

planning  
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**APPENDIX 5.4: Air Quality – Assessment of Impacts on Ecological Receptors**

**Wheelabrator Kemsley Generating Station (K3) and Wheelabrator Kemsley North (WKN) Waste to Energy Facility DCO**

S42 Draft ES

PINS ref: EN010083



## Appendix 5.4: Assessment of Ecological Impacts

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The following European designated nature conservation sites, within 10 km of the Application Site, have been identified:

- The Swale Special Protection Area (SPA);
- The Swale Ramsar;
- Medway Estuary and Marshes SPA;
- Medway Estuary and Marshes Ramsar;
- Thames Estuary and Marshes SPA;
- Thames Estuary and Marshes Ramsar;
- Queensdown Warren Special Area of Conservation (SAC); and
- Outer Thames Estuary SPA.

The following nationally designated sites, within 2 km of the Application Site, have also been identified:

- The Swale SSSI; and.
- Elmley NNR.

For information, the Medway Estuary and Marshes SSSI is 2.9 km from the Application Site (i.e. more than 2 km away) and has been excluded from the assessment. The Swale Marine Conservation Zone (MCZ) has also been excluded as there is no requirement to assess air quality impacts at waterbodies/MCZs.

### Approach

Concentrations of NO<sub>x</sub>, SO<sub>2</sub> and Ammonia have been predicted using the same model as used in the assessment of impacts at human-health receptors. Modelling has been undertaken for a grid of receptor points, with a grid spacing of 200 m, across each identified nature conservation site. The receptor grid points have been modelled at ground level. The maximum PC for WKN and K3 at each site and for all the meteorological datasets has been identified and is presented in this Appendix.

### Critical Levels

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. PCs and, if appropriate, PECs of NO<sub>x</sub>, SO<sub>2</sub> and NH<sub>3</sub> have been calculated for comparison with the relevant critical level. Background concentrations at each designated site have been derived from the UK Air Pollution Information System (APIS) database [1].

### Critical Loads

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. Nutrient nitrogen deposition and acid deposition are considered in this Appendix.

### *Critical Loads – Nutrient N Deposition*

Percentage contributions to nutrient nitrogen deposition have been derived from the modelled NO<sub>x</sub> concentrations. Deposition rates have been calculated using empirical methods recommended by the Environment Agency, as follows:

1. The dry deposition flux ( $\mu\text{g}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ ) has been calculated by multiplying the ground level NO<sub>2</sub> concentrations ( $\mu\text{g}\cdot\text{m}^{-3}$ ) by the deposition velocity of 0.003  $\text{m}\cdot\text{s}^{-1}$  for forests/tall habitats and 0.0015  $\text{m}\cdot\text{s}^{-1}$  for grassland/short habitats.
2. 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 NO<sub>x</sub>.
3. Predicted contributions to nitrogen deposition have been calculated and compared with the relevant critical load range for the habitat types associated with the designated site. These have been derived from the APIS database.

### *Critical Loads – Acidification*

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.

Wet deposition in the near field is not significant compared with dry deposition for N [2] and therefore for the purposes of this assessment, wet deposition has not been considered.

Predicted contributions to acid deposition have been calculated and compared with the minimum critical load function for the habitat types associated with the designated site as derived from the APIS database.

### *Significance Criteria*

Maximum PCs and PECs of NO<sub>x</sub>, SO<sub>2</sub>, NH<sub>3</sub> and N/acid deposition have been compared against the relevant EQS for the relevant habitat type/interest feature. The Environment Agency guidelines [3] 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."*

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."

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

The ambient NO<sub>x</sub>, SO<sub>2</sub> and NH<sub>3</sub> concentrations and existing deposition rates have been obtained from APIS. The highest deposition rates have been obtained taking into account the various habitats across the sites. The lowest critical loads for nitrogen deposition and acid deposition have been also obtained from APIS [4].

The maximum predicted annual-mean NO<sub>x</sub>, SO<sub>2</sub> and NH<sub>3</sub> concentrations are compared with the critical level in Tables 5.4.1, 5.4.2 and 5.4.3. The maximum predicted nutrient N deposition rates are compared with the critical load in Table 5.4.4. The maximum predicted acid deposition rates are compared with the critical load function in Table 5.4.5.

