 tomorrow (Tuesday 18th December).

- 51 Air Quality Mitigation Quantification Report.pdf

Kind Regards

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HORIZON NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

Air Quality Mitigation Quantification Report

PINS Reference Number: EN010007

18 December 2018

Revision 1.0
Examination Deadline 3

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Horizon Internal DCRM Number: WN0902-HZDCO-PAC-REP-00089

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Contents

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1 Introduction and basis of assessment

1.1.1 Additional air quality mitigation was proposed in chapter D5 Air quality (excluding emissions from traffic) (APP-124) due to the significant effects with regard to emissions of oxides of nitrogen (NOx) from construction plant, machinery and marine vessels at the Wylfa Newydd Development Area. The additional mitigation was set out in Section 7.5 (Emissions from plant and machinery) of the Main Power Station Site sub-Code of Construction Practice (CoCP) (APP-415). The additional mitigation comprised a comprehensive air quality monitoring and reporting scheme which would include a range of measures to ensure compliance with the appropriate environmental standards and reduce NOx and nitrogen dioxide (NO_2) concentrations and nitrogen and acid deposition rates at human and ecological receptors. Horizon committed to developing the scheme through discussion with the Isle of Anglesey County Council (IACC) and Natural Resources Wales (NRW).

1.1.2 Horizon has now developed and submitted that comprehensive air quality monitoring and reporting scheme, which was submitted in the updated Main Power Station Site sub-CoCP (REP2-032) at Deadline 2 (04 December 2018).

1.1.3 One of the measures included in the scheme was a commitment to utilise newer non-road mobile machinery (NRMM) which comply with more stringent NOx emission standards. As this measure had not yet been fully developed, it was not possible to quantify the reduction in pollutant concentrations or deposition rates as a result of utilising the newer, lower emitting plant within the Environmental Statement. With regard to NO_2 concentrations at human receptors, the residual effect was concluded to be not significant (i.e. after the application of the proposed scheme). This conclusion assumed that a sufficient level of reduction in NOx emissions could be achieved through the adoption of more stringent emission standards for the NRMM, and that this could be combined with the other elements of the monitoring and reporting scheme to provide effective mitigation (i.e. continuous monitoring of NOx and NO_2 with appropriate feedback mechanisms to facilitate management of NOx emissions and active and on-going management of the plant).

1.1.4 This element of the proposed additional mitigation was included in section 7.5 (Emissions from plant and machinery) of the updated Main Power Station Site sub-CoCP (REP2-032) submitted at Deadline 2 (04 December 2018). This also included a commitment to reduce NOx emissions from marine vessels/plant associated with the Marine Works, with the overall aim of reducing NOx emissions to as low a level as is reasonably practicable. The lower emitting plant, machinery and marine vessels proposed as part of the additional mitigation monitoring and reporting scheme in the DCO application are summarised below.

- A minimum of 90% of NRMM to meet the EU stage IV NRMM emission standards (EC Directive 97/68/EC), with all other NRMM to meet the EU stage IIIB NRMM emission standards. The stage IV limits apply to all

NRMM manufactured from 2014 onwards. The stage IIIB standards were introduced in 2011 for the larger engine sizes most relevant to the works.

- Relevant Marine Works marine plant to comply with Tier III International Maritime Organisation (IMO) emission standard for NOx. The Tier III emission standard was implemented in 2016 for marine vessels operating in NOx Emission Control Areas (ECAs). The Irish Sea is not within a NOx ECA so this proposal is considered to represent beyond best practice.

1.1.5 This report presents the assessment of the potential air quality effects of emissions from plant, machinery and marine vessels with the mitigation as described in paragraph 1.1.4 in place. The purpose of the report is to demonstrate the effect of applying this element of the monitoring and reporting scheme to control NOx emissions from construction plant, machinery as proposed in the DCO application and specified in the updated Main Power Station Site sub-CoCP submitted at Deadline 2 (04 December 2018) (REP2-032).

1.1.6 The remainder of this section of the report provides a summary of the basis of the assessment, modelling results and conclusions as presented in chapter D5 Air quality (excluding emissions from traffic) (APP-124). It is recommended that this report is read in conjunction with chapter D5 Air quality (excluding emissions from traffic) (APP-124).

1.1.7 The dispersion modelling of emissions to air from construction plant, machinery and marine vessels during construction (as presented in chapter D5 (APP-124) of the Environmental Statement) was undertaken for two scenarios.

- Peak of activities associated with the site grading and bulk earthworks, deep excavations, landscape formation, cooling water tunnels and outfall construction and construction of the Marine Off-Loading Facility (MOLF). The scenario represents a 12-month period during which the highest number of diesel-engine plant items and site vehicles are forecast to be operating at the Wylfa Newydd Development Area at any time during Main Construction (hereafter referred to as the ‘year 2 peak earthworks and Marine Works scenario’). This scenario is used to determine the highest potential air quality effects during approximately the first two years of the construction programme.
- Peak of activities associated with the construction of the Power Station buildings and structures, including (but not limited to) concrete production, distribution and placing, steel reinforcing works, craneage, access to structures and related site logistics, such as the transportation of construction workers and materials. The scenario represents a 12-month period during which the highest number of diesel-engine plant items and site vehicles are forecast to be operating at the Wylfa Newydd Development Area after completion of the earthworks and Marine Works earlier in the construction schedule (hereafter referred to

as the 'year 5 peak construction scenario'). This scenario is used to determine the highest potential air quality effects once the earthworks and Marine Works are completed (i.e. from approximately year 3 to year 9 of the construction programme).

1.1.8 The assessment concluded that for both the year 2 peak earthworks and Marine Works scenario and year 5 peak construction scenario, the effects of predicted changes to long and short-term concentrations of particulate matter (PM_{10} and $PM_{2.5}$[1]), sulphur dioxide (SO_2) and carbon monoxide (CO) at human receptors were negligible adverse and concentrations were well within the relevant air quality objectives (AQOs) and Environmental Assessment Levels (EALs). Consequently, it was concluded that air quality effects for these pollutants were not significant.

1.1.9 The assessment also concluded that, prior to the application of additional mitigation, there was a risk of significant effects due to the large predicted increases in NO_2 concentrations at human receptors due to emissions of NOx from construction plant, machinery and marine vessels for the year 2 peak earthworks and Marine Works scenario (i.e. representing the highest potential air quality effects during approximately the first two years of the construction programme). This included a predicted exceedance/near exceedance of the one-hour mean AQO at two long-term human receptors close to the Wylfa Newydd Development Area (R14 and R15). The assessment concluded that for the year 5 peak construction scenario, there would not be a significant effect with regard to NO_2 concentrations (i.e. from approximately year 3 to year 9 of the construction programme).

1.1.10 In relation to vehicle and machinery pollutant emissions (i.e. NO_2 and PM_{10}/$PM_{2.5}$) on the Wylfa Newydd Development Area during construction, the Health Impact Assessment Report (APP-429) reached the conclusion that the residual significance of potential health and well-being effects was considered to be minor adverse for the general population (the majority of people) near the Wylfa Newydd Development Area. For particularly sensitive groups within the affected population, the residual effect could range up to moderate adverse.

1.1.11 The air quality assessment also identified that several ecological receptors which required further consideration within the terrestrial and freshwater ecology assessment in chapter D9 (APP-128) of the Environmental Statement due to the predicted changes in NO_x concentrations or nitrogen and acid deposition. These were:

- Cae Gwyn Site of Special Scientific Interest (SSSI) (based on the magnitude of predicted changes to short-term NOx concentrations and nitrogen and acid deposition for the year 2 scenario and nitrogen and acid deposition for the year 5 scenario);

[1] PM_{10} and $PM_{2.5}$ are particulate matter with an aerodynamic diameter of 10 microns or less and 2.5 microns or less, respectively.

- Cemlyn Bay Special Area of Conservation (SAC)/SSSI[2] (based on the magnitude of predicted changes to acid deposition for the year 2 and year 5 scenarios);
- Trwyn Pencarreg Wildlife Site (based on the magnitude of predicted changes to annual mean and 24-hour mean NOx concentrations for the year 2 scenario only);
- Tre'r Gof SSSI (based on the magnitude of predicted changes to annual mean and 24-hour mean NOx concentrations and nitrogen and acid deposition for the year 2 and year 5 scenarios);
- Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site (based on the magnitude of predicted changes to annual mean and 24-hour mean NOx concentrations for the year 2 scenario); and
- a small area of Ancient Woodland (ID 62060) near Tre'r Gof (based on the magnitude of predicted changes to annual mean NOx concentrations and nitrogen deposition for the year 2 scenario only).

1.1.12 In chapter D9 Terrestrial and freshwater ecology (APP-128), following the application of additional ecological mitigation, minor adverse residual effects were identified as a result of changes in air quality for the following receptors: Tre'r Gof SSSI; Cemlyn Bay SSSI / SAC; Cae Gwyn SSSI; Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site; fungi; and lichen.

1.1.13 Further consideration of the predicted changes in air quality at Cestyll Garden, a Registered Historic Park and Garden Grade II, was also undertaken in chapter D11 Cultural heritage (APP-130). Considered in-combination with other aspects relating to construction including removal of elements of Cestyll Garden, noise and visual intrusion, the predicted increases in NOx concentrations, nitrogen and acid deposition were categorised as a major adverse significance of effect.

1.1.14 The assessment presented in chapter D5 Air quality (excluding emissions from traffic) (APP-124) was based on all NRMM meeting the EU stage IIIB NRMM emission standards and marine plant emissions were based on emission factors derived from the UK ship inventory [RD2] (see appendix D5-2 Main site construction phase air dispersion EIA – final modelling report (APP-140) for further details).

1.1.15 As noted previously, this report presents the findings of the assessment of the potential air quality effects of emissions from plant, machinery and marine vessels with the mitigation described in paragraph 1.1.4 in place. Appendix D5-2 Main site construction phase air dispersion EIA – final modelling report (APP-140) set out the technical methods used to quantify the potential air quality effects from emissions from plant, machinery and

[2] Through the issue of a report to Natural Resources Wales on the critical loads for Cemlyn Bay SAC (included in appendix G of the Shadow Habitats Regulations Assessment Report (Part 2 of 2) (APP-051), it was agreed that Cemlyn Bay SAC is not sensitive to acid deposition [RD1].

marine vessels using dispersion modelling, including dispersion modelling methodology, emissions calculation methodology, emissions and activity data and detailed assumptions for all modelled plant items. An updated version of this report has been produced to support the modelling undertaken for this assessment and is provided in appendix 1-1 of this report.

1.1.16 Section 2.1 of this report sets out the results of the air quality dispersion modelling and determines the significance of air quality effects at human receptors. For those ecological receptors where air quality effects were screened out from further consideration based on the modelling results, these were concluded to represent negligible effects which were not significant. For those ecological receptors which could not be screened out from further consideration, these are assessed in Section 2.2 of this report (i.e. providing an update to the assessment presented in chapter D9 Terrestrial and freshwater ecology (APP-128)). Section 2.3 provides an updated assessment of air quality effects at Cestyll Garden (a cultural heritage receptor) that was presented in chapter D11 Cultural heritage (APP-130).

1.1.17 The scenarios modelled and assessed are the same two scenarios modelled in chapter D5 (APP-124) of the Environmental Statement as described above in paragraph 1.1.7 (i.e. year 2 peak earthworks and Marine Works and year 5 peak construction).

1.1.18 The number of plant items, types, sizes, working locations and diurnal and monthly working patterns specified for the assessment remains as modelled for the assessment in chapter D5 Air quality (excluding emissions from traffic) (APP-124). Further details are available in appendix D5-2 Main site construction phase air dispersion EIA – final modelling report (APP-140).

2 Update to residual effects

2.1 Air quality

Human receptors

2.1.1 The additional mitigation (i.e. use of newer, lower NOx emitting plant, machinery and marine vessels) would not alter the emissions of PM_{10}, $PM_{2.5}$, and CO as there is no reduction in the emission standard between EU Stage IIIB and EU Stage IV. There are some predicted reductions in SO_2 concentrations as the original assessment of marine vessels assumed use of fuel with a sulphur content of 1.5% as a worst case. For marine plant complying with the Tier III NOx emission limits, it is likely that the maximum fuel sulphur content would be 0.5% (i.e. the global limit for fuel sulphur content from 2020 onwards where marine vessels are operating outside of a sulphur oxides (SOx) Emission Control Area as per Annex VI of the MARPOL Convention).

2.1.2 Figure D5-5 of WNDA Development Figure Booklet – Volume D (Part 1 of 2) (APP-237) provides a visualisation of the construction zones and landscape mound areas considered in the dispersion modelling (see appendix D5-2 Main site construction phase air dispersion EIA – final modelling report (APP-140) for further details). The mounds and zones specified in this figure are referred to throughout the analysis to aid with the interpretation of the results in relation to construction activity areas within the Wylfa Newydd Development Area.

2.1.3 In this section, the magnitude of changes in air pollutant concentrations are considered at individual key receptors before considering the significance of the likely residual air quality effects across the study area as a whole.

Annual mean (NO_2)

2.1.4 The predicted changes in annual mean concentrations of NO_2 for the year 2 peak earthworks and Marine Works scenario are reported in table 2-1 for the key human receptor locations. Figure 1 illustrates the spatial pattern of annual mean NO_2 concentration changes at all receptors representing relevant long-term exposure locations.

2.1.5 The predicted changes in annual mean concentrations of air pollutants for the year 5 peak construction scenario are reported in table 2-2. The predicted changes in annual mean NO_2 concentrations at all long-term receptors are illustrated in figure 2. For the year 5 scenario, this includes receptors representing the boundary of the Site Campus area.

2.1.6 The values reported in the results tables are based on the maximum predicted annual mean concentration for any of the 10 years of meteorological data used for the dispersion modelling.

2.1.7 The predicted increase in annual mean NO_2 concentrations at the receptors representing Cemaes and close to mound A (R1 to R4) is equivalent to up to 5% of the AQO value (at R2) in the year 2 scenario, decreasing to an

increase of up to 1% of the AQO value at the peak of construction in year 5. At these receptors, the change would have a negligible adverse effect in year 2 and year 5 (based on the effect descriptors from the Environmental Protection UK (EPUK)/IAQM guidance [RD3] as set out in chapter B5 Air quality (APP-070).

2.1.8 Other receptors located close to areas where landscape mounds are being created (R8, R10, R12 and R13) would experience a temporary peak emissions period during mound creation, before activity moves to areas located further from the receptors. For the year 2 peak earthworks and Marine Works scenario, annual mean NO_2 concentrations are predicted to increase by the equivalent of 8% of the AQO value at R13 near to Mound E and by 6% at R10 near zones 5 and 7 to the south (small adverse effects). Negligible adverse effects are predicted at R8 (near mound C) and R12 (near mound E). Predicted increases to annual mean NO_2 concentrations for the year 5 scenario are up to 2% of the AQO value at R8, R12 and R13 representing negligible adverse effects and 6% of the AQO at R10 (closer to the central construction activity zones) representing a small adverse effect.

