

# REDCAR ENERGY CENTRE APPENDIX 11.5

## Air Quality Impacts on Designated Habitat Sites

Redcar Energy Centre  
Environmental Statement  
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# 1 AIR QUALITY IMPACTS ON DESIGNATED HABITAT SITES

## 1.1 Introduction

1.1.1 The following designated nature conservation sites, within 2 km of the Application Site, have been identified:

- Teesmouth and Cleveland Coast Site of Special Scientific Interest (SSSI);
- Saltholme Nature Reserve;
- Teesmouth National Nature Reserve;
- Coatham Marsh Nature Reserve (Tees Wildlife Trust); and
- Seaton Dunes and Common Local Nature Reserve.

1.1.2 The Teesmouth and Cleveland Special Protection Area (SPA) and Ramsar site are within 10 km of the Application Site.

### Approach

1.1.3 Concentrations of NO<sub>x</sub>, SO<sub>2</sub> and NH<sub>3</sub> have been predicted using the same model as used in the assessment of impacts at human-health receptors. Modelling has been undertaken for the nearest points of the conservation site to the Application Site. The receptor points have been modelled at ground level. The maximum PCs for all the meteorological datasets have been identified and is presented in this report.

### Critical Levels

1.1.4 Critical levels are maximum atmospheric concentrations of pollutants for the protection of vegetation and ecosystems and are specified within relevant European air quality directives and corresponding UK air quality regulations. Process Contributions (PCs) and Predicted Environmental Concentrations (PECs) of NO<sub>x</sub>, SO<sub>2</sub> and NH<sub>3</sub> have been calculated for comparison with the relevant annual-mean critical level. Background concentrations of NO<sub>x</sub>, SO<sub>2</sub> and NH<sub>3</sub> at each designated site have been derived from the UK Air Pollution Information System (APIS) database<sup>1</sup>. Background concentrations for each designated site were found using the websites 'search by location' function.

### Critical Loads

1.1.5 Critical loads refer to the quantity of pollutant deposited, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Site relevant critical loads were not available for the designated sites on the APIS website. Background concentrations for each designated site were found using the websites 'search by location' function. Background concentrations for each habitat site were not available.

### Critical Loads – Nutrient Nitrogen Deposition

1.1.6 Percentage contributions to nutrient nitrogen deposition have been derived from the results of the ADMS dispersion modelling. Deposition rates have been calculated using empirical methods recommended by the EA, as follows:

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<sup>1</sup> Air Pollution Information Systems, [www.apis.ac.uk](http://www.apis.ac.uk)

- The dry deposition flux ( $\mu\text{g}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ ) has been calculated by multiplying the ground level  $\text{NO}_2$  concentrations ( $\mu\text{g}\cdot\text{m}^{-3}$ ) by the deposition velocity. The EA guidance provides deposition velocities of  $0.0015 \text{ m}\cdot\text{s}^{-1}$  for grasslands/short habitats and  $0.003 \text{ m}\cdot\text{s}^{-1}$  for forests/tall habitats.
- Units of  $\mu\text{g}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$  have been converted to units of  $\text{kg}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$  by multiplying the dry deposition flux by the standard conversion factor of 96 for  $\text{NO}_x$ .

### Critical Loads – Acidification

- 1.1.7 The acid deposition rate, in equivalents  $\text{keq}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$ , has been calculated by multiplying the dry deposition flux ( $\text{kg}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$ ) by a conversion factor of 0.071428 for N. This takes into account the degree to which a chemical species is acidifying, calculated as the proportion of N within the molecule.
- 1.1.8 Wet deposition in the near field is not significant compared with dry deposition for  $\text{N}^2$  and therefore for the purposes of this assessment, wet deposition has not been considered.