For the Outer Thames Estuary SPA, APIS describes the habitat as *inshore sublittoral sediment*, which provides wintering for the red-throated diver. APIS states that this habitat is not sensitive to increases in NO<sub>x</sub>, SO<sub>2</sub> or NH<sub>3</sub> concentrations, nitrogen deposition or acid deposition. As such, this site has not been considered further in the assessment.

**Table 5.4.1 Predicted Annual-Mean NOx Concentrations at Designated Sites**

Designated Site	CL ( $\mu\text{g}\cdot\text{m}^{-3}$ )	Future AC ( $\mu\text{g}\cdot\text{m}^{-3}$ )	WKN + Increase in K3 PC ( $\mu\text{g}\cdot\text{m}^{-3}$ )	WKN + Increase in K3 PC/CL (%)	WKN + Increase in K3 PEC ( $\mu\text{g}\cdot\text{m}^{-3}$ )	WKN + Increase in K3 PEC as % of CL ( $\mu\text{g}\cdot\text{m}^{-3}$ )
The Swale SPA/Ramsar/SSSI/Elmley NNR	30	14.1	1.4	5	15.5	52
Medway Estuary and Marshes SPA/Ramsar		24.6	0.2	1	24.8	83
Thames Estuary and Marshes SPA/Ramsar		18.5	0.2	1	18.7	62
Queendown Warren SAC		18.8	0.1	0	18.9	63

Notes:

Future AC is the AC from the APIS website plus the PC from K3 as permitted.

The Swale SPA, Medway Estuary and Marshes SPA and Thames Estuary and Marshes SPA all cover the same geographical areas as the corresponding Ramsar and SSSI designations. Therefore, the values set out in Table C1 represent the NOx concentrations at all of these sites. Elmley NNR is within The Swale SPA/Ramsar/SSSI. APIS does not provide data for NNRs so the ambient concentrations and critical levels/loads have been assumed to be the same as The Swale SPA.

Consistent with the Institute of Air Quality Management's Position Statement "Use of a Criterion for the Determination of an Insignificant Effect of Air Quality Impacts on Sensitive Habitats" [5], the PC as a % of the CL has been rounded to the nearest integer.

**Table 5.4.2 Predicted Annual-Mean SO<sub>2</sub> Concentrations at Designated Sites**

Designated Site	CL ( $\mu\text{g}\cdot\text{m}^{-3}$ )	Future AC ( $\mu\text{g}\cdot\text{m}^{-3}$ )	WKN + Increase in K3 PC ( $\mu\text{g}\cdot\text{m}^{-3}$ )	WKN + Increase in K3 PC/CL (%)	WKN + Increase in K3 PEC ( $\mu\text{g}\cdot\text{m}^{-3}$ )	WKN + Increase in K3 PEC as % of CL ( $\mu\text{g}\cdot\text{m}^{-3}$ )
The Swale SPA/Ramsar/SSSI/Elmley NNR	20	0.73	0.36	2	1.09	5
Medway Estuary and Marshes SPA/Ramsar		0.40	0.05	0	0.45	2
Thames Estuary and Marshes SPA/Ramsar		0.37	0.06	0	0.43	2
Queendown Warren SAC		0.36	0.02	0	0.38	2

Notes:

Future AC is the AC from the APIS website plus the PC from K3 as permitted.

The Swale SPA, Medway Estuary and Marshes SPA and Thames Estuary and Marshes SPA all cover the same geographical areas as the corresponding Ramsar and SSSI designations. Therefore, the values set out in Table C1 represent the SO<sub>2</sub> concentrations at all of these sites. Elmley NNR is within The Swale SPA/Ramsar/SSSI. APIS does not provide data for NNRs so the ambient concentrations and critical levels/loads have been assumed to be the same as The Swale SPA.

Consistent with the Institute of Air Quality Management's Position Statement "Use of a Criterion for the Determination of an Insignificant Effect of Air Quality Impacts on Sensitive Habitats" [6], the PC as a % of the CL has been rounded to the nearest integer.