2.1.9 At receptors within Tregele (R6 and R7), emissions from plant and machinery used in zone 9, plus emissions from other zones, are predicted to give rise to an increase in annual mean NO_2 concentrations by the equivalent of up to 6% of the AQO value (a small adverse effect) for the year 2 peak earthworks and Marine Works scenario and a change of up to 3% (a negligible adverse effect) for the year 5 peak construction scenario.

2.1.10 At the nearest human receptors to the central area of the Wylfa Newydd Development Area where there is a high density of construction activities (R14 and R15), predicted increases in annual mean NO_2 concentrations are equivalent to 17% of the AQO value in year 2 (at R14). This would increase the baseline annual mean NO_2 concentration from approximately 4µg/m^3 to 11µg/m^3, and therefore would remain well below the AQO value of 40µg/m^3 set for the protection of human health. This is described as a medium adverse effect. R15 is predicted to experience a smaller increase from approximately 4µg/m^3 to 10µg/m^3 (14% of the AQO value, and also a medium adverse effect).

2.1.11 For the year 5 peak construction scenario, the magnitude of change in the annual mean NO_2 concentration at R14 would decrease compared to year 2, with a predicted increase for the year 5 scenario equivalent to 5% of the AQO value (an increase of approximately 2µg/m^3 to a total concentration of approximately 6µg/m^3). The increase at R15 is predicted to be 3% of the AQO value. These are described as negligible adverse effects.

2.1.12 The predicted annual mean NO_2 concentrations at receptor locations near to the Site Campus demonstrate that off-shift workers would experience air quality that is of a good standard in the year 5 peak construction scenario. The highest annual mean concentration at any of the receptors used to represent the boundary of the Site Campus area was 13µg/m^3, which is well below the AQO of 40µg/m^3.

Table 2-1 Year 2 peak earthworks and Marine Works scenario – predicted annual mean NO_2 concentrations at key human receptors

Receptor	Year 2 baseline	Year 2 peak earthworks and Marine Works	Magnitude of change as percentage of AQO value [1,2]
	NO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	NO_2 (AQO = 40$\mu g/m^3$)
R1	5.1	6.7	+4% (n)
R2	5.1	7.2	+5% (n)
R3	5.1	6.1	+3% (n)
R4	10.4	11.5	+3% (n)
R5	6.9	9.0	+5% (n)
R6	8.4	10.6	+6% (s)
R7	6.1	8.6	+6% (s)
R8	5.1	5.9	+2% (n)
R9	4.8	5.9	+3% (n)
R10	4.4	6.8	+6% (s)
R11	4.4	5.5	+3% (n)
R12	4.3	6.1	+5% (n)
R13	4.1	7.1	+8% (s)
R14	4.4	11.3	+17% (m)
R15	4.4	9.9	+14% (m)
R16	4.4	5.1	+2% (n)
R17	4.4	4.9	+1% (n)

Note 1: Impact magnitude rounded to whole numbers and reported as a percentage of the respective AQO value.

Note 2: Effect descriptors at individual receptors in parentheses as per table B5-15 of chapter B5 Air quality (APP-070): ‘n’ is negligible, ‘s’ is small, ‘m’ is medium and ‘l’ is large. ‘

Table 2-2 Year 5 peak construction – predicted annual mean NO_2 concentrations at key human receptors

Receptor	Year 5 baseline	Year 5 peak construction	Magnitude of change as percentage of AQO value [1,2, 3]
	NO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	NO_2 (AQO = 40$\mu g/m^3$)
R1	5.1	5.6	+1% (n)
R2	5.1	5.6	+1% (n)
R3	5.1	5.5	+1% (n)
R4	9.7	10.1	+1% (n)
R5	6.6	7.5	+2% (n)
R6	7.8	9.0	+3% (n)
R7	5.8	7.2	+3% (n)
R8	5.0	5.4	+1% (n)
R9	4.8	5.4	+1% (n)
R10	4.4	6.9	+6% (s)
R11	4.4	5.0	+2% (n)
R12	4.3	4.8	+1% (n)
R13	4.1	4.9	+2% (n)
R14	4.4	6.2	+5% (n)
R15	4.4	5.8	+3% (n)
R16	4.4	4.7	+1% (n)
R17	4.4	4.6	0% (n)

Note 1: Impact magnitude rounded to whole numbers and reported as a percentage of the respective AQO value.

Note 2: Effect descriptors at individual receptors in parentheses as per table B5-15 of chapter B5 Air quality (APP-070): ‘n’ is negligible, ‘s’ is small, ‘m’ is medium and ‘l’ is large.

Note 3: Any changes of 0% (i.e. less than 0.5%) are described as negligible (‘n’).

Short-term concentrations (NO_2 and SO_2)

2.1.13 The predicted change in short-term concentrations of NO_2 and SO_2 are summarised in table 2-3 and table 2-4 for the year 2 peak earthworks and Marine Works scenario and in table 2-5 and table 2-6 for the year 5 peak construction scenario. The short-term concentrations presented in table 2-3 to table 2-6 are based on the relevant percentiles for direct comparison to the AQOs as set out in table B5-14 of chapter B5 Air quality (APP-070). The table column headers for each pollutant have been shortened for ease and clarity of reporting as follows:

- 1-hour NO_2 = 99.8th percentile of one-hour means;
- 24-hour SO_2 = 99.2nd percentile of 24-hour means;
- 1-hour SO_2 = 99.7th percentile of one-hour means; and
- 15-min SO_2 = 99.9th percentile of 15-minute means.

2.1.14 The values reported in all results tables are based on the maximum predicted concentrations for the relevant percentiles and averaging periods for any of the 10 years of meteorological data used for the dispersion modelling.

2.1.15 For the year 2 peak earthworks and Marine Works scenario, the effect of changes to short-term concentrations of SO_2 at all human receptors would be negligible adverse and all concentrations are well within the relevant AQOs. This is also observed for the year 5 peak constructions scenario.

2.1.16 The predicted total 99.8th percentile of one-hour mean NO_2 concentrations reported in table 2-3 at long-term exposure receptors in Cemaes and Tregele (R1 to R7 and R9) are 21% or less of the AQO value. These results relate to areas for which confidence in model output is high, and therefore it is considered unlikely that these areas would experience episodes of elevated one-hour concentrations of NO_2 which could exceed the AQO value of 200µg/m^3. Collectively, the effect on local air quality at Cemaes and Tregele (R1 to R7 and R9) is considered to predominantly represent a negligible to small adverse effect in year 2.

2.1.17 There are some residential properties (R12, R14, R15) located close to the western boundary of the Wylfa Newydd Development Area. Cestyll Garden (R25) is located near to R15. As noted in paragraph 5.5.64 of chapter D5 Air quality (excluding emissions from traffic) (APP-124), the model outputs at these locations are likely to be conservative (i.e. over-estimates). With the additional mitigation in place, the model predicted a maximum 99.8th percentile of one-hour mean concentrations of 69µg/m^3 long-term exposure locations (R12, R14 and R15) (see table 2-3), which is well within the AQO of 200µg/m^3.

2.1.18 At short-term locations such as footpaths, workplaces and Cestyll Garden where exposure would be transient or infrequent (represented by R18, R19, R20, R22 and R25), the highest predicted 99.8th percentile of one-hour mean concentrations was 111µg/m^3. Other footpath locations very close to or within the Wylfa Newydd Development Area, particularly near the western

boundary and at Wylfa Head, are also predicted to experience similar or lower concentrations.

2.1.19 As noted in paragraph 5.5.66 of chapter D5 Air quality (excluding emissions from traffic) (APP-124), the model outputs at receptors close to or within the site boundary are likely to be over-estimates. Therefore, while the highest effects at these receptors would be large or medium adverse, the maximum predicted total concentrations of between 50% – 60% of the AQO indicates that an exceedance of the one-hour mean AQO is considered to be highly unlikely to occur.

2.1.20 The predicted total one-hour mean NO_2 (99.8th percentile of one-hour mean) concentrations for the year 2 peak earthworks and Marine Works scenario at all long-term and short-term receptors are illustrated in figure 3.

Table 2-3 Year 2 peak earthworks and Marine Works scenario – predicted short-term NO_2 and SO_2 concentrations at key human receptors

Receptor	Year 2 baseline				Year 2 peak earthworks and Marine Works			
	1-hour NO_2 ($\mu g/m^3$)	24-hour SO_2 ($\mu g/m^3$)	1-hour SO_2 ($\mu g/m^3$)	15-min SO_2 ($\mu g/m^3$)	1-hour NO_2 ($\mu g/m^3$)	24-hour SO_2 ($\mu g/m^3$)	1-hour SO_2 ($\mu g/m^3$)	15-min SO_2 ($\mu g/m^3$)
R1	10.3	6.7	6.7	6.7	26.3	6.9	7.3	7.7
R2	10.3	6.7	6.7	6.7	30.1	6.9	7.4	7.8
R3	10.3	6.7	6.7	6.7	25.3	6.9	7.3	7.7
R4	20.7	6.7	6.7	6.7	36.5	6.9	7.4	7.9
R5	13.8	4.1	4.1	4.1	39.3	4.4	5.1	6.1
R6	16.7	4.1	4.1	4.1	42.5	4.4	5.2	6.1
R7	12.2	4.1	4.1	4.1	41.0	4.4	5.2	5.9
R8	10.3	3.3	3.3	3.3	24.6	3.6	4.1	4.7
R9	9.7	4.1	4.1	4.1	26.9	4.3	4.9	5.6
R10	8.8	3.3	3.3	3.3	35.4	3.8	4.6	5.6
R11	8.8	3.3	3.3	3.3	29.3	3.6	4.2	5.0
R12	8.5	2.9	2.9	2.9	49.6	3.2	4.0	4.6
R13	8.3	3.8	3.8	3.8	43.0	4.3	5.2	6.1
R14	8.8	3.8	3.8	3.8	62.1	4.4	5.5	6.3
R15	8.8	3.8	3.8	3.8	69.0	4.8	6.1	6.8
R16	8.9	3.7	3.7	3.7	19.9	3.8	4.2	4.7
R17	8.9	3.7	3.7	3.7	17.8	3.8	4.1	4.7
R18	9.0	5.2	5.2	5.2	66.8	5.8	6.8	7.5
R19	9.0	5.2	5.2	5.2	110.7	6.3	7.8	8.9
R20	13.5	4.2	4.2	4.2	61.2	5.0	6.2	6.9
R22	13.5	4.2	4.2	4.2	104.7	5.4	6.9	7.6
R25	8.8	3.8	3.8	3.8	102.5	5.2	6.6	7.5

Table 2-4 Year 2 peak earthworks and Marine Works scenario – magnitude of short-term changes at key human receptors

Receptor	Magnitude of change as percentage of AQO value[1,2]			
	1-hour NO_2 (AQO = 200µg/m^3)	24-hour SO_2 (AQO = 125µg/m^3)	1-hour SO_2 (AQO = 350µg/m^3)	15-min SO_2 (AQO = 266µg/m^3)
R1	+8% (n)	0% (n)	0% (n)	0% (n)
R2	+10% (n)	0% (n)	0% (n)	0% (n)
R3	+8% (n)	0% (n)	0% (n)	0% (n)
R4	+8% (n)	0% (n)	0% (n)	0% (n)
R5	+13% (s)	0% (n)	0% (n)	+1% (n)
R6	+13% (s)	0% (n)	0% (n)	+1% (n)
R7	+14% (s)	0% (n)	0% (n)	+1% (n)
R8	+7% (n)	0% (n)	0% (n)	+1% (n)
R9	+9% (n)	0% (n)	0% (n)	+1% (n)
R10	+13% (s)	0% (n)	0% (n)	+1% (n)
R11	+10% (n)	0% (n)	0% (n)	+1% (n)
R12	+21% (m)	0% (n)	0% (n)	+1% (n)
R13	+17% (s)	0% (n)	0% (n)	+1% (n)
R14	+27% (m)	0% (n)	0% (n)	+1% (n)
R15	+30% (m)	+1% (n)	+1% (n)	+1% (n)
R16	+6% (n)	0% (n)	0% (n)	0% (n)
R17	+4% (n)	0% (n)	0% (n)	0% (n)
R18	+29% (m)	0% (n)	0% (n)	+1% (n)
R19	+51% (l)	+1% (n)	+1% (n)	+1% (n)
R20	+24% (m)	+1% (n)	+1% (n)	+1% (n)
R22	+46% (m)	+1% (n)	+1% (n)	+1% (n)
R25	+47% (m)	+1% (n)	+1% (n)	+1% (n)

Note 1: Impact magnitude rounded to whole numbers and reported as a percentage of the respective AQO value.

Note 2: Descriptors of effects at individual receptors in parentheses as per table B5-16 of chapter B5 (APP-070): ‘n’ is negligible, ‘s’ is small, ‘m’ is medium and ‘l’ is large.

2.1.21 The predicted increase in one-hour mean NO_2 concentrations for the year 5 peak construction scenario (see table 2-5 and table 2-6) varies in magnitude from the equivalent of 2% to 3% of the AQO value in Cemaes (R1 to R4), 3% to 6% in or near Tregele (R5, R6, R7 and R9) to 10% at Caerdegog Isaf (R10), representing a negligible effect at these receptors.

2.1.22 At long-term receptors within or to the west of the Wylfa Newydd Development Area (R11 to R15), the magnitudes of change to the one-hour mean NO_2 concentrations range from 4% to 8% of the AQO, which is described as negligible adverse. The maximum total concentration at any of the long-term human receptors (R1 to R17) is 28µg/m^3, which is 14% of the AQO of 200µg/m^3 (R10).

2.1.23 At short-term locations such as footpaths, workplaces and Cestyll Garden where exposure would be transient or infrequent (represented by R18, R19, R20, R22 and R25), the highest predicted 99.8th percentile of one-hour mean concentrations was 39µg/m^3. Other footpath locations very close to or within the Wylfa Newydd Development Area, particularly near the western boundary and at Wylfa Head, are also predicted to experience similar or lower concentrations. The maximum effect descriptor at any of the short-term receptors was small adverse.

2.1.24 The predicted air pollutant concentrations at receptor locations near to the Site Campus (R18, R19, R20) demonstrate that off-shift workers would experience air quality that is of a good standard in the year 5 peak construction scenario. The highest 99.8th percentile of one-hour means concentration at any of the receptors used to represent the boundary of the Site Campus area was 61µg/m^3, which is within the AQO of 200µg/m^3.

2.1.25 The predicted total one-hour mean NO_2 (99.8th percentile of one-hour mean) concentrations for the year 5 peak construction scenario are illustrated in figure 4.