## 1.2 Significance Criteria

- 1.2.1 The PCs and PECs of  $\text{NO}_x$ ,  $\text{SO}_2$  and  $\text{NH}_3$  have been compared against the relevant critical level. The Environment Agency guidelines<sup>3</sup> state that:

*"To screen out a PC for any substance so that you don't need to do any further assessment of it, the PC must meet both of the following criteria:*

- *the short-term PC is less than 10% of the short-term environmental standard*
- *the long-term PC is less than 1% of the long-term environmental standard*

*If you meet both of these criteria you don't need to do any further assessment of the substance.*

*If you don't meet them you need to carry out a second stage of screening to determine the impact of the PEC."*

- 1.2.2 It continues by stating that:

*"If your long-term PC is greater than 1% and your PEC is less than 70% of the long-term environmental standard, the emissions are insignificant – you don't need to assess them any further."*

- 1.2.3 For LNRs the Environment Agency guidelines states that:

***"When there are local nature sites within the specified distance***

*If your emission meet both of the following criteria they're insignificant – you don't need to assess them any further:*

- *the short-term PC is less than 100% of the short-term environmental standard*
- *the long-term PC is less than 100% of the long-term environmental standard"*

<sup>2</sup> Approaches to modelling local nitrogen deposition and concentrations in the context of Natura 2000 - Topic 4

<sup>3</sup> Air emissions risk assessment for your environmental permit

- 1.2.4 Where *potentially* significant impacts have been identified, the impacts have been passed to the project's ecologist to allow the significance of the likely effect to be determined.

## Results

- 1.2.5 The predicted annual-mean NO<sub>x</sub>, SO<sub>2</sub> and NH<sub>3</sub> concentrations are compared with the critical levels in Table 1.1, Table 1.2 and Table 1.3. The predicted nutrient N deposition rate and acid deposition rates is presented in Table 1.4 and Table 1.5.

**Table 1.1: Predicted Annual-Mean NOx Concentrations at Designated Habitat Sites**

Designated Site	Critical Level ( $\mu\text{g.m}^{-3}$ )	PC ( $\mu\text{g.m}^{-3}$ )	PC/Critical Level (%)	AC ( $\mu\text{g.m}^{-3}$ )	PEC ( $\mu\text{g.m}^{-3}$ )	PEC/Critical Level (%)
Teesmouth and Cleveland Coast SSSI	30	4.54	15	22.91	27.45	91
Teesmouth and Cleveland SPA and Ramsar		4.54	15	22.91	27.45	91
Saltholme Nature Reserve		3.45	12	26.33	29.78	99
Teesmouth National Nature Reserve		0.31	1	26.95	27.26	91
Coatham Marsh Nature Reserve (Tees Wildlife Trust)		0.29	1	28.54	28.83	96
Seaton Dunes and Common Local Nature Reserve		0.17	1	22.91	23.08	77

**Table 1.2: Predicted Annual-Mean SO2 Concentrations at Designated Habitat Sites**

Designated Site	Critical Level ( $\mu\text{g.m}^{-3}$ )	PC ( $\mu\text{g.m}^{-3}$ )	PC/Critical Level (%)	AC ( $\mu\text{g.m}^{-3}$ )	PEC ( $\mu\text{g.m}^{-3}$ )	PEC/Critical Level (%)
Teesmouth and Cleveland Coast SSSI	20	1.13	6	2.27	3.40	17
Teesmouth and Cleveland SPA and Ramsar		1.13	6	2.27	3.40	17
Saltholme Nature Reserve		0.86	4	0	0.86	4
Teesmouth National Nature Reserve		0.08	0	3.07	3.15	16
Coatham Marsh Nature Reserve (Tees Wildlife Trust)		0.07	0	3.9	3.97	20
Seaton Dunes and Common Local Nature Reserve		0.04	0	2.27	2.31	12

**Table 1.3: Predicted Annual-Mean NH<sub>3</sub> Concentrations at Designated Habitat Sites**

Designated Site	Critical Level ( $\mu\text{g.m}^{-3}$ )	PC ( $\mu\text{g.m}^{-3}$ )	PC/Critical Level (%)	AC ( $\mu\text{g.m}^{-3}$ )	PEC ( $\mu\text{g.m}^{-3}$ )	PEC/Critical Level (%)
Teesmouth and Cleveland Coast SSSI	3	0.23	8	1.01	1.24	41
Teesmouth and Cleveland SPA and Ramsar		0.23	8	1.01	1.24	41
Saltholme Nature Reserve		0.17	6	0.64	0.81	27
Teesmouth National Nature Reserve		0.02	1	0.93	0.95	32
Coatham Marsh Nature Reserve (Tees Wildlife Trust)		0.01	0	1.26	1.27	42
Seaton Dunes and Common Local Nature Reserve		0.01	0	1.01	1.02	34