**Table 5.4.3 Predicted Annual-Mean NH<sub>3</sub> Concentrations at Designated Sites**

Designated Site	CL ( $\mu\text{g.m}^{-3}$ )	WKN + Increase in K3 PC ( $\mu\text{g.m}^{-3}$ )	WKN + Increase in K3 PC/CL (%)
The Swale SPA/Ramsar/SSSI/Elmley NNR	3	0.036	1
Medway Estuary and Marshes SPA/Ramsar		0.005	0
Thames Estuary and Marshes SPA/Ramsar		0.006	0
Queendown Warren SAC		0.002	0

Notes:

The Swale SPA, Medway Estuary and Marshes SPA and Thames Estuary and Marshes SPA all cover the same geographical areas as the corresponding Ramsar and SSSI designations. Therefore, the values set out in Table C1 represent the NH<sub>3</sub> concentrations at all of these sites. Elmley NNR is within The Swale SPA/Ramsar/SSSI. APIS does not provide data for NNRs so the ambient concentrations and critical levels/loads have been assumed to be the same as The Swale SPA.

Consistent with the Institute of Air Quality Management's Position Statement "Use of a Criterion for the Determination of an Insignificant Effect of Air Quality Impacts on Sensitive Habitats" [7], the PC as a % of the CL has been rounded to the nearest integer.

**Table 5.4.4 Predicted Nutrient N Deposition at Designated Sites**

Designated Site	Interest Feature	CL ( $\text{kgN.ha}^{-1}\text{.yr}^{-1}$ )	Future AC ( $\text{kgN.ha}^{-1}\text{.yr}^{-1}$ )	WKN + Increase in K3 PC ( $\text{kgN.ha}^{-1}\text{.yr}^{-1}$ )	WKN + Increase in K3 PC/CL (%)	WKN + Increase in K3 PEC ( $\text{kgN.ha}^{-1}\text{.yr}^{-1}$ )	WKN + Increase in K3 PEC/CL (%)
The Swale SPA/Elmley NNR	Breeding Lapwing	20	14.7	0.4	2	15.1	75
	Ringed plover	20	14.7	0.4	2	15.1	75
	Eurasian reed warbler	15	14.7	0.4	3	15.1	101
	Eurasian curlew	20	14.7	0.4	2	15.1	75
	Reed bunting	15	14.7	0.4	3	15.1	101
	Dark-bellied brent goose	20	14.7	0.4	2	15.1	75
	Common shelduck	20	14.7	0.4	2	15.1	75
	Eurasian teal	20	14.7	0.4	2	15.1	75
	Mallard	Not available	14.7	0.4	-	15.1	-
	Common moorhen	Not available	10.3	0.4	-	10.7	-
	Gadwall	Not available	10.3	0.4	-	10.7	-
	Grey plover	20	14.7	0.4	2	15.1	75

Designated Site	Interest Feature	CL (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Future AC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PC/CL (%)	WKN + Increase in K3 PEC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PEC/CL (%)
	Dunlin	20	14.7	0.4	2	15.1	75
	Common coot	Not available	10.3	0.4	-	10.7	-
	Common redshank	20	14.7	0.4	2	15.1	75
	Eurasian oystercatcher	20	14.7	0.4	2	15.1	75
Medway Estuary and Marshes SPA	Common tern	8	13.3	0.06	1	13.3	166
	Red-throated diver	Not sensitive	10.9	0.06	-	10.9	-
	Eurasian curlew	20	13.3	0.06	0	13.3	67
	Common greenshank	20	13.3	0.06	0	13.3	67
	Little tern	8	13.3	0.06	1	13.3	166
	Hen harrier	10	13.3	0.06	1	13.3	133
	Merlin	10	13.3	0.06	1	13.3	133
	Ringed plover	20	13.3	0.06	0	13.3	67
	Short-eared owl	10	Not available	0.06	1	-	-
	Great crested grebe	20	13.3	0.06	0	13.3	67
	Great cormorant	Not available	13.3	0.06	-	13.3	-
	Dark-bellied brent goose	20	13.3	0.06	0	13.3	67
	Eurasian teal	20	13.3	0.06	0	13.3	67
	Mallard	20	13.3	0.06	0	13.3	67
	Northern shoveler	Not available	13.3	0.06	-	13.3	-
	Common shelduck	20	13.3	0.06	0	13.3	67
	Eurasian wigeon	20	13.3	0.06	0	13.3	67
	Northern pintail	20	13.3	0.06	0	13.3	67
	Common pochard	20	13.3	0.06	0	13.3	67
	Eurasian oystercatcher	20	13.3	0.06	0	13.3	67
Pied avocet	20	13.3	0.06	0	13.3	67	
Grey plover	20	13.3	0.06	0	13.3	67	
Red knot	20	13.3	0.06	0	13.3	67	