Table 2-5 Year 5 construction scenario – predicted short-term NO_2 and SO_2 concentrations at key human receptors

Receptor	Year 5 baseline				Year 5 peak earthworks and Marine Works			
	1-hour NO_2 ($\mu g/m^3$)	24-hour SO_2 ($\mu g/m^3$)	1-hour SO_2 ($\mu g/m^3$)	15-min SO_2 ($\mu g/m^3$)	1-hour NO_2 ($\mu g/m^3$)	24-hour SO_2 ($\mu g/m^3$)	1-hour SO_2 ($\mu g/m^3$)	15-min SO_2 ($\mu g/m^3$)
R1	10.3	6.7	6.7	6.7	14.9	7.1	7.9	8.9
R2	10.3	6.7	6.7	6.7	15.2	7.1	7.9	9.0
R3	10.3	6.7	6.7	6.7	14.5	7.0	8.0	8.9
R4	19.4	6.7	6.7	6.7	24.6	7.1	8.0	9.0
R5	13.1	4.1	4.1	4.1	22.1	4.7	6.1	8.0
R6	15.6	4.1	4.1	4.1	25.7	4.7	6.0	7.4
R7	11.6	4.1	4.1	4.1	22.8	4.7	5.9	7.0
R8	9.9	3.3	3.3	3.3	16.6	3.8	4.8	6.1
R9	9.7	4.1	4.1	4.1	16.5	4.5	5.6	6.8
R10	8.8	3.3	3.3	3.3	27.8	4.3	5.8	7.7
R11	8.8	3.3	3.3	3.3	17.6	3.9	4.9	7.0
R12	8.5	2.9	2.9	2.9	16.6	3.4	4.8	6.5
R13	8.3	3.8	3.8	3.8	17.8	4.8	6.9	9.0
R14	8.8	3.8	3.8	3.8	24.6	5.1	7.5	9.3
R15	8.8	3.8	3.8	3.8	22.8	6.0	8.8	10.6
R16	8.9	3.7	3.7	3.7	12.5	4.0	4.7	5.6
R17	8.9	3.7	3.7	3.7	12.4	3.9	4.6	5.5
R18	9.0	5.2	5.2	5.2	31.6	6.3	8.3	10.0
R19	9.0	5.2	5.2	5.2	28.0	6.9	9.9	12.5
R20	13.5	4.2	4.2	4.2	33.3	6.1	9.0	10.6
R22	13.5	4.2	4.2	4.2	39.0	6.7	10.6	12.2
R25	8.8	3.8	3.8	3.8	27.1	7.0	9.9	11.6

Table 2-6 Year 5 construction scenario – magnitude of short-term changes at key human receptors

Receptor	Magnitude of change as percentage of AQO value[1,2]			
	1-hour NO_2 (AQO = 200µg/m^3)	24-hour SO_2 (AQO = 125µg/m^3)	1-hour SO_2 (AQO = 350µg/m^3)	15-min SO_2 (AQO = 266µg/m^3)
R1	+2% (n)	0% (n)	0% (n)	+1% (n)
R2	+2% (n)	0% (n)	0% (n)	+1% (n)
R3	+2% (n)	0% (n)	0% (n)	+1% (n)
R4	+3% (n)	0% (n)	0% (n)	+1% (n)
R5	+4% (n)	0% (n)	+1% (n)	+1% (n)
R6	+5% (n)	0% (n)	+1% (n)	+1% (n)
R7	+6% (n)	0% (n)	+1% (n)	+1% (n)
R8	+3% (n)	0% (n)	0% (n)	+1% (n)
R9	+3% (n)	0% (n)	0% (n)	+1% (n)
R10	+10% (n)	+1% (n)	+1% (n)	+2% (n)
R11	+4% (n)	0% (n)	0% (n)	+1% (n)
R12	+4% (n)	0% (n)	+1% (n)	+1% (n)
R13	+5% (n)	+1% (n)	+1% (n)	+2% (n)
R14	+8% (n)	+1% (n)	+1% (n)	+2% (n)
R15	+7% (n)	+2% (n)	+1% (n)	+3% (n)
R16	+2% (n)	0% (n)	0% (n)	+1% (n)
R17	+2% (n)	0% (n)	0% (n)	+1% (n)
R18	+11% (s)	+1% (n)	+1% (n)	+2% (n)
R19	+10% (n)	+1% (n)	+1% (n)	+3% (n)
R20	+10% (n)	+2% (n)	+1% (n)	+2% (n)
R22	+13% (s)	+2% (n)	+2% (n)	+3% (n)
R25	+9% (n)	+3% (n)	+2% (n)	+3% (n)

Note 1: Impact magnitude rounded to whole numbers and reported as a percentage of the respective AQO value.

Note 2: Descriptors of effects at individual receptors in parentheses as per table B5-16 of chapter B5 (APP-070): ‘n’ is negligible, ‘s’ is small, ‘m’ is medium and ‘l’ is large.

Summary – human receptors

2.1.26 A summary of the changes in annual mean and one-hour mean NO_2 concentrations at all modelled receptors representing long-term exposure are summarised in table 2-7. These show that the overall balance of the effects is predominantly negligible for both the year 2 and the year 5 scenarios, with the year 2 predicted to have a slightly higher number of small and medium adverse effects. There are no large adverse effects forecast for any scenario and the number of medium adverse effects are relatively few.

Table 2-7 Number of human receptors experiencing predicted effects – long-term receptors

Effect descriptor	Number of receptors experiencing predicted effects			
	Annual mean NO_2		One-hour mean NO_2 (99.8th percentile)	
	Year 2 peak earthworks and Marine Works scenario	Year 5 peak construction scenario	Year 2 peak earthworks and Marine Works scenario	Year 5 peak construction scenario
Large adverse	0 [0]	0 [0]	0 [12]	0 [1]
Medium adverse	2 [109]	1 [2]	3 [621]	1 [1]
Small adverse	5 [499]	1 [41]	76 [594]	0 [60]
Negligible adverse	1,220 [619]	1,226 [1,185]	1,148 [0]	1,227 [1,166]
Values shown in square brackets are those presented in chapter D5 (APP-124) (i.e. prior to the application of any additional mitigation).				

2.1.27 A summary of the changes in the 99.8th percentile of one-hour mean NO_2 concentrations at all modelled receptors representing short-term exposure are summarised in table 2-8. As discussed in chapter D5 (APP-124), this includes over 400 receptors within 2km of the Wylfa Newydd Development Area representing short-term and transient exposure locations such as footpaths (e.g. Wales Coast Path and other Public Rights of Way which comprise approximately 380 receptors), commercial/industrial premises (e.g. shops, Existing Power Station), and other short-term locations such as playing fields or play areas The values in brackets in table D5-15 represent the summary of the changes at the short-term receptor locations excluding the transient exposure locations such as footpaths or the public highways (i.e. including only those locations where exposure would occur at a fixed location such as commercial/industrial premises or playing fields/play areas).

Table 2-8 Number of human receptors experiencing predicted effects – short-term receptors

Effect descriptor	Number of short-term only receptors experiencing predicted effects	
	One-hour mean NO_2 (99.8th percentile)	
	Year 2 peak earthworks and Marine Works scenario	Year 5 peak construction scenario
Large adverse	3 (0) [86 (9)]	0 (0) [1 (0)]
Medium adverse	38 (8) [273 (20)]	1 (0) [36 (8)]
Small adverse	134 (4) [68 (19)]	20 (6) [97 (4)]
Negligible adverse	252 (36) [0 (0)]	406 (42) [293 (36)]
Values shown in square brackets are those presented in chapter D5 (APP-124) (i.e. prior to the application of any additional mitigation).		

2.1.28 The summary of effects set out in table 2-8 demonstrates that the overall balance of short-term effects is similar to that predicted at long-term receptors, with the majority of receptors experiencing a negligible effect. However, there is a higher proportion of small adverse effects at the short-term receptors. There is some shift from medium and large effects in the year 2 peak earthworks and Marine Works scenario to negligible and small effects in the year 5 peak construction scenario.

2.1.29 Overall, when considering the results presented and discussed in paragraphs 2.1.4 to 2.1.28, the emissions of NOx from plant, machinery and marine vessels are predicted to have a not significant effect on local air quality at human receptors during the construction period as represented by the year 2 peak earthworks and Marine Works scenario. The results confirm the conclusion set out in section 5.7 of chapter D5 (APP-124), that with the application of the proposed additional mitigation, the residual effects with regard to NO_2 at human receptors for the year 2 scenario (i.e. representing the highest potential air quality effects during approximately the first two years of the construction programme) would be not significant. Although a not significant effect was already identified for the year 5 scenario (i.e. representing the remainder of the construction programme) in chapter D5 (APP-124), the proposed additional mitigation reduces effects for this scenario further.

2.1.30 The above conclusion for the year 2 scenario is based on the following.

- The 99.8th percentile of one-hour mean NO_2 concentrations at all long-term and short-term receptors are within the AQO of 200µg/m^3. No exceedances are forecast and there is considerable headroom between the predicted concentrations and the AQO.
- The predicted increases in annual mean NO_2 concentrations are considerably smaller than prior to the application of the additional mitigation. The maximum predicted increase has dropped from 61% of the AQO value (see table D5-8 of chapter D5 (APP-124)) to 17% and

the maximum concentration is now predicted to be 11.5µg/m^3, considerably lower than 28.6µg/m^3 (see table D5-8 of chapter D5 (APP-124)) and well within the AQO of 40µg/m^3.

- The effects are predominantly described as negligible adverse at all long-term human receptors, with only a relatively small number of small or medium adverse effects.

Ecological receptors

Air quality assessment

2.1.31 The predicted changes in NOx and SO_2 concentrations at ecological receptors for the year 2 peak earthworks and Marine Works scenario are reported in table 2-9 to table 2-11. Corresponding predicted changes in nitrogen deposition rates are reported in table 2-12 and predicted changes in acid deposition rates are reported in table 2-13. Please note, the deposition rates reported in these tables and following nitrogen and acid deposition tables, are to one decimal place. The calculations and total deposition rates were based on the raw model outputs before rounding. The predicted change in NOx and SO_2 concentrations at ecological receptors for the year 5 peak construction scenario are reported in table 2-14 to table 2-16. Corresponding predicted changes in nitrogen deposition rates are reported in table 2-17 and predicted changes in acid deposition rates are reported in table 2-18.

2.1.32 The results in table 2-9 to table 2-18 demonstrate that the predicted annual mean and maximum 24-hour mean NOx concentrations and annual mean SO_2 concentrations at all ecological receptors were below the criteria for requiring further consideration in the terrestrial and freshwater ecology assessment (see chapter B5 Air quality (APP-070) for full details of the criteria). On this basis, effects due to increases in NOx concentrations are concluded to be negligible, and not significant at all ecological receptors.

2.1.33 Further consideration is given in the terrestrial and freshwater ecology assessment in section 2.2 of this report to the significance of direct and in-combination effects due to predicted changes in nitrogen or acid deposition for the following receptors:

- Cae Gwyn SSSI (based on the magnitude of predicted changes to nitrogen deposition for the year 2 scenario only); and
- Tre'r Gof SSSI (based on the magnitude of predicted changes to nitrogen and acid deposition for the year 2 and year 5 scenarios).

2.1.34 The effect of nitrogen and acid deposition at all other ecological receptors is concluded to be negligible, and not significant.

2.1.35 As discussed in paragraph 1.1.13, the assessment of air quality effects on the Cestyll Garden vegetation was considered within chapter D11 Cultural heritage (APP-130). Section 2.3 of this report provides an updated assessment of air quality effects on the Cestyll Garden vegetation based on the predicted concentrations and deposition rates with the additional air quality mitigation in place.

Table 2-9 Year 2 peak earthworks and Marine Works scenario – magnitude of annual mean NOx changes at ecological receptors

Receptor	Critical level (AQO) (µg/m^3)	Total concentration for:		Change as a percentage of AQO	Total concentration as a percentage of AQO	Further consideration required?
		Year 2 baseline (µg/m^3)	Year 2 peak earthworks and Marine Works (µg/m^3)			
Anglesey and Llyn Fens SAC and Ramsar	30	5.7	5.7	0%	19%	No
Cae Gwyn SSSI	30	5.6	7.2	+5%	24%	No
Cemlyn Bay SAC/SSSI and Anglesey Terns SPA	30	5.3	8.5	+10%	28%	No
Holy Island Coast SPA and SAC	30	6.0	6.1	0%	20%	No
Llyn Dinam SAC	30	6.2	6.3	0%	21%	No
Llyn Llygeirian SSSI	30	5.8	6.1	+1%	20%	No
Tre'r Gof SSSI	30	8.9	17.4	+28%	58%	No
Afon Wygyr Wildlife Site	30	10.4	11.2	+3%	37%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	30	5.8	19.2	+45%	64%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	30	5.7	6.6	+3%	22%	No
Cors Cae-Owen Wildlife Site	30	5.6	6.1	+2%	20%	No
Cors Cromlech Wildlife Site	30	6.0	6.9	+3%	23%	No
Cors Mynachdy Wildlife Site	30	5.3	5.9	+2%	20%	No

Receptor	Critical level (AQO) (µg/m^3)	Total concentration for:		Change as a percentage of AQO	Total concentration as a percentage of AQO	Further consideration required?
		Year 2 baseline (µg/m^3)	Year 2 peak earthworks and Marine Works (µg/m^3)			
Rhostir Mynydd Mechell Wildlife Site	30	5.7	6.0	+1%	20%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	30	5.6	6.0	+1%	20%	No
Trwyn Pencarreg Wildlife Site	30	5.7	18.2	+42%	61%	No
Ancient Woodland (ID 26076)	30	6.4	7.1	+2%	24%	No
Ancient Woodland (ID 26058)	30	5.7	6.3	+2%	21%	No
Ancient Woodland (ID 26074)	30	5.7	6.2	+2%	21%	No
Ancient Woodland (ID 26057)	30	5.6	6.1	+2%	20%	No
Ancient Woodland (ID 26073)	30	5.6	6.1	+1%	20%	No
Ancient Woodland (ID 26072)	30	5.6	6.0	+1%	20%	No
Ancient Woodland (ID 26053)	30	5.6	6.0	+1%	20%	No
Ancient Woodland (ID 26051)	30	12.9	13.5	+2%	45%	No
Ancient Woodland (ID 26052)	30	5.5	6.0	+2%	20%	No
Ancient Woodland (ID 26054)	30	5.4	6.0	+2%	20%	No
Ancient Woodland (ID 26055)	30	5.4	6.0	+2%	20%	No
Ancient Woodland (ID 26056)	30	5.4	6.0	+2%	20%	No
Ancient Woodland (ID 26060)	30	8.9	18.1	+31%	60%	No
Cestyll Garden	30	5.7	19.2	+45%	64%	No

Table 2-10 Year 2 peak earthworks and Marine Works scenario – magnitude of short-term NOx changes at ecological receptors