**Table 1.4: Predicted Nutrient N Deposition at Designated Habitat Sites**

Designated Site	Critical Load ( $\text{kgN.ha}^{-1}\text{.yr}^{-1}$ )	PC ( $\text{kgN.ha}^{-1}\text{.yr}^{-1}$ ) <sup>1)</sup>	PC/Critical Load (%)	AC ( $\text{kgN.ha}^{-1}\text{.yr}^{-1}$ ) <sup>1)</sup>	PEC ( $\text{kgN.ha}^{-1}\text{.yr}^{-1}$ )	PEC/Critical Load (%)
Teesmouth and Cleveland Coast SSSI	10	1.64	16	11.2	12.84	128
Teesmouth and Cleveland SPA and Ramsar	10	1.64	16	11.2	12.84	128
Saltholme Nature Reserve	15	1.24	8	10.22	11.46	76
Teesmouth National Nature Reserve	20	0.11	1	12.04	12.15	61
Coatham Marsh Nature Reserve (Tees Wildlife Trust)	15	0.10	1	13.86	13.96	93
Seaton Dunes and Common Local Nature Reserve	10	0.06	1	11.2	11.26	113

**Table 1.5: Predicted Acid Deposition at Designated Habitat Sites**

Designated Site	Critical Load (keq.ha <sup>-1</sup> .yr <sup>-1</sup> )			PC (keq.ha <sup>-1</sup> .yr <sup>-1</sup> )		PC/Critical Load (%)	AC (keq.ha <sup>-1</sup> .yr <sup>-1</sup> )		PEC (keq.ha <sup>-1</sup> .yr <sup>-1</sup> )		PEC/Critical Load (%)
	Min N	Min S	Max N	N	S		N	S	N	S	
Teesmouth and Cleveland Coast SSSI	0.223	1.56	1.998	0.117	0.134	13	0.8	0.2	0.92	0.33	63
Teesmouth and Cleveland SPA and Ramsar	0.223	1.56	1.998	0.117	0.134	13	0.8	0.2	0.92	0.33	63
Saltholme Nature Reserve	Not sensitive										
Teesmouth National Nature Reserve	Not sensitive										
Coatham Marsh Nature Reserve (Tees Wildlife Trust)	Not sensitive										
Seaton Dunes and Common Local Nature Reserve	Not sensitive										



## Interpretation of Results

- 1.2.6 The PC does not exceed 1% (or 100% for local sites) of the relevant critical levels for NO<sub>x</sub>, SO<sub>2</sub> and NH<sub>3</sub> for all sites except the Teesmouth and Cleveland Coast SSSI/SPA/Ramsar and Saltholme Nature Reserve and the impacts can be screened out as insignificant. For the Teesmouth and Cleveland Coast SSSI/SPA/Ramsar and Saltholme Nature Reserve the PEC is below the critical level and the impacts can be screened out as insignificant.
- 1.2.7 For N Deposition, the PC does not exceed 1% (or 100% for local sites) of the relevant critical loads for all sites except the Teesmouth and Cleveland Coast SSSI/SPA/Ramsar and Saltholme Nature Reserve and the impacts can be screened out as insignificant. For Saltholme Nature Reserve the PEC is below the critical load and the impacts can be screened out as insignificant. For the Teesmouth and Cleveland Coast SSSI/SPA/Ramsar the PEC is above the critical load and the impacts are potentially significant. The results have been passed to the projects ecologist to determine the effects. Figure 1 shows the contour plot for N Deposition PC (kg.ha<sup>-1</sup>.year<sup>-1</sup>).
- 1.2.8 For Acid Deposition, the PC exceeds 1% of the relevant critical loads but the PEC is below the critical load and the impacts can be screened out as insignificant.

## Cumulative Impacts

- 1.2.9 Appendix 4.2 outlines the cumulative developments considered. Of these cumulative developments, only three developments have identified air quality impacts on ecological receptors. The following developments have therefore been included in the assessment of cumulative air quality effects on ecological receptors:
- Tees Renewable Energy Plant (REP);
  - Teesside Combined Cycle Power Plant (CCPP); and
  - Grangetown Prairie Energy Recovery Facility.
- 1.2.10 For all pollutants except NO<sub>x</sub> and N Deposition, the maximum PEC is less than 70% of the critical level/load and has therefore not been considered in the cumulative assessment.
- 1.2.11 For NO<sub>x</sub> and N Deposition, where available, the maximum PC from each of the three cumulative developments listed above have been added to the AC and PC for the proposed facility to derive a cumulative PEC in Table 1.6 and Table 1.7. These will be conservative as the maximum PC from each development will not occur at the same location as each other or at the same location as the PC for the proposed facility.