Designated Site	Interest Feature	CL (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Future AC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PC/CL (%)	WKN + Increase in K3 PEC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PEC/CL (%)
	Dunlin	20	13.3	0.06	0	13.3	67
	Black-tailed godwit	20	13.3	0.06	0	13.3	67
	Common redshank	20	13.3	0.06	0	13.3	67
	Ruddy turnstone	20	13.3	0.06	0	13.3	67
	Tundra swan	Not sensitive	13.3	0.06	-	13.3	-
	Common kingfisher	Not available	10.9	0.06	-	10.9	-
Thames Estuary and Marshes SPA	Ringed plover	8	12.0	0.07	1	12.1	151
	Hen harrier	10	12.0	0.07	1	12.1	121
	Pied avocet	20	12.0	0.07	0	12.1	60
	Grey plover	20	12.0	0.07	0	12.1	60
	Red knot	20	12.0	0.07	0	12.1	60
	Dunlin	20	12.0	0.07	0	12.1	60
	Black-tailed godwit	20	12.0	0.07	0	12.1	60
	Common redshank	20	12.0	0.07	0	12.1	60
Queendown Warren SAC	Semi-natural dry grasslands and scrubland facies on calcareous substrates	15	15.4	0.02	0	15.4	103
The Swale Ramsar/SSSI	Intertidal habitats (coastal saltmarsh)	20	14.7	0.4	2	15.1	75
	Saltmarsh (coastal saltmarsh)	20	14.7	0.4	2	15.1	75
	Shingle & sea cliff (dunes, shingle & machair)	10	14.7	0.4	2	15.1	75
	Arable (horticultural & arable)	Not sensitive	-	-	-	-	-
	Standing water (standing open water)	No CL	-	-	-	-	-
	Waste land, industrial (no corresponding APIS	Not sensitive	-	-	-	-	-
Medway Estuary and Marshes Ramsar	Intertidal habitats (coastal saltmarsh)	20	13.3	0.1	0	13.3	67
	Saltmarsh (coastal saltmarsh)	20	13.3	0.1	0	13.3	67
	Shingle & sea cliff (dunes, shingle & machair)	10	13.3	0.1	1	13.3	133
	Wet grassland (grazing marsh)	20	13.3	0.1	0	13.3	67
	Dry grassland (grazing marsh)	10	13.3	0.1	1	13.3	133



Designated Site	Interest Feature	CL (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	Future AC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PC/CL (%)	WKN + Increase in K3 PEC (kgN.ha <sup>-1</sup> .yr <sup>-1</sup> )	WKN + Increase in K3 PEC/CL (%)
	Bogs, marshes, fens (fen, marsh & swamp)	15	13.3	0.1	0	13.3	89
	Standing water (standing open water)	No CL	-	-	-	-	-
	Intertidal habitats (coastal saltmarsh)	20	13.3	0.1	0	13.3	66.6
Thames Estuary and Marshes Ramsar	Intertidal habitats (coastal saltmarsh)	20	12.0	0.1	0	12.1	60.3
	Saltmarsh (coastal saltmarsh)	20	12.0	0.1	0	12.1	60.3
	Shingle & sea cliff (dunes, shingle & machair)	10	12.0	0.1	1	12.1	120.6
	Wet grassland (grazing marsh)	20	12.0	0.1	0	12.1	60.3
	Dry grassland (grazing marsh)	20	12.0	0.1	0	12.1	60.3
	Bogs, marshes, fens (fen, marsh & swamp)	15	12.0	0.1	0	12.1	80.4
	Standing water (standing open water)	No CL	-	-	-	-	-

Note:

Future AC is the AC from the APIS website plus the PC from K3 as permitted

Critical loads (CLs) for nutrient nitrogen deposition are provided as a range. In this case, the lower limit of the CL range has been used in the assessment.

Consistent with the Institute of Air Quality Management's Position Statement "Use of a Criterion for the Determination of an Insignificant Effect of Air Quality Impacts on Sensitive Habitats" [5], the PC as a % of the CL has been rounded to the nearest integer.