Receptor	Critical level (EAL) (µg/m^3)	Total concentration for:		Change as a percentage of EAL	Total concentration as a percentage of EAL	Further consideration required?
		Year 2 baseline (µg/m^3)	Year 2 peak earthworks and Marine Works (µg/m^3)			
Anglesey and Llyn Fens SAC and Ramsar	75	11.4	12.7	+2%	17%	No
Cae Gwyn SSSI	75	11.6	33.4	+29%	45%	No
Cemlyn Bay SAC/SSSI and Anglesey Terns SPA	200	10.6	50.9	+20%	25%	No
Holy Island Coast SPA and SAC	75	12.0	14.5	+3%	19%	No
Llyn Dinam SAC	200	12.5	14.8	+1%	7%	No
Llyn Llygeirian SSSI	200	11.1	24.6	+7%	12%	No
Tre'r Gof SSSI	75	17.7	62.3	+59%	83%	No
Afon Wygyr Wildlife Site	200	20.8	33.4	+6%	17%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	200	11.6	80.6	+34%	40%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	75	11.4	22.8	+15%	30%	No
Cors Cae-Owen Wildlife Site	200	11.2	21.4	+5%	11%	No
Cors Cromlech Wildlife Site	200	12.0	29.1	+9%	15%	No
Cors Mynachdy Wildlife Site	200	10.5	23.5	+6%	12%	No

Receptor	Critical level (EAL) (µg/m^3)	Total concentration for:		Change as a percentage of EAL	Total concentration as a percentage of EAL	Further consideration required?
		Year 2 baseline (µg/m^3)	Year 2 peak earthworks and Marine Works (µg/m^3)			
Rhostir Mynydd Mechell Wildlife Site	200	11.3	29.7	+9%	15%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	200	11.2	20.2	+4%	10%	No
Trwyn Pencarreg Wildlife Site	200	11.3	107.1	+48%	54%	No
Ancient Woodland (ID 26076)	200	12.7	24.3	+6%	12%	No
Ancient Woodland (ID 26058)	200	11.4	21.9	+5%	11%	No
Ancient Woodland (ID 26074)	200	11.4	20.0	+4%	10%	No
Ancient Woodland (ID 26057)	200	11.3	22.1	+5%	11%	No
Ancient Woodland (ID 26073)	200	11.3	21.8	+5%	11%	No
Ancient Woodland (ID 26072)	200	11.3	21.1	+5%	11%	No
Ancient Woodland (ID 26053)	200	11.3	21.4	+5%	11%	No
Ancient Woodland (ID 26051)	200	25.8	37.1	+6%	19%	No
Ancient Woodland (ID 26052)	200	11.0	23.6	+6%	12%	No
Ancient Woodland (ID 26054)	200	10.9	21.9	+6%	11%	No
Ancient Woodland (ID 26055)	200	10.9	23.6	+6%	12%	No
Ancient Woodland (ID 26056)	200	10.7	25.6	+7%	13%	No
Ancient Woodland (ID 26060)	200	17.7	63.3	+23%	32%	No
Cestyll Garden	200	11.3	106.8	+48%	53%	No

Table 2-11 Year 2 peak earthworks and Marine Works scenario – magnitude of annual mean SO_2 changes at ecological receptors

Receptor	Critical level (AQO or EAL) ($\mu g/m^3$)	Total concentration for:		Change as a percentage of AQO or EAL	Total concentration as a percentage of AQO or EAL	Further consideration required?
		Year 2 baseline ($\mu g/m^3$)	Year 5 peak earthworks and Marine Works ($\mu g/m^3$)			
Anglesey and Llyn Fens SAC and Ramsar	10	1.3	1.3	0%	13%	No
Cae Gwyn SSSI	10	1.7	1.7	0%	17%	No
Cemlyn Bay SAC/SSSI and Anglesey Terns SPA	20	1.9	2.0	0%	10%	No
Holy Island Coast SPA and SAC	10	2.2	2.2	0%	22%	No
Llyn Dinam SAC	20	1.5	1.5	0%	8%	No
Llyn Llygeirian SSSI	20	1.6	1.6	0%	8%	No
Tre'r Gof SSSI	10	2.1	2.2	+1%	22%	No
Afon Wygyr Wildlife Site	20	2.1	2.1	0%	10%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	20	2.6	2.8	+1%	14%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	10	1.8	1.8	0%	18%	No
Cors Cae-Owen Wildlife Site	20	1.6	1.6	0%	8%	No
Cors Cromlech Wildlife Site	20	1.6	1.7	0%	8%	No
Cors Mynachdy Wildlife Site	20	1.4	1.4	0%	7%	No

Receptor	Critical level (AQO or EAL) (µg/m^3)	Total concentration for:		Change as a percentage of AQO or EAL	Total concentration as a percentage of AQO or EAL	Further consideration required?
		Year 2 baseline (µg/m^3)	Year 5 peak earthworks and Marine Works (µg/m^3)			
Rhostir Mynydd Mechell Wildlife Site	20	1.6	1.6	0%	8%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	20	1.6	1.6	0%	8%	No
Trwyn Pencarreg Wildlife Site	20	1.9	2.1	+1%	11%	No
Ancient Woodland (ID 26076)	20	2.1	2.1	0%	10%	No
Ancient Woodland (ID 26058)	20	1.7	1.7	0%	9%	No
Ancient Woodland (ID 26074)	20	1.7	1.7	0%	9%	No
Ancient Woodland (ID 26057)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26073)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26072)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26053)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26051)	20	1.6	1.6	0%	8%	No
Ancient Woodland (ID 26052)	20	1.6	1.6	0%	8%	No
Ancient Woodland (ID 26054)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26055)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26056)	20	1.7	1.7	0%	9%	No
Ancient Woodland (ID 26060)	20	2.1	2.2	+1%	11%	No
Cestyll Garden	20	1.9	2.1	+1%	11%	No

Table 2-12 Year 2 peak earthworks and Marine Works scenario – change to nitrogen deposition rate at ecological receptors

Receptor	Vegetation type	Nitrogen deposition (kgN/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CL)	Year 2 baseline	Year 2 peak earthworks and Marine Works contribution	Total			
Anglesey and Llyn Fens SAC and Ramsar	Short	10	14.4	0.0	14.4	0%	144%	No
Cae Gwyn SSSI	Short	10	9.9	0.2	10.1	+2%	101%	Yes
Cemlyn Bay SAC/SSSI	Short	20	9.9	0.3	10.3	+2%	51%	No
Holy Island Coast SPA and SAC	Short	10	8.1	0.0	8.1	0%	81%	No
Llyn Dinam SAC	Short	10	12.2	0.0	12.2	0%	122%	No
Llyn Llygeirian SSSI	Short	10	13.0	0.0	13.1	0%	131%	No
Tre'r Gof SSSI	Short	10	13.0	0.9	13.9	+9%	139%	Yes
Afon Wygyr Wildlife Site	Short	10	13.0	0.1	13.1	+1%	131%	No
	Tall	10	20.4	0.2	20.6	+2%	206%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	Short	10	13.0	1.3	14.4	+13%	144%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	Short	10	13.0	0.1	13.1	+1%	131%	No
Cors Cae-Owen Wildlife Site	Short	10	13.0	0.0	13.1	0%	131%	No
	Tall	10	20.4	0.1	20.5	+1%	205%	No

Receptor	Vegetation type	Nitrogen deposition (kgN/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CL)	Year 2 baseline	Year 2 peak earthworks and Marine Works contribution	Total			
Cors Cromlech Wildlife Site	Short	10	13.0	0.1	13.1	+1%	131%	No
Cors Mynachdy Wildlife Site	Short	10	9.9	0.1	10.0	+1%	100%	No
Rhostir Mynydd Mechell Wildlife Site	Short	10	13.0	0.0	13.1	0%	131%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	Short	10	13.0	0.0	13.1	0%	131%	No
	Tall	10	20.4	0.1	20.5	+1%	205%	No
Trwyn Pencarreg Wildlife Site	Short	10	9.9	1.3	11.2	+13%	112%	No
Ancient Woodland (ID 26076)	Tall	5	20.4	0.1	20.6	+3%	412%	No
Ancient Woodland (ID 26058)	Tall	5	20.4	0.1	20.6	+2%	411%	No
Ancient Woodland (ID 26074)	Tall	5	20.4	0.1	20.5	+2%	411%	No
Ancient Woodland (ID 26057)	Tall	5	20.4	0.1	20.5	+2%	411%	No
Ancient Woodland (ID 26073)	Tall	5	20.4	0.1	20.5	+2%	411%	No
Ancient Woodland (ID 26072)	Tall	5	20.4	0.1	20.5	+2%	410%	No
Ancient Woodland (ID 26053)	Tall	5	20.4	0.1	20.5	+2%	410%	No
Ancient Woodland (ID 26051)	Tall	5	16.0	0.1	16.1	+2%	321%	No
Ancient Woodland (ID 26052)	Tall	5	16.0	0.1	16.1	+2%	321%	No

Receptor	Vegetation type	Nitrogen deposition (kgN/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CL)	Year 2 baseline	Year 2 peak earthworks and Marine Works contribution	Total			
Ancient Woodland (ID 26054)	Tall	5	16.0	0.1	16.1	+2%	321%	No
Ancient Woodland (ID 26055)	Tall	5	16.0	0.1	16.1	+2%	322%	No
Ancient Woodland (ID 26056)	Tall	5	16.0	0.1	16.1	+3%	322%	No
Ancient Woodland (ID 26060)	Tall	5	20.4	1.9	22.3	+37%	446%	No
Cestyll Garden	Short	n/a	9.9	1.4	11.3	n/a		Yes
	Tall		16.0	2.7	18.7			Yes

Table 2-13 Year 2 peak earthworks and Marine Works scenario – change to acid deposition rate at ecological receptors

Receptor	Vegetation type	Acid deposition (keq/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CLmaxN)	Year 2 baseline (N + S)	Year 2 peak earthworks and Marine Works contribution	Total			
Anglesey and Llyn Fens SAC and Ramsar	Short	4.28	1.20	0.00	1.20	0%	28%	No
Cae Gwyn SSSI	Short	1.01	0.85	0.01	0.86	+1%	85%	No
Cemlyn Bay SAC/SSSI	Short	Not sensitive	0.85	0.03	0.88	Not sensitive		No
Holy Island Coast SPA and SAC	Short	1.97	0.71	0.00	0.71	0%	36%	No
Llyn Dinam SAC	Short	0.50	1.02	0.00	1.02	0%	204%	No
Llyn Llygeirian SSSI	Short	2.04	1.07	0.00	1.07	0%	53%	No
Llyn Llygeirian SSSI (CLmaxS)[1]	Short	0.79	0.14	0.00	0.14	0%	18%	No
Tre'r Gof SSSI	Short	1.23	1.10	0.08	1.18	+6%	96%	Yes
Afon Wygyr Wildlife Site	Short	1.99	1.10	0.01	1.11	0%	56%	No
	Tall	2.77	1.66	0.02	1.68	+1%	61%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	Short	1.02	1.10	0.12	1.22	+11%	119%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	Short	1.50	1.10	0.01	1.11	+1%	74%	No

Receptor	Vegetation type	Acid deposition (keq/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CLmaxN)	Year 2 baseline (N + S)	Year 2 peak earthworks and Marine Works contribution	Total			
Cors Cae-Owen Wildlife Site	Short	1.02	1.10	0.00	1.10	0%	108%	No
	Tall	1.55	1.66	0.01	1.67	+1%	108%	No
Cors Cromlech Wildlife Site	Short	1.99	1.10	0.01	1.11	0%	56%	No
Cors Mynachdy Wildlife Site	Short	1.99	0.85	0.01	0.86	0%	43%	No
Rhostir Mynydd Mechell Wildlife Site	Short	1.99	1.10	0.00	1.10	0%	55%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	Short	1.02	1.10	0.00	1.10	0%	108%	No
	Tall	1.55	1.66	0.01	1.67	+1%	108%	No
Trwyn Pencarreg Wildlife Site	Short	1.01	0.85	0.12	0.97	+11%	96%	No
Ancient Woodland (ID 26076)	Tall	2.77	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26058)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26074)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26057)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26073)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26072)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26053)	Tall	2.78	1.66	0.01	1.67	0%	60%	No

Receptor	Vegetation type	Acid deposition (keq/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CLmaxN)	Year 2 baseline (N + S)	Year 2 peak earthworks and Marine Works contribution	Total			
Ancient Woodland (ID 26051)	Tall	2.74	1.32	0.01	1.33	0%	49%	No
Ancient Woodland (ID 26052)	Tall	1.52	1.32	0.01	1.33	+1%	87%	No
Ancient Woodland (ID 26054)	Tall	2.74	1.32	0.01	1.33	0%	49%	No
Ancient Woodland (ID 26055)	Tall	2.74	1.32	0.01	1.33	0%	49%	No
Ancient Woodland (ID 26056)	Tall	1.51	1.32	0.01	1.33	+1%	88%	No
Ancient Woodland (ID 26060)	Tall	1.55	1.66	0.16	1.82	+11%	118%	No
Cestyll Garden	Short	n/a	0.85	0.12	0.97	n/a		Yes
	Tall		1.32	0.24	1.56			Yes

Table 2-14 Year 5 peak construction scenario – magnitude of annual mean NOx changes at ecological receptors

Receptor	Critical level (AQO) (µg/m^3)	Total concentration for:		Change as a percentage of AQO	Total concentration as a percentage of AQO	Further consideration required?
		Year 5 baseline (µg/m^3)	Year 5 peak construction (µg/m^3)			
Anglesey and Llyn Fens SAC and Ramsar	30	5.7	5.7	0%	19%	No
Cae Gwyn SSSI	30	5.6	6.8	+4%	23%	No
Cemlyn Bay SAC/SSSI and Anglesey Terns SPA	30	5.3	6.2	+3%	21%	No
Holy Island Coast SPA and SAC	30	6.0	6.0	0%	20%	No
Llyn Dinam SAC	30	6.2	6.3	0%	21%	No
Llyn Llygeirian SSSI	30	5.8	5.9	+1%	20%	No
Tre'r Gof SSSI	30	8.9	13.9	+17%	46%	No
Afon Wygyr Wildlife Site	30	10.0	10.3	+1%	34%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	30	5.8	9.2	+11%	31%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	30	5.7	6.1	+1%	20%	No
Cors Cae-Owen Wildlife Site	30	5.6	5.8	+1%	19%	No
Cors Cromlech Wildlife Site	30	6.0	6.4	+1%	21%	No
Cors Mynachdy Wildlife Site	30	5.3	5.5	+1%	18%	No
Rhostir Mynydd Mechell Wildlife Site	30	5.7	5.8	+1%	19%	No