**Table 1.6: Predicted Annual-Mean NOx Concentrations at Designated Habitat Sites**

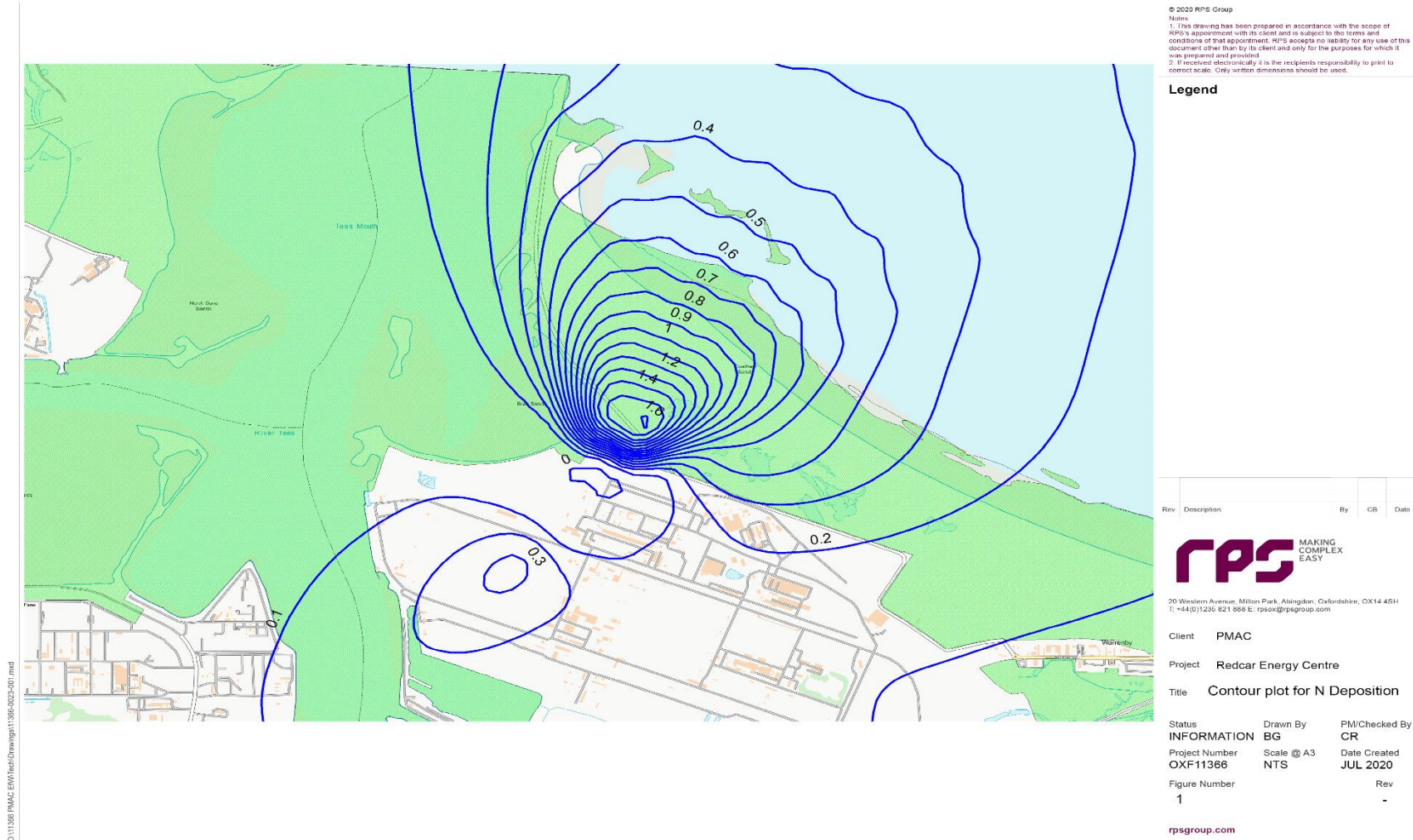
Designated Site	Critical Level	PC ( $\mu\text{g.m}^{-3}$ )	Tees REP PC ( $\mu\text{g.m}^{-3}$ )	Tees CCPP PC ( $\mu\text{g.m}^{-3}$ )	Graythorp PC ( $\mu\text{g.m}^{-3}$ )	Cumulative PC ( $\mu\text{g.m}^{-3}$ )	Cumulative PC/Critical Level (%)	AC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC/Critical Level (%)
Teesmouth and Cleveland Coast SSSI		4.54	0.11	0.27	0.81	5.73	19	22.91	28.64	95
Teesmouth and Cleveland SPA and Ramsar		4.54	0.11	0.27	0.81	5.73	19	22.91	28.64	95
Saltholme Nature Reserve		3.45				3.45	12	26.33	29.78	99
Teesmouth National Nature Reserve	30	0.31			0.38	0.68	2	26.95	27.63	92
Coatham Marsh Nature Reserve (Tees Wildlife Trust)		0.29			0.81	1.09	4	28.54	29.63	99
Seaton Dunes and Common Local Nature Reserve		0.17				0.17	1	22.91	23.08	77

