ARUP

Technical Note

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Habitats assessment - impact from nutrient nitrogen deposition

a) Justify the use of the nutrient nitrogen deposition critical load of 20 kgN/ha/yr at the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site and Site of Special Scientific Interest (SSSI) and North Killingholme Haven Pits SSSI. Reasoning should be provided regarding the use of this critical load instead of the minimum critical loads specified on the Air Pollution Information System (APIS) website for these sites.

Section 4.4 of the Air Quality Impact Assessment states "*It is noted that the Humber Estuary has more stringent Critical Load for dune type habitats listed, however it is considered that the locations of these habitats are over 15km from the Installation and therefore are not likely to be impacted by the emissions from it.*"

The main Humber sand dunes are present at Cleethorpes and on Spurn Point, as shown on Magic.gov.uk mapping (Figure 1), which shows the dune habitats in orange and saltmarsh habitats in green). There is also a very small area of dunes that are 17km to the east of the Installation.

The sand dunes at Cleethorpes are 19km to the southeast of the Installation and those at Spurn Point are 25km southeast. None of the sand dunes are in the prevailing wind direction. It is therefore considered that due to the distance from the Installation and the prevailing wind direction, that the impacts at all sand dune locations would be insignificant. Clarification on the location of the dune habitats has been added in to the text in Section 4.4 of the Air Quality Impact Assessment.

Figure 1: Magic Mapping of Sand Dunes and Saltmarsh Locations

For Atlantic upper-mid & mid-low salt marshes APIS states that *"It is recommended that this is the relevant critical load for most of saltmarsh but the lower level of 10 kgN/ha/yr should be applied to the more densely vegetated upper marsh (e.g. EUNIS class MA223, MA224) and to areas of marsh subjected to direct run-off from adjacent catchments (NRW recommendation). For pioneer saltmarsh (MA225) use the higher 20-30 kg N/ha/yr critical load."*

There are two small areas of saltmarsh located in close proximity to the Installation, as shown in magic.gov.uk mapping (Figure 2).

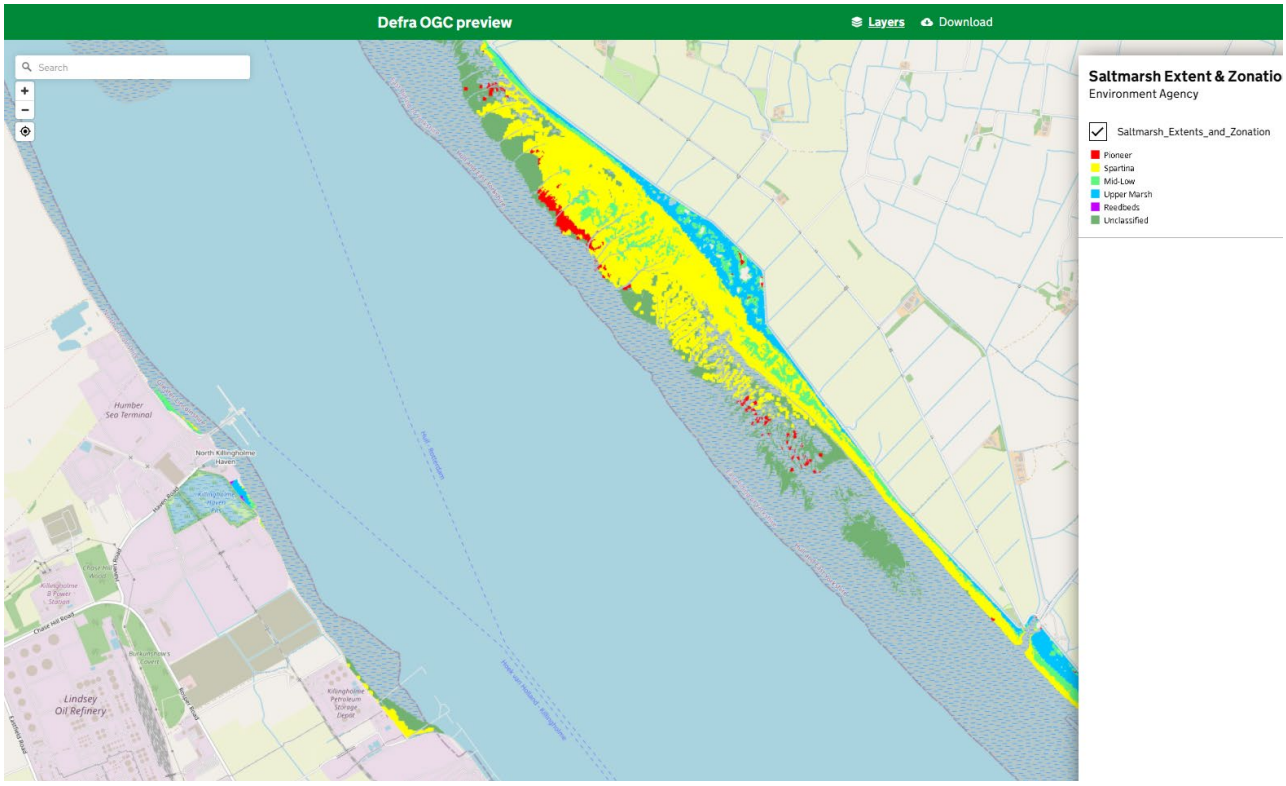
Figure 2: Magic Mapping of Saltmarsh Close to the Installation

Further from the Installation there are more extensive areas of saltmarsh, as shown in Figure 3.