**Table 5.4.5 Predicted Acid Deposition at Designated Sites**

Designated Site	Interest Feature	Critical Loads (keq.ha <sup>-1</sup> .yr <sup>-1</sup> )			WKN + Increase in K3 PC (keq.ha <sup>-1</sup> .yr <sup>-1</sup> )		WKN + Increase in K3 PC/CLF (%)
		Min N	Max N	Max S	N	S	
The Swale SPA	Breeding Lapwing	0.223	0.743	0.52	0.028	0.042	0
	Eurasian curlew	0.223	0.743	0.52	0.028	0.042	0

	Common redshank	0.223	0.743	0.52	0.028	0.042	0
Medway Estuary and Marshes SPA	Common tern	0.223	1.113	0.89	0.004	0.006	0
	Eurasian curlew	0.223	1.113	0.89	0.004	0.006	0
	Little tern	0.223	1.113	0.89	0.004	0.006	0
Thames Estuary and Marshes SPA	Ringed plover	0.223	0.743	0.52	0.005	0.007	0
Queendown Warren SAC	Semi-natural dry grasslands and scrubland facies on calcareous substrates.	0.856	4.856	4	0.002	0.002	0
The Swale Ramsar/SSSI	Intertidal habitats (coastal saltmarsh)	Not sensitive	-	-	-	-	-
	Saltmarsh (coastal saltmarsh)	Not sensitive	-	-	-	-	-
	Shingle & sea cliff (dunes, shingle & machair)#	Not sensitive	-	-	-	-	-
	Arable (horticultural & arable)	Not sensitive	-	-	-	-	-
	Standing water (standing open water)	No CL	-	-	-	-	-
	Waste land, industrial (no corresponding APIS habitat)	Not sensitive	-	-	-	-	-
Medway Estuary and Marshes Ramsar	Intertidal habitats (coastal saltmarsh)	Not sensitive	-	-	-	-	-
	Saltmarsh (coastal saltmarsh)	Not sensitive	-	-	-	-	-
	Shingle & sea cliff (dunes, shingle & machair)	Not sensitive	-	-	-	-	-
	Wet grassland (grazing marsh)	Not sensitive	-	-	-	-	-
	Dry grassland (grazing marsh)	Not sensitive	-	-	-	-	-
	Bogs, marshes, fens (fen, marsh & swamp)	Not sensitive	-	-	-	-	-
	Standing water (standing open water)	No CL	-	-	-	-	-
Thames Estuary and Marshes Ramsar	Intertidal habitats (coastal saltmarsh)	Not sensitive	-	-	-	-	-
	Saltmarsh (coastal saltmarsh)	Not sensitive	-	-	-	-	-
	Shingle & sea cliff (dunes, shingle & machair)	Not sensitive	-	-	-	-	-
	Wet grassland (grazing marsh)	Not sensitive	-	-	-	-	-
	Dry grassland (grazing marsh)	Not sensitive	-	-	-	-	-
	Bogs, marshes, fens (fen, marsh & swamp)	Not sensitive	-	-	-	-	-

	Standing water (standing open water)	No CL	-	-	-	-	-
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Notes:

\* Habitat in parenthesis is the corresponding APIS broad habitat for which critical loads are available

# dune/shingle/marsh systems in this location are calcareous and therefore well buffered

CLF = Critical Load Function.

Consistent with the Institute of Air Quality Management's Position Statement "Use of a Criterion for the Determination of an Insignificant Effect of Air Quality Impacts on Sensitive Habitats" [5], the PC as a % of the CL has been rounded to the nearest integer.

### *Annual-mean NO<sub>x</sub>*

The maximum annual-mean NO<sub>x</sub> WKN + Increase in K3 PCs only exceeds 1% of the critical level at the Swale SPA/SSSI/Ramsar; the effects can be screened out as insignificant at the other sites. At the Swale SPA/SSSI/Ramsar the WKN + Increase in K3 PC is 5% of the critical level and based on the PC alone the impact is potentially significant; however, when the future AC is added to the PC, the PEC is only 52% of the critical level of 30 µg.m<sup>-3</sup> and the impacts can be screened out as insignificant.

### *Annual-mean SO<sub>2</sub>*

The maximum annual-mean SO<sub>2</sub> WKN + Increase in K3 PCs only exceeds 1% of the critical level at the Swale SPA/SSSI/Ramsar and the effects can be screened out as insignificant at the other sites. At the Swale SPA/SSSI/Ramsar the WKN + Increase in K3 PC is 2% of the critical level and based on the PC alone the impact is potentially significant; however, when the future AC is added to the PC, the PEC is only 5% of the critical level of 20 µg.m<sup>-3</sup> and the impacts can be screened out as insignificant.