**Table 1.7: Predicted Nutrient N Deposition at Designated Habitat Sites**

Designated Site	Critical Load ( $\text{kgN.ha}^{-1}.\text{yr}^{-1}$ )	PC ( $\text{kgN.ha}^{-1}.\text{yr}^{-1}$ )	Tees REP PC ( $\text{kgN.ha}^{-1}.\text{yr}^{-1}$ )	Tees CCPP PC ( $\text{kgN.ha}^{-1}.\text{yr}^{-1}$ )	Graythorp PC ( $\text{kgN.ha}^{-1}.\text{yr}^{-1}$ )	Cumulative PC ( $\text{kgN.ha}^{-1}.\text{yr}^{-1}$ )	Cumulative PC/Critical Load (%)	AC ( $\text{kgN.ha}^{-1}.\text{yr}^{-1}$ )	Cumulative PEC ( $\text{kgN.ha}^{-1}.\text{yr}^{-1}$ )	Cumulative PEC/Critical Load (%)
Teesmouth and Cleveland Coast SSSI	10	1.64	0.01	0.039	0.62	2.30	23	11.2	13.50	135
Teesmouth and Cleveland SPA and Ramsar	10	1.64	0.01	0.039	0.62	2.30	23	11.2	13.50	135
Saltholme Nature Reserve	15	1.24				1.24	8	10.22	11.46	76
Teesmouth National Nature Reserve	20	0.11			0.54	0.65	3	12.04	12.69	63

Designated Site	Critical Load (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	PC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Tees REP PC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Tees CAPP PC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Graythorp PC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Cumulative PC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Cumulative PC/Critical Load (%)	AC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Cumulative PEC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Cumulative PEC/Critical Load (%)
Coatham Marsh Nature Reserve (Tees Wildlife Trust)	15	0.10				0.10	1	13.86	13.96	93
Seaton Dunes and Common Local Nature Reserve	10	0.06			0.62	0.68	7	11.2	11.88	119

- 1.2.12 For NO<sub>x</sub>, the PC does not exceed 100% of the relevant critical levels for local sites and the cumulative impacts can be screened out as insignificant. For national sites where the PC exceeds 1% of the critical level, the cumulative PEC is less than the critical level and the cumulative impacts can be screened out as insignificant.
- 1.2.13 For N Deposition, the cumulative PC does not exceed 1% (or 100% for local sites) of the relevant critical loads for all sites except the Teesmouth and Cleveland Coast SSSI/SPA/Ramsar, Teesmouth National Nature Reserve and Saltholme Nature Reserve and the impacts can be screened out as insignificant. For Saltholme Nature Reserve the cumulative PEC is below the critical load and the impacts can be screened out as insignificant. For the Teesmouth and Cleveland Coast SSSI/SPA/Ramsar the PEC is above the critical load and the impacts are potentially significant. The results have been passed to the projects ecologist to determine the effects.



**Figure 1: Contour plot for N deposition.**