Figure 3: Magic Mapping of Saltmarsh for the Humber Estuary

Defra's saltmarsh extent and zonation mapping[1] (Figure 4) indicates that the small area of saltmarsh close to North Killingolme Haven Pits is largely Upper Marsh, with some mid-low saltmarsh and spartina also present. It is therefore considered that the 10kg N/ha/yr Critical Load for Atlantic upper-mid & mid-low salt marshes should be applied to ensure a conservative assessment. The Air Quality Impact Assessment has been updated accordingly for receptors E1, E2, E5 and E14.

Figure 4: Magic Mapping of Saltmarsh for the Humber Estuary



With this in mind, Table 6.4 of the Air Quality Impact Assessment has been updated for the Humber Estuary receptors as below:

Table 6-1: Highest Nutrient Nitrogen Deposition (Kg/Ha/Yr) Results

Receptor ID	Site Name	BDep (kg N/ha/yr)	Lowest CLd Class Applicable	Lower Value of CLd Range	PC (kg N/ha/yr)	PC % CLd	1st Stage Screened as Insignificant?
E1	Humber Estuary, North Killingholme Haven Pits, Halton Marsh Clay Pits	16.7	Atlantic upper-mid & mid-low salt marshes	10	0.10	1.0%	Yes
E2	Humber Estuary	16.7		10	0.10	1.0%	
E5	Humber Estuary	16.7		10	< 0.1	0.0%	

[1] Saltmarsh Extent & Zonation

Receptor ID	Site Name	BDep (kg N/ha/yr)	Lowest CLd Class Applicable	Lower Value of CLd Range	PC (kg N/ha/yr)	PC % CLd	1st Stage Screened as Insignificant?
E14	Humber Estuary – SAC salt meadow habitat	16.6		10	0.09	0.9%	
PC = Process Contribution, CLd = Critical Load, BDep = Background Deposition, PEC = Predicted Environmental Concentration							

Whilst the presented impacts using the lower Critical Load for Atlantic saltmarsh are at 1% of the Critical Load at the assessed receptors, and therefore can be considered to be insignificant, it is noted that there is a small area of saltmarsh just to the northeast of the Installation that was not included as a specific receptor in the Air Quality Impact Assessment.

The small area of saltmarsh just to the northeast of the Installation is shown in Figure 4 to be mainly Mid-Low and Spartina, and therefore again, the 10kg N/ha/yr Critical Load for Atlantic upper-mid & mid-low salt marshes, rather than the 20 kg N/ha/yr for pioneer saltmarsh should be applied to ensure a conservative assessment. The Contour Plot provided in Figure 5 shows that this area is predicted to have nitrogen deposition concentrations that would be up to 2% of the 10kg N/ha/yr Critical Load, and therefore the potential impacts of nitrogen deposition need to be considered further.

The Humber Estuary SAC and SSSI is designated for supporting numerous Annex I habitats, with H1130 Estuaries and H1140 Mudflats and sandflats not covered by seawater at low tide being the primary reason for the selection of the site. H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) is present as a qualifying feature, but is not a primary reason for the selection of the site[2][3].

Whilst nitrogen inputs have been experimentally demonstrated to have an effect on overall species composition of saltmarsh, it is important to note from APIS that the experimental studies that underlie conclusions regarding the sensitivity of saltmarsh to nitrogen have '… *neither used very realistic N doses nor input methods i.e. they have relied on a single large application more representative of agricultural discharge*', which is far in excess of anything that would be deposited from the atmosphere. Therefore, APIS indicates that determining which part of the Critical Load range to use for saltmarsh requires expert judgment. Overall, there is good reason to believe the upper part of the critical load range (i.e. 20 kgN/ha/yr for Atlantic saltmarsh) may be more appropriate than the lower part (10 kgN/ha/yr) for some saltmarsh communities.

The Critical Loads on APIS are relatively generic for each habitat type and cover a wide range of deposition rates. They do not (and are not intended to) take other influences to which the habitat on a given site may be exposed into consideration. For instance, Natural England's Designated Site Overview[4] for SSSI Unit 97 states that the condition of the site is Unfavourable-Declining, with the reasoning being due to the populations of non-breeding birds having declined by more than 25%. It is considered that this is due to the impacts of bird flu, and not as a consequence of habitat change due to nitrogen deposition.

[2] Spreadsheet of Habitat Correspondences | JNCC Resource Hub

[3] https://sac.jncc.gov.uk/habitat/H1330/

[4] Unit detail

There is already high background nitrogen deposition at this location (16.7 kgN/ha/yr), which exceeds the lower critical load of 10 kgN/ha/yr for upper saltmarsh. The process contribution at this location only represents 1.2% of the background nitrogen deposition.

If a conservative approach is taken at this stage, assuming a 10kg N/ha/yr Critical Load for the saltmarsh within the area, it is considered there might be potential for an impact on the habitat there. However, since the background nitrogen deposition is already 16.7kg N/ha/yr, the baseline vegetation community there is already subject and adjusted to higher levels of nitrogen. In addition, the affected area represents a very small area of saltmarsh compared to the extent of saltmarsh habitat present throughout the SAC and SSSI.

b) Provide a contour plot showing your predicted nutrient nitrogen deposition impacts.

A contour plot of the nitrogen deposition is provided in Figure 5 and shows that the extent of the nitrogen deposition impacts over the 1% Critical Load of 10kg N/ha/yr are very localised to the Installation. This figure has been included in the Air Quality Impact Assessment.

Figure 5: Contour Plot of Nitrogen Deposition