Receptor	Critical level (AQO) (µg/m^3)	Total concentration for:		Change as a percentage of AQO	Total concentration as a percentage of AQO	Further consideration required?
		Year 5 baseline (µg/m^3)	Year 5 peak construction (µg/m^3)			
Tir Gwlyb Teilia Neuadd Wildlife Site	30	5.6	5.8	+1%	19%	No
Trwyn Pencarreg Wildlife Site	30	5.7	8.1	+8%	27%	No
Ancient Woodland (ID 26076)	30	6.3	6.6	+1%	22%	No
Ancient Woodland (ID 26058)	30	5.7	5.9	+1%	20%	No
Ancient Woodland (ID 26074)	30	5.7	5.9	+1%	20%	No
Ancient Woodland (ID 26057)	30	5.6	5.8	+1%	19%	No
Ancient Woodland (ID 26073)	30	5.6	5.8	+1%	19%	No
Ancient Woodland (ID 26072)	30	5.6	5.8	+1%	19%	No
Ancient Woodland (ID 26053)	30	5.6	5.8	+1%	19%	No
Ancient Woodland (ID 26051)	30	12.2	12.5	+1%	42%	No
Ancient Woodland (ID 26052)	30	5.5	5.7	+1%	19%	No
Ancient Woodland (ID 26054)	30	5.4	5.6	+1%	19%	No
Ancient Woodland (ID 26055)	30	5.4	5.7	+1%	19%	No
Ancient Woodland (ID 26056)	30	5.4	5.6	+1%	19%	No
Ancient Woodland (ID 26060)	30	8.9	14.0	+17%	47%	No
Cestyll Garden	30	5.7	8.4	+9%	28%	No

Table 2-15 Year 5 peak construction scenario – magnitude of short-term NOx changes at ecological receptors

Receptor	Critical level (EAL) (µg/m^3)	Total concentration for:		Change as a percentage of EAL	Total concentration as a percentage of EAL	Further consideration required?
		Year 5 baseline (µg/m^3)	Year 5 peak construction (µg/m^3)			
Anglesey and Llyn Fens SAC and Ramsar	75	11.4	11.8	+1%	16%	No
Cae Gwyn SSSI	75	11.6	21.3	+13%	28%	No
Cemlyn Bay SAC/SSSI and Anglesey Terns SPA	200	10.6	20.4	+5%	10%	No
Holy Island Coast SPA and SAC	75	12.0	12.8	+1%	17%	No
Llyn Dinam SAC	200	12.5	13.4	0%	7%	No
Llyn Llygeirian SSSI	200	11.5	15.8	+2%	8%	No
Tre'r Gof SSSI	75	17.7	46.0	+38%	61%	No
Afon Wygyr Wildlife Site	200	20.0	23.3	+2%	12%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	200	11.6	54.1	+21%	27%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	75	11.4	15.3	+5%	20%	No
Cors Cae-Owen Wildlife Site	200	11.2	14.5	+2%	7%	No
Cors Cromlech Wildlife Site	200	12.0	18.8	+3%	9%	No
Cors Mynachdy Wildlife Site	200	10.5	14.4	+2%	7%	No
Rhostir Mynydd Mechell Wildlife Site	200	11.3	15.8	+2%	8%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	200	11.2	13.9	+1%	7%	No

Receptor	Critical level (EAL) ($\mu g/m^3$)	Total concentration for:		Change as a percentage of EAL	Total concentration as a percentage of EAL	Further consideration required?
		Year 5 baseline ($\mu g/m^3$)	Year 5 peak construction ($\mu g/m^3$)			
Trwyn Pencarreg Wildlife Site	200	11.3	29.3	+9%	15%	No
Ancient Woodland (ID 26076)	200	12.7	15.6	+1%	8%	No
Ancient Woodland (ID 26058)	200	11.4	14.5	+2%	7%	No
Ancient Woodland (ID 26074)	200	11.4	14.2	+1%	7%	No
Ancient Woodland (ID 26057)	200	11.3	14.2	+1%	7%	No
Ancient Woodland (ID 26073)	200	11.3	14.4	+2%	7%	No
Ancient Woodland (ID 26072)	200	11.3	14.2	+1%	7%	No
Ancient Woodland (ID 26053)	200	11.3	14.4	+2%	7%	No
Ancient Woodland (ID 26051)	200	24.4	28.7	+2%	14%	No
Ancient Woodland (ID 26052)	200	11.0	14.6	+2%	7%	No
Ancient Woodland (ID 26054)	200	10.9	15.0	+2%	8%	No
Ancient Woodland (ID 26055)	200	10.9	15.2	+2%	8%	No
Ancient Woodland (ID 26056)	200	10.7	14.8	+2%	7%	No
Ancient Woodland (ID 26060)	200	17.7	46.3	+14%	23%	No
Cestyll Garden	200	11.3	30.6	+10%	15%	No

Table 2-16 Year 5 peak construction scenario – magnitude of annual mean SO_2 changes at ecological receptors

Receptor	Critical level (AQO or EAL) ($\mu g/m^3$)	Total concentration for:		Change as a percentage of AQO or EAL	Total concentration as a percentage of AQO or EAL	Further consideration required?
		Year 5 baseline ($\mu g/m^3$)	Year 5 peak construction ($\mu g/m^3$)			
Anglesey and Llyn Fens SAC and Ramsar	10	1.3	1.3	0%	13%	No
Cae Gwyn SSSI	10	1.7	1.7	0%	17%	No
Cemlyn Bay SAC/SSSI and Anglesey Terns SPA	20	1.9	2.0	+1%	10%	No
Holy Island Coast SPA and SAC	10	2.2	2.2	0%	22%	No
Llyn Dinam SAC	20	1.5	1.5	0%	8%	No
Llyn Llygeirian SSSI	20	1.6	1.6	0%	8%	No
Tre'r Gof SSSI	10	2.1	2.3	+2%	23%	No
Afon Wygyr Wildlife Site	20	2.1	2.1	0%	10%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	20	2.6	2.8	+1%	14%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	10	1.8	1.9	0%	19%	No
Cors Cae-Owen Wildlife Site	20	1.6	1.6	0%	8%	No
Cors Cromlech Wildlife Site	20	1.6	1.7	0%	8%	No
Cors Mynachdy Wildlife Site	20	1.4	1.4	0%	7%	No
Rhostir Mynydd Mechell Wildlife Site	20	1.6	1.6	0%	8%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	20	1.6	1.6	0%	8%	No

Receptor	Critical level (AQO or EAL) ($\mu g/m^3$)	Total concentration for:		Change as a percentage of AQO or EAL	Total concentration as a percentage of AQO or EAL	Further consideration required?
		Year 5 baseline ($\mu g/m^3$)	Year 5 peak construction ($\mu g/m^3$)			
Trwyn Pencarreg Wildlife Site	20	1.9	2.2	+2%	11%	No
Ancient Woodland (ID 26076)	20	2.1	2.1	0%	10%	No
Ancient Woodland (ID 26058)	20	1.7	1.7	0%	9%	No
Ancient Woodland (ID 26074)	20	1.7	1.7	0%	9%	No
Ancient Woodland (ID 26057)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26073)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26072)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26053)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26051)	20	1.6	1.6	0%	8%	No
Ancient Woodland (ID 26052)	20	1.6	1.6	0%	8%	No
Ancient Woodland (ID 26054)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26055)	20	1.5	1.5	0%	8%	No
Ancient Woodland (ID 26056)	20	1.7	1.7	0%	9%	No
Ancient Woodland (ID 26060)	20	2.1	2.3	+1%	11%	No
Cestyll Garden	20	1.9	2.2	+1%	11%	No

Table 2-17 Year 5 peak construction scenario – change to nitrogen deposition at ecological receptors

Receptor	Vegetation type	Nutrient nitrogen deposition (kgN/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CL)	Year 5 baseline	Year 5 peak construction contribution	Total			
Anglesey and Llyn Fens SAC and Ramsar	Short	10	14.4	0.0	14.4	0%	144%	No
Cae Gwyn SSSI	Short	10	9.9	0.1	10.1	1%	101%	No
Cemlyn Bay SAC/SSSI	Short	20	9.9	0.1	10.0	0%	50%	No
Holy Island Coast SPA and SAC	Short	10	8.1	0.0	8.1	0%	81%	No
Llyn Dinam SAC	Short	10	12.2	0.0	12.2	0%	122%	No
Llyn Llygeirian SSSI	Short	10	13.0	0.0	13.0	0%	130%	No
Tre'r Gof SSSI	Short	10	13.0	0.5	13.5	5%	135%	Yes
Afon Wygyr Wildlife Site	Short	10	13.0	0.0	13.1	0%	131%	No
	Tall	10	20.4	0.1	20.5	1%	205%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	Short	10	13.0	0.3	13.4	3%	134%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	Short	10	13.0	0.0	13.1	0%	131%	No
Cors Cae-Owen Wildlife Site	Short	10	13.0	0.0	13.0	0%	130%	No
	Tall	10	20.4	0.0	20.5	0%	205%	No
Cors Cromlech Wildlife Site	Short	10	13.0	0.0	13.1	0%	131%	No

Receptor	Vegetation type	Nutrient nitrogen deposition (kgN/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CL)	Year 5 baseline	Year 5 peak construction contribution	Total			
Cors Mynachdy Wildlife Site	Short	10	9.9	0.0	10.0	0%	100%	No
Rhostir Mynydd Mechell Wildlife Site	Short	10	13.0	0.0	13.0	0%	130%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	Short	10	13.0	0.0	13.0	0%	130%	No
	Tall	10	20.4	0.0	20.5	0%	205%	No
Trwyn Pencarreg Wildlife Site	Short	10	9.9	0.2	10.2	2%	102%	No
Ancient Woodland (ID 26076)	Tall	5	20.4	0.1	20.5	1%	410%	No
Ancient Woodland (ID 26058)	Tall	5	20.4	0.0	20.5	1%	410%	No
Ancient Woodland (ID 26074)	Tall	5	20.4	0.0	20.5	1%	410%	No
Ancient Woodland (ID 26057)	Tall	5	20.4	0.0	20.5	1%	410%	No
Ancient Woodland (ID 26073)	Tall	5	20.4	0.0	20.5	1%	410%	No
Ancient Woodland (ID 26072)	Tall	5	20.4	0.0	20.5	1%	409%	No
Ancient Woodland (ID 26053)	Tall	5	20.4	0.0	20.5	1%	409%	No
Ancient Woodland (ID 26051)	Tall	5	16.0	0.1	16.0	1%	320%	No
Ancient Woodland (ID 26052)	Tall	5	16.0	0.0	16.0	1%	320%	No
Ancient Woodland (ID 26054)	Tall	5	16.0	0.0	16.0	1%	320%	No
Ancient Woodland (ID 26055)	Tall	5	16.0	0.0	16.0	1%	320%	No

Receptor	Vegetation type	Nutrient nitrogen deposition (kgN/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CL)	Year 5 baseline	Year 5 peak construction contribution	Total			
Ancient Woodland (ID 26056)	Tall	5	16.0	0.0	16.0	1%	320%	No
Ancient Woodland (ID 26060)	Tall	5	20.4	1.0	21.5	21%	430%	No
Cestyll Garden	Short	n/a	9.9	0.27	10.2	n/a		Yes
	Tall		16.0	0.54	16.5			Yes

Table 2-18 Year 5 peak construction scenario – change to acid deposition rate at ecological receptors

Receptor	Vegetation type	Acid deposition (keq/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CLmaxN)	Year 5 baseline (N + S)	Year 5 peak construction contribution	Total			
Anglesey and Llyn Fens SAC and Ramsar	Short	4.28	1.20	0.00	1.20	0%	28%	No
Cae Gwyn SSSI	Short	1.01	0.85	0.01	0.86	+1%	85%	No
Cemlyn Bay SAC/SSSI	Short	Not sensitive	0.85	0.02	0.87	Not sensitive		No
Holy Island Coast SPA and SAC	Short	1.97	0.71	0.00	0.71	0%	36%	No
Llyn Dinam SAC	Short	0.50	1.02	0.00	1.02	0%	204%	No
Llyn Llygeirian SSSI	Short	2.04	1.07	0.00	1.07	0%	53%	No
Llyn Llygeirian SSSI (CLmaxS)[1]	Short	0.79	0.14	0.00	0.79	0%	18%	No
Tre'r Gof SSSI	Short	1.23	1.10	0.06	1.16	+5%	94%	Yes
Afon Wygyr Wildlife Site	Short	1.99	1.10	0.01	1.11	0%	56%	No
	Tall	2.77	1.66	0.01	1.67	0%	60%	No
Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site	Short	1.02	1.10	0.05	1.15	+5%	112%	No
Arfordir Trwyn y Buarth – Porth Wen Wildlife Site	Short	1.50	1.10	0.01	1.11	0%	74%	No
Cors Cae-Owen Wildlife Site	Short	1.02	1.10	0.00	1.10	0%	108%	No

Receptor	Vegetation type	Acid deposition (keq/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CLmaxN)	Year 5 baseline (N + S)	Year 5 peak construction contribution	Total			
	Tall	1.55	1.66	0.01	1.67	0%	108%	No
Cors Cromlech Wildlife Site	Short	1.99	1.10	0.01	1.11	0%	56%	No
Cors Mynachdy Wildlife Site	Short	1.99	0.85	0.00	0.85	0%	43%	No
Rhostir Mynydd Mechell Wildlife Site	Short	1.99	1.10	0.00	1.10	0%	55%	No
Tir Gwlyb Teilia Neuadd Wildlife Site	Short	1.02	1.10	0.00	1.10	0%	108%	No
	Tall	1.55	1.66	0.01	1.67	0%	108%	No
Trwyn Pencarreg Wildlife Site	Short	1.01	0.85	0.05	0.90	+5%	89%	No
Ancient Woodland (ID 26076)	Tall	2.77	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26058)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26074)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26057)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26073)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26072)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26053)	Tall	2.78	1.66	0.01	1.67	0%	60%	No
Ancient Woodland (ID 26051)	Tall	2.74	1.32	0.01	1.33	0%	49%	No
Ancient Woodland (ID 26052)	Tall	1.52	1.32	0.01	1.33	0%	87%	No

Receptor	Vegetation type	Acid deposition (keq/ha/year)				Change as a percentage of CL	Total deposition rate as a percentage of CL	Further consideration required?
		Critical load (CLmaxN)	Year 5 baseline (N + S)	Year 5 peak construction contribution	Total			
Ancient Woodland (ID 26054)	Tall	2.74	1.32	0.01	1.33	0%	48%	No
Ancient Woodland (ID 26055)	Tall	2.74	1.32	0.01	1.33	0%	48%	No
Ancient Woodland (ID 26056)	Tall	1.51	1.32	0.01	1.33	+1%	88%	No
Ancient Woodland (ID 26060)	Tall	1.55	1.66	0.12	1.78	+8%	115%	No
Cestyll Garden	Short	n/a	0.85	0.05	0.90	n/a		Yes
	Tall		1.32	0.10	1.42			Yes

2.2 Terrestrial and freshwater ecology

2.2.1 Chapter D9 Terrestrial and freshwater ecology (APP-128) identified the following receptors as potentially affected by changes to air quality during the two modelled scenarios (year 2 peak earthworks and marine works, and year 5 peak construction):

- Tre'r Gof SSSI;
- Cemlyn Bay SSSI / Special Area of Conservation (SAC);
- Cae Gwyn SSSI;
- Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site;
- Ancient woodland
- fungi; and,
- lichen.