### *Annual-mean NH<sub>3</sub>*

The maximum annual-mean NH<sub>3</sub> WKN + Increase in K3 PCs do not exceed 1% of the critical level at all habitat sites and the impacts can be screened out as insignificant.

### *Nutrient N Deposition*

The maximum nitrogen deposition PC is less than 1% of the critical load at all interest features for the Medway Estuary and Marshes SPA/Ramsar, Thames Estuary and Marshes SPA/Ramsar and Queendown Warren SAC. At the Swale SPA/SSSI/Ramsar interest features, the WKN + Increase in K3 PCs are 2% of the critical load and based on the PC alone, the impact is potentially significant; however, when the future AC is added to the PC, the PEC is only 75% of the critical load for all but two interest features and the impacts can be screened out as insignificant. For Eurasian reed warbler and Reed bunting, the PEC is 101% of the critical level and the impacts can't be screened out. The results have been passed to the projects' ecologist to assess the effects.

### *Acid Deposition*

The maximum acid deposition PC is less than 1% of the critical load at all sensitive interest features and the impacts can be screened out as insignificant.

### *Cumulative Impacts*

For the cumulative impacts across the grid, only interest features where the PC as a % of the CL exceeds 1% are considered further. Where the PC does not exceed 1% of the CL, the cumulative impacts are considered to be insignificant.

For ammonia and acid deposition, the PC as a % of the CL is less than 1% at all habitat sites and interest features and the cumulative impacts are considered to be insignificant.

For NO<sub>x</sub>, SO<sub>2</sub> and N Deposition, the PC as a % of the CL is less than 1% at all habitat sites except the Swale SPA/SSSI/Ramsar and the cumulative impacts are considered to be insignificant. At the Swale SPA/SSSI/Ramsar the impacts can't be screened out based on the PC alone and the cumulative PEC needs to be considered.

Section 5.12 of Chapter 5: Air Quality sets out the cumulative developments considered for this assessment. There are four developments where there was sufficient detail to allow a PC to be added to give a cumulative PEC for human-health receptors:

- Kemsley K4 CHP PC (EN010090 (18/501923/ADJ))
- Kemsley AD (SW/11/1291)
- Reserve Power Plant PC (18/500393/FULL)
- Garden of England Energy Facility (15/500348/COUNTY)

The PCs for the Swale SPA/SSSI/Ramsar for each of these four developments are outlined in the table below. This has been added to the maximum PEC for the Swale from Tables 5.4.1, 5.4.2 and 5.4.4 to give a Cumulative PEC.

**Table 5.4.6 Cumulative Predicted Environmental Concentrations at the Swale SPA/SSSI/Ramsar**

	Kemsley K4 CHP PC (EN010090 (18/501923/ADJ))	Kemsley AD (SW/11/1291)	Reserve Power Plant PC (18/500393/FULL)	Garden of England Energy Facility (15/500348/COUNTY)	WKN + Increase in K3 PEC	Cumulative PEC	CL	Cumulative PEC as % of CL
<b>NO<sub>x</sub> PC (µg.m<sup>-3</sup>)</b>	0.8	1.69	2.23	1.33	15.5	21.55	30	72
<b>SO<sub>2</sub> PC (µg.m<sup>-3</sup>)</b>	-	-	-	0.33	1.09	1.42	20	7
<b>N Deposition PC (kgN.ha<sup>-1</sup>.yr<sup>-1</sup>)</b>	0.1	0.0174	1.92	1.87	15.1	19.0074	15*	127
							20	95

\*Critical load for Eurasian reed warbler and reed bunting

For NO<sub>x</sub> and SO<sub>2</sub> at the Swale SPA/SSSI/Ramsar, the cumulative PEC as a % of critical level is less than the CL and the cumulative impacts can be screened out as insignificant.

For N deposition the cumulative PEC is 95% of the critical load and the cumulative impacts can be screened out as insignificant for all interest features except Eurasian reed warbler and Reed bunting. For Eurasian reed warbler and Reed bunting the cumulative PEC is 127% of the CL and the

cumulative impacts can't be screened out. The results have been passed to the projects' ecologist to assess the effects.