2.2.2 With the application of additional ecological mitigation measures described in chapter D9 (APP-128), the assessment concluded there would be no significant effects as a result of changes to air quality on any ecological receptor. The effects of changes in air quality on both Cemlyn Bay SSSI / SAC, and ancient woodland were concluded as being negligible; neither receptor is therefore considered further in this document.

2.2.3 With the application of additional air quality mitigation measures to control NOx emissions from construction plant and machinery (see paragraph **Error! Reference source not found.**), no ecological receptors have been identified as requiring further consideration as a result of increases in annual mean or 24-hour mean NOx concentrations during either modelled scenario.

2.2.4 Two ecological receptors have been identified as requiring further consideration as a result of increases to nitrogen and/or acid deposition during one or both modelled scenarios:

- Tre'r Gof SSSI: increases in both nitrogen and acid deposition during both the year 2 and year 5 modelled scenarios.
- Cae Gwyn SSSI: an increase in nitrogen deposition during the year 2 modelled scenario.

2.2.5 As described in chapter D9 (APP-128), a study by Caporn et al. [RD4] was used to predict changes in habitat quality indicators at both Tre'r Gof SSSI and Cae Gwyn SSSI as a result of incremental changes in long-term nitrogen deposition above critical loads.

2.2.6 Although alkaline fen as a defined habitat was not represented within the Caporn et al. (2016) study, the nearest available equivalent was used; in this case bog habitat. It is acknowledged that, ecologically, the two habitats are distinct, but the effects of increased nitrogen deposition are considered similar for both. The either year study period employed by Caporn et al. is different from the two peak modelled scenarios assessed here. However, it is felt that the use of the Caporn et al. (2016) study represents a precautionary approach.

2.2.7 A typical response to increases in nitrogen deposition is an increase in nutrient-demanding plants such as grasses and sedges (graminoids), and the consequent loss of less competitive species such as smaller herbs and bryophytes [RD4]; [RD5] which are likely to represent the rarer, more important species present within the SSSIs.

2.2.8 At Tre'r Gof SSSI, the predicted increase in nitrogen deposition at year 2 is 0.9 kgN/ha/year, and at year 5 this drops to 0.5 kgN/ha/year. Following Caporn et al's 2016 study, the year 2 scenario would potentially lead to a 0.8% decrease in overall species richness within the SSSI, a 3.5% decrease in forb species richness, and a 1.4% increase in graminoid cover. The year 5 scenario would potentially lead to a 0.5% decrease in overall species richness within the SSSI, a 2.0% decrease in forb species richness, and a 0.8% increase in graminoid cover.

2.2.9 The predicted increases in acid deposition at Tre'r Gof SSSI as a result of the year 2 and year 5 scenarios are 0.08 keq/ha/year and 0.06 keq/ha/year respectively. This increase in acid is below the critical load value for the SSSI and is likely to be buffered by the fen's alkaline nature which provides resilience to changes in pH levels, although areas within the SSSI which are more acidic may be affected by a decrease in species diversity.

2.2.10 Although the additional air quality mitigation to control NOx emissions from construction plant and machinery would result in a decrease in nitrogen and acid deposition at Tre'r Gof SSSI from that described in chapter D9 (APP-128), it is considered that there may still be measurable changes in the attributes and quality of the SSSI as a result of changes in air quality (including fugitive dust). This would represent a small magnitude of change and a moderate adverse effect in the medium term, which is anticipated to reduce as changes in nitrogen and acid deposition reduce towards baseline conditions.

2.2.11 Additional ecological mitigation measures presented in chapter D9 (APP-128), would still be implemented and, once taken into account, it is considered that the overall effect on Tre'r Gof SSSI from changes in air quality would be minor adverse and therefore not significant. However, the combined effect to Tre'r Gof SSSI from changes to air quality and hydrology remains major adverse, as presented in chapter D9 (APP-128).

2.2.12 Cae Gwyn SSSI requires further consideration in relation to an increase in nitrogen deposition during the year 2 scenario only. Acid deposition at this site is not considered to require further consideration.

2.2.13 The nitrogen deposition at Cae Gwyn SSSI predicted to occur at year 2 is an increase of 0.2 kgN/ha/year. Again, using the Caporn et al 2016 study, this increase would potentially lead to a 0.2% decrease in overall species richness within the SSSI, a 0.8% decrease in forb species richness, and a 0.3% increase in graminoid cover.

2.2.14 The overall changes in air quality at Cae Gwyn SSSI, including effects of fugitive dust, are predicted to lead to very small measurable changes in the interest features and quality of the SSSI. This is considered to represent a small magnitude of change and a minor adverse effect in the medium term,

which is anticipated to reduce as changes in nitrogen deposition reduce towards baseline conditions.

2.2.15 Potential minor adverse effects on the SSSI are also predicted as a result of changes to hydrological conditions, as presented in chapter D9 (APP-128). The overall combined effect for Cae Gwyn SSSI remains minor adverse.

2.2.16 Although Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site has been screened out for further consideration as a result of changes in NOx concentrations and nitrogen and acid deposition at the site, sources of fugitive dust would still be present within the site itself and within 50m of much of its boundary. The overall assessment of air quality effects on Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site therefore remains minor adverse following the implementation of additional ecological mitigation measures, as presented in chapter D9 (APP-128).

2.2.17 The assessment of effects on fungi presented in chapter D9 (APP-128), was directly linked to the assessment of effects on Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site. It is therefore considered that, as with Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site, the overall assessment of effects on fungi remains minor adverse following the implementation of additional ecological mitigation measures, as presented in chapter D9 (APP-128).

2.2.18 Although all other designated site ecological receptors have been screened out for further consideration following the application of additional air quality mitigation measures to control NOx emissions from construction plant and machinery, lichen as a species receptor requires consideration. Although the modelled figures for NOx concentrations presented in this document do not meet the criteria for further ecological consideration, there is still an increase from baseline conditions. Given the paucity of information on the effects of air quality on seashore lichens, it is considered that the conclusions of the assessment for lichen presented in chapter D9 (APP-128), should be retained here as a suitably precautionary approach, and that minor adverse effects may occur.

2.3 Cultural heritage

2.3.1 An assessment of the potential effects resulting from an increase in the deposition of NOx, and increased nitrogen deposition and acid deposition on Cestyll Garden, a Grade II Registered Historic Park and Garden, were assessed in chapter D11 (cultural heritage) (APP-130). The assessment identified that:

- due to construction lasting a relatively short period of time in the lifespan of woody species and the ability of the soil to buffer against acidification from increased nitrogen deposition the effects of changes in air quality on woody species are likely to be limited;
- even with the potential for soil acidification, the pH is likely to remain within a healthy range for Species such as rhododendrons and azaleas; and

- there is some potential for other plant species present within the valley garden plants to be affected due to changes in air quality, in particular an increase in the concentration of NOx, increased nitrogen deposition and acid deposition.

2.3.2 As identified in paragraph 2.1.3 above, the predicted annual mean and maximum 24-hour mean NOx concentrations and annual mean SO_2 concentrations at Cestyll Garden are below the criteria for requiring further consideration in the terrestrial and freshwater ecology assessment (see chapter B5 Air quality (APP-070) for full details of the criteria). On this basis, effects due to increases in NOx concentrations are concluded to be negligible, and not significant for Cestyll Garden.

2.3.3 In addition, given the levels of nitrogen deposition and acid deposition now predicted, the potential for significant effects to plant species from nitrogen deposition and acid deposition is considered to be extremely limited. However, as a precaution, the mitigation measure identified in paragraph 11.6.16 of chapter D11 (cultural heritage) (APP-130) of consulting with the landowner of Cestyll Garden to implement appropriate monitoring of soil pH and a visual inspection of the condition of plants during the bulk earthworks of the construction period, would still be undertaken. This mitigation is secured in the Main Power Station Site sub-CoCP (APP-415).

2.3.4 Due to other effects, including removal of the kitchen garden, removal of part of the Essential Setting, noise and visual intrusion during construction and decommissioning, and visual intrusion during operation, the significance of residual effect for Cestyll Garden would remain as predicted in chapter D11 (cultural heritage) (APP-130) i.e. major adverse during construction and operation, and moderate adverse during decommissioning.

2.4 Health Impact Assessment

2.4.1 The revised air quality modelling discussed in section 2.1 has implications for the conclusions of section D.2 of the Health Impact Assessment Report (APP-429). The Health Impact Assessment was based on the air quality modelling presented in the DCO submission. That modelling represented a worst case scenario, which did not reflect the residual effects with the additional mitigation that had been proposed, but not quantified at that stage.

2.4.2 With consideration of the lower emitting plant, machinery and marine vessels modelled in section 2.1 (in relation to the emissions standards that the Wylfa Newydd DCO Project's plant and vehicles would comply with), NOx emissions produced from these sources would be considerably reduced. Although, the additional mitigation would not appreciably affect concentrations of PM_{10} and $PM_{2.5}$ from these sources, these were already assessed as negligible in chapter D5 (APP-124) of the Environmental Statement, being well within the relevant UK AQOs. The results of the section 2.1 modelling indicate that the additional mitigation would not lead to any changes to the description of effects for PM_{10} or $PM_{2.5}$.

2.4.3 In relation to vehicle and machinery emissions on the Wylfa Newydd Development Area during construction, the Health Impact Assessment Report (APP-429) reached an overall conclusion in relation to all air pollutants from this source, rather than separate conclusions for NO_2 and fine particulate matter (i.e. PM_{10} and $PM_{2.5}$). However, the assessment presented in chapter D5 (APP-124) of the Environmental Statement concluded that the effects from plant and machinery related primarily to NO_2 (particularly short-term concentrations), with negligible changes in annual mean or short-term concentrations of PM_{10} and $PM_{2.5}$.

2.4.4 Paragraphs D2.16 and D.2.17 of the Health Impact Assessment Report (APP-429), which concluded a minor adverse effect on the health of the general population and up to a moderate adverse effect on the health for particularly sensitive groups, therefore needs reconsidering in light of NO_2 concentrations (the pollutant driving the original conclusion) being substantially reduced by the additional mitigation.

2.4.5 On this basis it is considered that the conclusions reached in HIA paragraphs D2.16 that "*the residual significance of potential health and well-being effects is considered to be minor adverse for the general population (the majority of people) near the Wylfa Newydd Development Area*" would change to negligible as a consequence of the proposed change.

2.4.6 Similarly, the conclusions reached in HIA paragraphs D2.17 that "*For particularly sensitive groups within the affected population, the residual effect could range up to moderate adverse*" would change to minor adverse as a consequence of the proposed change.

2.4.7 The HIA conclusions in relation to air pollutants, particularly fine particulate matter, from other sources (such as dust generated by construction activities, excavation and earth movements during construction) are not

expected to be affected by the additional mitigation commitments described in paragraph **Error! Reference source not found.**.

2.4.8 In summary, changes to less adverse health impact assessment conclusions for vehicle and machinery emissions on the Wylfa Newydd Development Area during construction reflect the beneficial effects of the additional mitigation.

2.4.9 There would be no change to the cumulative effects of the Health Impact Assessment Report (APP-429).

3 Assessment of intra-project cumulative air quality effects

3.1.1 Chapter I4 (APP-387) and associated appendix (appendix I4-2 (APP-393)) considered the intra-project additive effects of the predicted increase in pollutant concentrations (NOx, NO_2 and particulate matter (PM_{10} and $PM_{2.5}$)) at key human and ecological receptor locations in close proximity to both the Wylfa Newydd Development Area and the A5025. Chapter I4 (APP-387) concluded that there would be no significant intra-project cumulative effects with regard to the combined emissions to air from sources within the Wylfa Newydd Development Area and emissions from road traffic associated with the Wylfa Newydd Project.

3.1.2 As the additional mitigation discussed in paragraph **Error! Reference source not found.** reduces emissions of NOx from construction plant, machinery and marine vessels in the Wylfa Newydd Development Area and leads to only reductions in the resulting pollutant concentrations (or nitrogen and acid deposition rates) at human and ecological receptors, there is no change to the conclusion set out in chapter I4 (APP-387).

3.1.3 For completeness, this chapter provides an update to the assessment of the construction phase presented in Appendix I4-2 (APP-393) with the additional mitigation in place. Only the model predictions related to emissions of NOx are updated as there is no change to the intra-project cumulative effects for PM_{10} and $PM_{2.5}$.

Peak earthworks and Marine Works construction – year 2

3.1.4 The predicted change in annual mean and short-term concentrations of NO_2 for the year 2 peak earthworks and Marine Works scenario are provided in table 3-1 and table 3-2, respectively. As discussed in section 2.1, the table column headers for the 99.8th percentile of one-hour mean NO_2 concentrations has been shortened to '1-hour NO_2'. The predicted change in annual mean and short-term concentrations of NO_2 and nitrogen and acid deposition at the relevant ecological receptors are set out in table 3-3 to table 3-6.

Table 3-1 Peak earthworks and Marine Works (year 2) – predicted intra-project additive annual mean air pollutant concentrations at key human receptors

Receptor	Total concentration for future baseline	Total intra-project additive concentration for future with Wylfa Newydd Project	Magnitude of change as percentage of AQO value[1,2]
	NO_2 (µg/m^3)	NO_2 (µg/m^3)	NO_2 (AQO = 40µg/m^3)
R4	10.4	12.2	+5% (n)
R5	7.5	9.4	+5% (n)
R6	8.4	11.5	+8% (s)
R7	6.1	9.0	+7% (s)
R8	5.1	6.3	+3% (n)

Note 1: Impact magnitude rounded to whole numbers and reported as a percentage of the respective AQO value.

Note 2: Descriptors of effects at individual receptors in parentheses as per table B5-15 of chapter B5 (APP-070): 'n' is negligible, 's' is small, 'm' is medium and 'l' is large.

Table 3-2 Peak earthworks and Marine Works (year 2) – predicted intra-project additive short-term air pollutant concentrations at key human receptors

Receptor	Total concentration for future baseline	Total intra-project additive concentration for future with Wylfa Newydd Project	Magnitude of change as percentage of AQO value[1,2]
	1-hour NO_2 (µg/m^3)	1-hour NO_2 (µg/m^3)	1-hour NO_2 (AQO = 200µg/m^3)
R4	20.7	38.1	+9% (n)
R5	14.9	40.1	+13% (s)
R6	16.7	44.4	+14% (s)
R7	12.2	41.9	+15% (s)
R8	10.3	25.3	+8% (n)

Note 1: Impact magnitude rounded to whole numbers and reported as a percentage of the respective AQO value.

Note 2: Descriptors of effects at individual receptors in parentheses as per table B5-16 of chapter B5 (APP-070): 'n' is negligible, 's' is small, 'm' is medium and 'l' is large.

Table 3-3 Peak earthworks and Marine Works (year 2) – predicted intra-project additive annual mean NOx concentrations at ecological receptors

Receptor	Critical level (AQO) (µg/m^3)	Total concentration for (µg/m^3)		Change as percentage of AQO	Total concentration as a percentage of AQO	Further consideration required
		Future baseline	Intra-project additive concentration for future with Wylfa Newydd Project			
Afon Wygyr Wildlife Site	30	10.4	11.7	+5%	39%	No
Ancient Woodland (26051)	30	12.9	12.7	-1%	42%	No
Ancient Woodland (26076)	30	6.4	7.2	+3%	24%	No

Table 3-4 Peak earthworks and Marine Works (year 2) – predicted intra-project additive short-term NOx concentrations at ecological receptors

Receptor	Critical level (EAL) (µg/m^3)	Total concentration for (µg/m^3)		Change as percentage of EAL	Total concentration as a percentage of EAL	Further consideration required
		Future baseline	Intra-project additive concentration for future with Wylfa Newydd Project			
Afon Wygyr Wildlife Site	200	20.8	34.5	+7%	17%	No
Ancient Woodland (26051)	200	25.8	35.4	+5%	18%	No
Ancient Woodland (26076)	200	12.7	24.4	+6%	12%	No

Table 3-5 Peak earthworks and Marine Works (year 2) – predicted intra-project additive nitrogen deposition rates (kgN/ha/yr) at ecological receptors

Receptor	Vegetation type	Nutrient nitrogen deposition (kgN/ha/yr)				Change as percentage of CL	Total deposition rate as a percentage of CL	Further consideration required
		Critical load (CL)	2020 baseline	2020 intra-project additive cumulative contributions	Total			
Afon Wygyr Wildlife Site	Short	10	13.0	0.1	13.2	+1%	132%	No
	Tall	10	20.4	0.3	20.7	+3%	207%	No
Ancient Woodland (26051)	Tall	5	16.0	-0.1	15.9	-1%	318%	No
Ancient Woodland (26076)	Tall	5	20.4	0.2	20.6	+3%	412%	No

Table 3-6 Peak earthworks and Marine Works (year 2) – predicted intra-project additive acid deposition rates (keq/ha/yr) at ecological receptors

Receptor	Vegetation type	Acid deposition (keq/ha/yr)				Change as percentage of CL	Total deposition rate as a percentage of CL	Further consideration required
		Critical load (CLmaxN)	2020 baseline (N + S)	2020 intra-project additive cumulative contributions	Total			
Afon Wygyr Wildlife Site	Short	1.99	1.10	0.01	1.11	+1%	56%	No
	Tall	2.77	1.66	0.02	1.68	+1%	61%	No
Ancient Woodland (26051)	Tall	2.74	1.32	0.00	1.32	0%	48%	No
Ancient Woodland (26076)	Tall	2.77	1.66	0.01	1.67	+1%	60%	No

Results at human receptors – year 2

3.1.5 The largest percentage increase for the predicted additive annual mean NO_2 concentration for R4 to R8 is at R6 (+8% of the AQO) and equates to a small adverse effect (increase of 3.1µg/m^3) (see table 3-1). At this receptor, the contribution to annual mean NO_2 concentrations from project-wide road traffic emissions is 0.9µg/m^3. At the other receptors the contribution from the project-wide road traffic emissions range from 0.4µg/m^3 to 0.8µg/m^3. The predicted changes in annual mean NO_2 concentrations are therefore only 0% to 2% higher than those for receptors R4 to R8 reported in table 2-1. The additive cumulative total concentrations do not cause an exceedance of the annual mean NO_2 AQO, nor do they alter the effect descriptors reported in table 2-1 for these human receptors, which remain a maximum of small adverse.

3.1.6 A similar pattern is observed for the predicted short-term additive concentrations where the emissions from construction plant, machinery and marine vessels are the dominant contributors to the 99.8th percentile of one-hour mean NO_2 concentrations (see table 3-2). An increase of up to 1% of the AQO is predicted at R4 to R8 compared to the values reported in table 2-4. This does not materially change the predicted increases in concentrations at these receptors and there are no changes to the effect descriptors specified in table 2-4 (i.e. negligible or small adverse). As discussed in paragraph 2.1.19, an exceedance of the one-hour mean AQO is considered to be highly unlikely to occur. This would not be affected by the addition of the emissions from the project-wide road traffic movements on the A5025.

Results at ecological receptors – year 2

3.1.7 Based on the predicted magnitude of changes to concentrations of NOx, and deposition rates of nitrogen and acid (see table 3-3 to table 3-6), it is considered that the likely additive effects at Afon Wygyr Wildlife Site and Ancient Woodland sites (26051 and 26076) would be negligible and not significant (i.e. no further consideration needs to be given to the significance of in-combination effects at these sites due to predicted changes in NOx concentrations or nitrogen and acid deposition as part of the assessment set out in section 2.2. of this report.

Peak construction – year 5

3.1.8 The predicted change in annual mean and short-term concentrations of NO_2 for the year 5 peak construction scenario are provided in table 3-7 and table 3-8, respectively. As discussed in section 2.1, the table column headers for the 99.8th percentile of one-hour mean NO_2 concentrations has been shortened to '1-hour NO_2'. The predicted change in annual mean and short-term concentrations of NO_2 and nitrogen and acid deposition at the relevant ecological receptors are set out in table 3-9 to table 3-12.

Table 3-7 Peak construction (year 5) – predicted intra-project additive annual mean air pollutant concentrations at key human receptors

Receptor	Total concentration for future baseline	Total intra-project additive concentration for future with Wylfa Newydd Project	Magnitude of change as percentage of AQO value[1,2]
	NO_2 (µg/m^3)	NO_2 (µg/m^3)	NO_2 (AQO = 40µg/m^3)
R4	9.7	11.2	+4% (n)
R5	7.1	8.1	+3% (n)
R6	7.8	10.3	+6% (s)
R7	5.8	7.8	+5% (n)
R8	5.0	6.0	+3% (n)

Note 1: Impact magnitude rounded to whole numbers and reported as a percentage of the respective AQO value.

Note 2: Descriptors of effects at individual receptors in parentheses as per table B5-15 of chapter B5 (APP-070): 'n' is negligible, 's' is small, 'm' is medium and 'l' is large.

Table 3-8 Peak construction (year 5) – predicted intra-project additive short-term air pollutant concentrations at key human receptors

Receptor	Total concentration for future baseline	Total intra-project additive concentration for future with Wylfa Newydd Project	Magnitude of change as percentage of AQO value[1,2]
	1-hour NO_2 (µg/m^3)	1-hour NO_2 (µg/m^3)	1-hour NO_2 (AQO = 200µg/m^3)
R4	19.4	26.7	+4% (n)
R5	14.1	23.2	+5% (n)
R6	15.6	28.1	+6% (n)
R7	11.6	24.1	+6% (n)
R8	9.9	17.7	+4% (n)

Note 1: Impact magnitude rounded to whole numbers and reported as a percentage of the respective AQO value.

Note 2: Descriptors of effects at individual receptors in parentheses as per table B5-16 of chapter B5 (APP-070): 'n' is negligible, 's' is small, 'm' is medium and 'l' is large.

Table 3-9 Peak construction (year 5) – predicted intra-project additive annual mean NOx concentrations at ecological receptors

Receptor	Critical level (AQO) (µg/m^3)	Total concentration for (µg/m^3)		Change as percentage of AQO	Total concentration as a percentage of AQO	Further consideration required
		Future baseline	Intra-project additive concentration for future with Wylfa Newydd Project			
Afon Wygyr Wildlife Site	30	10.0	11.0	+3%	37%	No
Ancient Woodland (26051)	30	12.2	13.1	+3%	44%	No
Ancient Woodland (26076)	30	6.3	6.7	+1%	22%	No

Table 3-10 Peak construction (year 5) – predicted intra-project additive short-term NOx concentrations at ecological receptors

Receptor	Critical level (EAL) (µg/m^3)	Total concentration for (µg/m^3)		Change as percentage of EAL	Total concentration as a percentage of EAL	Further consideration required
		Future baseline	Intra-project additive concentration for future with Wylfa Newydd Project			
Afon Wygyr Wildlife Site	200	20.0	24.7	+2%	12%	No
Ancient Woodland (26051)	200	24.4	30.0	+3%	15%	No
Ancient Woodland (26076)	200	12.7	15.8	+2%	8%	No

Table 3-11 Peak construction (year 5) – predicted intra-project additive nitrogen deposition rates (kgN/ha/yr) at ecological receptors

Receptor	Vegetation type	Nutrient nitrogen deposition (kgN/ha/yr)				Change as percentage of CL	Total deposition rate as a percentage of CL	Further consideration required
		Critical load (CL)	2020 baseline	2020 intra-project additive cumulative contributions	Total			
Afon Wygyr Wildlife Site	Short	10	13.0	0.11	13.1	+1%	131%	No
	Tall	10	20.4	0.21	20.7	+2%	207%	No
Ancient Woodland (26051)	Tall	5	16.0	0.19	16.1	+4%	323%	No
Ancient Woodland (26076)	Tall	5	20.4	0.08	20.5	+2%	410%	No

Table 3-12 Peak construction (year 5) – predicted intra-project additive acid deposition rates (keq/ha/yr) at ecological receptors

Receptor	Vegetation type	Acid deposition (keq/ha/yr)				Change as percentage of CL	Total deposition rate as a percentage of CL	Further consideration required
		Critical load (CLmaxN)	2020 baseline (N + S)	2020 intra-project additive cumulative contributions	Total			
Afon Wygyr Wildlife Site	Short	1.99	1.10	0.01	1.11	+1%	56%	No
	Tall	2.77	1.66	0.02	1.68	+1%	61%	No
Ancient Woodland (26051)	Tall	2.74	1.32	0.02	1.34	+1%	49%	No
Ancient Woodland (26076)	Tall	2.77	1.66	0.01	1.67	0%	60%	No

Results at human receptors – year 5

3.1.9 As shown in table 3-7 and table 3-8, the predicted increases in NO_2 concentrations at human receptors are predominantly negligible and the total concentrations are well within the relevant AQOs.

Results at ecological receptors – year 5

3.1.10 Based on the predicted magnitude of changes to concentrations of NOx, and deposition rates of nitrogen and acid (see table 3-9 to table 3-12), it is considered that the likely additive effects at Afon Wygyr Wildlife Site and Ancient Woodland sites (26051 and 26076) would be negligible and not significant.

Summary of residual intra-project cumulative effect

The outcome of the assessment and judgement of significance of residual effects set out in C4 (APP-091) and D5 (APP-124) (as updated by section 2.1 of this report) are unchanged. The significance of the residual air quality effects at human receptors is concluded to be not significant. For those ecological receptors where an additive cumulative effect is possible, the residual air quality effects are also not significant.

4 Assessment of inter-project cumulative air quality effects

4.1.1 As stated in section 5.2 of chapter I5 (APP-388), the significance of the inter-project cumulative effects due to air pollutant emissions would be not significant at human receptors within 2km of the Wylfa Newydd Development Area. With the application of the additional mitigation as set out and assessed in chapters 2 and 3 of this report, the risk of a significant inter-project cumulative effect is further reduced.

5 Conclusion

5.1.1 This report sets out the results of dispersion modelling to quantify the effect of applying additional mitigation to control NOx emissions to air from construction plant and machinery and marine vessels which was proposed in the DCO application and specified in the Main Power Station Site sub-CoCP (REP2-032) submitted at Deadline 2 (04 December 2018).

5.1.2 The additional mitigation proposed in the DCO application comprised a comprehensive air quality monitoring and reporting scheme which included a range of measures. One of the measures was to utilise newer NRMM which comply with more stringent NOx emission standards.

5.1.3 With the measure of using newer NRMM in place, the predicted concentrations of NOx and NO_2 and nitrogen and acid deposition rates at human and ecological receptors are considerably lower than those presented in section 5.5 of chapter D5 (APP-124) of the Environmental Statement.

5.1.4 The assessment set out in section 2.1 of this report confirms that the residual effects reported in section 5.7 of chapter D5 (APP-124) with regard to NO_2 concentrations at human receptors are not significant with the additional mitigation in place. The other elements of the additional mitigation (e.g. continuous monitoring of NO_2 and use of appropriate threshold concentrations to trigger investigation and action on-site to manage NOx emissions) remain as part of the proposed mitigation as described in the Main Power Station Site sub-CoCP (APP-415).

5.1.5 This report confirms that the intra-project and inter-project cumulative air quality effects as set out in chapter I4 (APP-387) and I5 (APP-388) are not significant.

5.1.6 The assessment of air quality effects at ecological receptors concluded that the overall effect on Tre'r Gof SSSI from changes in air quality would be minor adverse and therefore not significant. However, the combined effect to Tre'r Gof SSSI from changes to air quality and hydrology remains major adverse. For Cae Gwyn SSSI, the air quality and overall combined effect with changes to hydrological conditions is minor adverse, which is not significant. The overall assessment of air quality effects on Arfordir Mynydd y Wylfa - Trwyn Penrhyn (Wylfa Head) Wildlife Site and associated fungi remains minor adverse and air quality effects to lichens were also concluded to be minor adverse, and not significant.

5.1.7 The assessment of air quality effects at Cestyll Garden set out in section 2.3 concluded that NOx concentrations were negligible and the reduced nitrogen and acid deposition rates were unlikely to cause a significant effect. However, due to other effects, the significance of residual effect for Cestyll Garden would remain as predicted in chapter D11 (cultural heritage) (APP-130) i.e. major adverse during construction and operation, and moderate adverse during decommissioning.

5.1.8 The Health Impact Assessment concluded that the residual significance of potential health and well-being effects from vehicle and machinery emissions is negligible for the general population and minor adverse for particularly sensitive groups within the population near the Wylfa Newydd Development Area.