#### Cumulative Impacts at Sensitive Receptors

The above assessment does not consider the impacts of cumulative traffic as the areas of maximum impact will be different for stack and traffic emissions. Traffic emissions have been modelled at a selection of discrete receptor points at the closest point of the habitat site to a road adjacent to roads affected by the WKN and K3 proposed development. Only the Swale SPA/SSSI/Ramsar and the Medway Estuary and Marshes SPA/Ramsar are within 200 m of a road affected by the WKN and K3 proposed development.

The A249 passes through the Medway Estuary and Marshes SPA/Ramsar so receptors were selected at the roadside.

Cumulative traffic data for the WKN and K3 Proposed Development in the opening year of WKN, 2024 was modelled. The PC from the WKN and the increase in K3 stack emissions at each of the sensitive receptors was added to the road contribution to give a 'WKN + Increase in K3' PC that considers both stack and traffic emissions. To calculate the cumulative PEC, the maximum PCs for the developments in Table 5.4.5 were added to the highest future AC for each habitat site and the WKN + Increase in K3 PC. These were compared with the lowest CL for each habitat site. The results are presented in Table 5.5.7 and 5.5.8.

**Table 5.4.7 Cumulative NOx Predicted Environmental Concentrations – Sensitive Receptors**

Habitat Site	WKN + Increase in K3 Road Contribution ( $\mu\text{g.m}^{-3}$ )	WKN + Increase in K3 PC (stack emissions) ( $\mu\text{g.m}^{-3}$ )	WKN + Increase in K3 PC as % of CL	Kemsley K4 CHP PC (EN010090 (18/501923/A DJ))	Kemsley AD (SW/11/129 1)	Reserve Power Plant PC (18/500393/FUL L)	Garden of England Energy Facility (15/500348/COUNTY )	Cumulative PEC ( $\mu\text{g.m}^{-3}$ )	Cumulative PEC as % of CL
The Swale SPA/SSSI/Ramsar	1.74	0.44	7	0.80	1.69	2.23	1.33	20.84	69
Medway Estuary and Marshes SPA/Ramsar	0.04	0.20	1	0.10	0.07	0.00	0.11	25.09	84

\*Critical level is  $30 \mu\text{g.m}^{-3}$

**Table 5.4.8 Cumulative N Deposition Predicted Process Contributions – Sensitive Receptors**

Habitat Site	WKN + Increase in K3 PC (Traffic and Stack Emissions)( $\mu\text{g.m}^{-3}$ )	Minimum CL	WKN + Increase in K3 PC as % of CL (Traffic and Stack Emissions)( $\mu\text{g.m}^{-3}$ )
The Swale SPA/SSSI/Ramsar	0.22	15	1
Medway Estuary and Marshes SPA/Ramsar	0.02	8	0

For NO<sub>x</sub>, the cumulative PC as % of the CL is less than 1% for the Medway Estuary and Marshes SPA/Ramsar. At both the Swale SPA/SSSI/Ramsar and the Medway Estuary and Marshes SPA/Ramsar, the PEC is less than the CL for . On that basis, the cumulative effects are considered insignificant.

For N deposition the cumulative PC as % of the CL is less than 1% for both the Medway Estuary and Marshes SPA/Ramsar and the Swale SPA/SSSI/Ramsar and the cumulative impacts are considered insignificant.

The cumulative PECs presented in Tables 5.4.7 and 5.4.8 can be considered highly conservative as the PCs from the other developments are the maximum impacts across a grid and are unlikely to occur at the same location as the maximum road contribution.

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- 1 Air Pollution Information Systems, [www.apis.ac.uk](http://www.apis.ac.uk)
  - 2 Approaches to modelling local nitrogen deposition and concentrations in the context of Natura 2000 - Topic 4
  - 3 Air emissions risk assessment for your environmental permit
  - 4 Data downloaded from APIS December 2017
  - 5 [http://www.iaqm.co.uk/text/position\\_statements/aq\\_impacts\\_sensitive\\_habitats.pdf](http://www.iaqm.co.uk/text/position_statements/aq_impacts_sensitive_habitats.pdf)
  - 6 [http://www.iaqm.co.uk/text/position\\_statements/aq\\_impacts\\_sensitive\\_habitats.pdf](http://www.iaqm.co.uk/text/position_statements/aq_impacts_sensitive_habitats.pdf)
  - 7 [http://www.iaqm.co.uk/text/position\\_statements/aq\\_impacts\\_sensitive\\_habitats.pdf](http://www.iaqm.co.uk/text/position_statements/aq_impacts_sensitive_habitats.pdf)