6 References

Table 6-1 Table of references

ID	Reference
RD1	Natural Resources Wales. 2018. RE: Wylfa: CEH Assessment of critical loads for Cemlyn Bay SAC (Email communication to Horizon). 17 January 2018.
RD2	Entec UK Limited (report for Defra), Defra UK Ship Emissions Inventory, Doc Reg No 21897-01. November 2010. London: Defra
RD3	Institute of Air Quality Management (IAQM). 2017. *Land-Use Planning and Development Control: Planning for Air Quality*. Version 1.2. January 2017. London: Institute of Air Quality Management.
RD4	Caporn, S., Field, C., Payne, R., Dise, N., Britton, A., Emmett, B., Jones, L., Phoenix, G., Power, S., Sheppard, L., Stevens, C. 2016. *Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance*. Natural England Commissioned Reports, Number 2010.
RD5	Stevens, C., Jones, L., Rowe, E., Dale, S., Hall, J., Payne, R., Evans, C., Caporn, S., Sheppard, L., Menichino, N., and Emmett, B. 2013. *Review of the effectiveness of on-site habitat management to reduce atmospheric nitrogen deposition impacts on terrestrial habitats*. CCW Science Report No. 1037 (A).

7 Figures

Figure 1 Predicted change in annual meal nitrogen dioxide concentrations at human receptors – year 2 peak earthworks and Marine Works (residual effects)

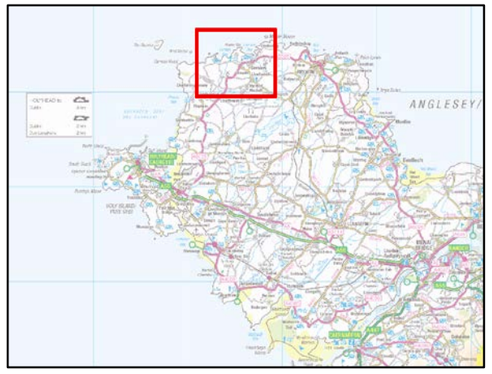
FIGURE 1

Legend

- Wylfa Newydd Development Area
- Construction plant, machinery and marine vessels study area (2km buffer from the Wylfa Newydd Development Area)
- R1 Key receptors (long-term exposure)

Change in annual mean nitrogen dioxide concentration (µg/m³)

- 0 to +0.4
- > +0.4 to +1
- > +1 to +2
- > +2 to +4
- > +4 to +10
- > +10



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
1.0	NOV 18	DCO submission	HNPWL	HNPWL	HNPWL	HNPWL

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
ENVIRONMENTAL STATEMENT

Drawing Title

PREDICTED CHANGE IN ANNUAL MEAN NITROGEN DIOXIDE CONCENTRATIONS AT HUMAN RECEPTORS - YEAR 2 PEAK EARTHWORKS AND MARINE WORKS (RESIDUAL EFFECTS)

Scale @ A3	1:26,000	DO NOT SCALE
Jacobs No.	60PO80AG	
Client No.		

Drawing No.

60PO80AG_DCO_VOL_D_05_07_01

0 125 250 500 750 1,000 metres

Figure 2 Predicted change in annual meal nitrogen dioxide concentrations at human receptors – year 5 peak construction (residual effects)

FIGURE 2

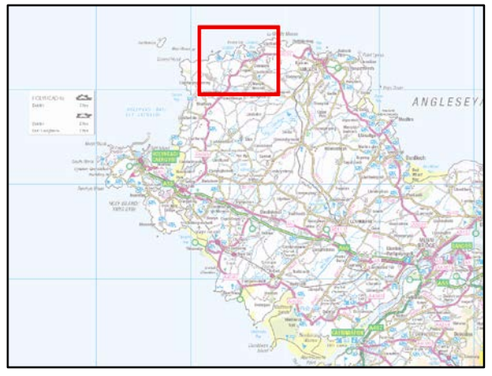
Legend

- Wylfa Newydd Development Area
- Construction plant, machinery and marine vessels study area (2km buffer from the Wylfa Newydd Development Area)
- R1 Key receptors (long-term exposure)

Change in annual mean nitrogen dioxide concentration (µg/m³)

- 0 to +0.4
- > +0.4 to +1
- > +1 to +2
- > +2 to +4
- > +4 to +10
- > +10

Note: Site Campus receptors displayed at ground level (1.6m)



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
1.0	NOV 18	DCO submission	HNPWL	HNPWL	HNPWL	HNPWL

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
ENVIRONMENTAL STATEMENT

Drawing Title

PREDICTED CHANGE IN ANNUAL MEAN NITROGEN DIOXIDE CONCENTRATIONS AT HUMAN RECEPTORS - YEAR 5 PEAK CONSTRUCTION (RESIDUAL EFFECTS)

Scale @ A3	1:26,000	DO NOT SCALE
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Drawing No.

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Figure 3 Predicted total one-hour mean (99.8th percentile) nitrogen dioxide concentrations at human receptors – year 2 peak earthworks and Marine Works (residual effects)

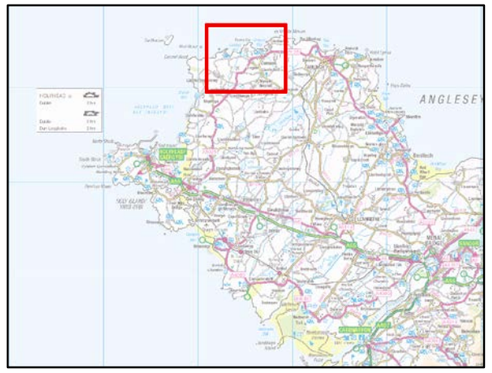
FIGURE 3

Legend

- Wylfa Newydd Development Area
- Construction plant, machinery and marine vessels study area (2km buffer from the Wylfa Newydd Development Area)
- R1 Key receptors (short-term exposure)

Predicted total one-hour mean (99.8th percentile) nitrogen dioxide concentrations (µg/m³)

- < 20
- > 20 - 50
- > 50 - 100
- > 100 - 150
- > 150 - 200
- >200



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
1.0	NOV 18	DCO submission	HNPWL	HNPWL	HNPWL	HNPWL

Client: HORIZON NUCLEAR POWER

Project: WYLFA NEWYDD PROJECT
ENVIRONMENTAL STATEMENT

Drawing Title: PREDICTED TOTAL ONE-HOUR MEAN (99.8th PERCENTILE) NITROGEN DIOXIDE CONCENTRATIONS AT HUMAN RECPTORS - YEAR 2 PEAK EARTHWORKS AND MARINE WORKS (RESIDUAL EFFECTS)

Scale @ A3	1:26,000	DO NOT SCALE
Jacobs No.	60PO80AG	
Client No.		

Drawing No.: 60PO80AG_DCO_VOL_D_05_09_03

0 125 250 500 750 1,000 metres

Figure 4 Predicted total one-hour mean (99.8th percentile) nitrogen dioxide concentrations at human receptors – year 5 peak construction (residual effects)

FIGURE 4

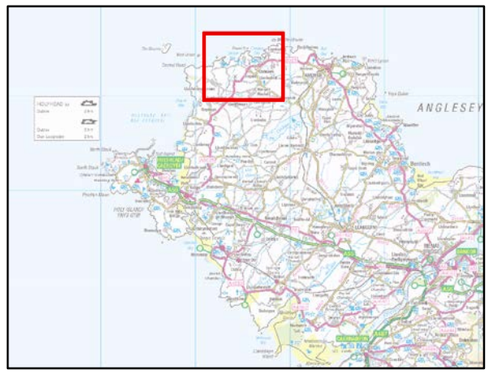
Legend

- Wylfa Newydd Development Area
- Construction plant, machinery and marine vessels study area (2km buffer from the Wylfa Newydd Development Area)
- R1 Key receptors (short-term exposure)

Predicted total one-hour mean (99.8th percentile) nitrogen dioxide concentrations (µg/m³)

- < 20
- > 20 - 50
- > 50 - 100
- > 100 - 150
- > 150 - 200
- >200

Note: Site Campus receptors displayed at ground level (1.6m)



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
1.0	NOV 18	DCO submission	HNPWL	HNPWL	HNPWL	HNPWL

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
ENVIRONMENTAL STATEMENT

Drawing Title

PREDICTED TOTAL ONE-HOUR MEAN (99.8th PERCENTILE) NITROGEN DIOXIDE CONCENTRATIONS AT HUMAN RECEPTORS - YEAR 5 PEAK CONSTRUCTION (RESIDUAL EFFECTS)

Scale @ A3	1:26,000	DO NOT SCALE
Jacobs No.	60PO80AG	
Client No.		

Drawing No.

60PO80AG_DCO_VOL_D_05_10_04

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Appendix 1-1 AQ Construction Phase: Quantification of Residual Effects with Additional Mitigation

1 Introduction

The application for a Development Consent Order (DCO) for the Wylfa Newydd Project included documentation of the modelling of emissions to atmosphere from vehicles, plant and equipment to be deployed during the earthworks and construction phases of the proposed project3. Following submission of this document, a further round of dispersion modelling has been carried out. This modelling reflects firmer evidence about the degree of mitigation that will be deliverable during these activities.

The revised modelling uses new emission rates, as described below, but is otherwise identical to the modelling used for the DCO submission, as set out in appendix D5-2 (APP-140) of the Environmental Statement3.

[3] Wylfa Newydd Project, 6.4.21 ES Volume D - WNDA Development App D5-2 - Main Site Construction Phase Air

Dispersion EIA - Final Modelling Report (Air Quality). APP-140. June 2018, Revision 1.0.

2 On-shore plant

The principal mitigation concerns the emissions standard that will be achieved by the plant and equipment used in the construction process. For the original modelling, two possibilities were modelled:

- All plant meet Stage IIIB standard only; and
- All plant meet Stage IV standard.

These standards are set by the European Directive on non-road mobile machinery4 (NRMM). Roughly speaking, NRMM sold after 2010–2012 (depending on power rating) must meet Stage IIIB, and NRMM sold after 2013 must meet Stage IV. The directive specifies emission factors for oxides of nitrogen (NOx), particulate matter (PM), and carbon monoxide (CO) which must be achieved by each Stage.

Emissions of NOx, the most critical pollutant, from Stage IV plant are substantially lower than from Stage IIIB plant, so using the former provides a great degree of mitigation against air quality impacts of the construction activities. At the time of the original modelling, it was uncertain whether it would be practical to source all equipment at Stage IV standard, so the two extreme cases of all Stage IIIB and all Stage IV were modelled. Subsequently, Horizon has committed to source 90% of the plant at Stage IV. Therefore, the air quality impacts have been remodelled under the assumption that 90% of the plant meets Stage IV emissions standards, with the remaining 10% at Stage IIIB. This provides a good degree of mitigation while retaining flexibility in case a small number of plant items cannot be sourced at Stage IV.

To model the 90%/10% split, no attempt was made to partition individual plant items into Stage IV or Stage IIIB. Instead, the weighted mean emission factor was calculated for each power category. For example, for plant in the power range 56–130 kW, the weighted mean NOx emission factor is 0.1 × 3.3 + 0.9 × 0.4 = 0.69 g/kWh, where 3.3 g/kWh is the Stage IIIB emission factor and 0.4 g/kWh is the Stage IV emission factor. Since the emissions are proportional to power output, this means that as long as 90% of the plant in terms of power rating meets Stage IV, the assessment will capture the emissions accurately.

[4] Directive 2004/ 26/EC of the European Parliament and of the Council of 21 April 2004 amending Directive 97/68/EC on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery

3 Marine plant

In the modelling for the submission, the marine vessels associated with the construction of the Marine Off-Loading Facility (MOLF) use emission factors derived from Defra's UK Ship Emissions Inventory report5. For the present assessment, these vessels are assumed to meet International Maritime Organization Tier III marine emissions standards. Of the two twelve-month construction periods modelled, these vessels are only active during the 2019–20 construction period and not the 2023 period. All marine vessels in 2023, mostly associated with transport of bulk materials, are assumed to meet the Defra emission factors only.

The emission factors are summarised in Table Error! No text of specified style in document.-1. For sulphur, the Defra emission factors are based on 1.5% sulphur content in Marine Diesel Oil, while the Tier III factors are based on 0.5% sulphur content (based on post-2020 MARPOL Annex VI fuel sulphur limits outside Emission Control Areas)

Table Error! No text of specified style in document.**-1 Marine emission factors (g/kWh)**

	Main Engines		Auxiliary Engines	
	Defra	Tier III	Defra	Tier III
NO_x	8.8	3.4	11.5	3.4
SO_2	6.8	2.3	6.5	2.2
PM	1.2	1.2	0.4	0.4

[5] Entec (2010) UK ship emissions inventory. November 2010. Doc reg No. 21897-01.

4 Modelling results

Results tables providing the construction/marine plant process contribution (PC), predicted environmental concentration with construction/marine plant contribution only (PEC(C)) and PEC with total Wylfa Newydd Project contribution (PEC(T)) for each receptor and each scenario, including a numerical comparison against the relevant air quality objective, are presented as attachments at Appendix A. Contour plots are given in Appendix B. These results are the highest concentrations predicted for individual receptors obtained from any year of meteorological data.

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Appendix A
Model results

Model results are given in the attached spreadsheets (***AQ Construction Phase_Model Results_Appendix A_1.xlsx*** and ***AQ Construction Phase_Model Results_Appendix A_2.xlsx***).

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Appendix B Contour plots

N

LEGEND

Wylfa Newydd Development Area

Annual Mean Process Contribution for NO_2 ($\mu g/m^3$)

0.4

1

5

10

Construction Plant (2019-20, 90% Stage IV) Annual Mean NO_2 Process Contribution

Scale: 1:15,000

When printed at A3

0 150 300 450 M

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LEGEND

Wylfa Newydd Development Area

Annual Mean Process Contribution for NO_2 ($\mu g/m^3$)

- 0.4
- 1
- 5
- 10

Construction Plant (2023, 90% Stage IV) Annual Mean NO_2 Process Contribution

Scale: 1:15,000

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LEGEND

Wylfa Newydd Development Area

One Hour Mean Process Contribution for NO_2 ($\mu g/m^3$)

- 20
- 50
- 100
- 150
- 200

Construction Plant (2019-20, 90% Stage IV) 99.79th Percentile 1-hour Mean NO_2 Process Contribution

Scale: 1:15,000

When printed at A3

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LEGEND

Wylfa Newydd Development Area

One Hour Mean Process Contribution for NO_2 ($\mu g/m^3$)

- 20
- 50
- 100
- 150
- 200

Construction Plant (2023, 90% Stage IV) 99.79th Percentile 1-hour Mean NO_2 Process Contribution

Scale: 1:15,000

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LEGEND

Wylfa Newydd Development Area

Annual Mean Process Contribution for PM_{10} / $PM_{2.5}$ ($\mu g/m^3$)

- 0.4
- 1
- 5
- 10

Construction Plant (2019-20, 90% Stage IV) Annual Mean PM_{10} and $PM_{2.5}$ Process Contribution

Scale: 1:15,000

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LEGEND

Wylfa Newydd Development Area

Annual Mean Process Contribution for PM_{10} / $PM_{2.5}$ ($\mu g/m^3$)

- 0.4
- 1
- 5
- 10

Construction Plant (2023, 90% Stage IV) Annual Mean PM_{10} and $PM_{2.5}$ Process Contribution

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