Newlands Developments

Land off Barnsley Road, Goldthorpe

Gypsy Marsh Ecology: Air Quality Review

December 2023

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1.0 INTRODUCTION

1.1 FPCR Environment and Design Ltd (FPCR,) have been commissioned on behalf of Newlands Developments, to provide advice regarding possible affects to Dearne Valley Wetlands Special Site of Scientific Interest (SSSI), in relation to the proposed development of Land off Barnsley Road, Goldthorpe ('the Site').

Proposals

1.2 Barnsley Metropolitan Borough Council (BMBC) produced a Masterplan Framework for the Site with Edward Architecture in 2021 (Goldthorpe Masterplan Framework Version 2.0 September 2021). This provided a broad overview of the context of the Site and development proposals.

1.3 The most recent illustrative masterplan for the proposed development at the time of reporting, (UMC Architects Drawing ***Environmental Statement Figure 4.1***) shows that the Site will be developed as four plots for employment (commercial/warehouse usage) with associated provision of parking, service areas and access roads. Landscape proposals will retain Carr Dike and provide additional grassland and woodland planting throughout the Site. In the west of Site, beyond the development area will be a biodiversity and flood compensation area.

1.4 Increases in traffic on the A6195 (located to the west of the Site) as a result of the development, and in conjunction with other schemes, were estimated by Simon Grubb of Vanguardia and it was determined that impacts to the SSSI may occur due to exceedances of the DMBR (2019[1]) and Natural England (2018[2]) air quality criteria. As such, further assessment has been carried out.

1.5 DMBR guidance states:

"The following traffic scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the do something traffic (with the project) compared to the do minimum traffic (without the project) in the opening year:

1) annual average daily traffic (AADT) >=1,000; or

2) heavy duty vehicle (HDV) AADT >=200; or

3) a change in speed band; or

4) a change in carriageway alignment by >=5m"

1.6 Natural England guidance is based upon impacts to European Sites that may be subject to Appropriate Assessment (also known as Habitats Regulations Assessment/HRA) and states that a project that will result in an increase of no more than 1% of critical loads or levels (either alone or in combination) can be regarded as insignificant from an air quality point of view. Therefore, any project where there may be an increase above 1% of the loads/levels may lead to significant effects.

1.7 It is noted that the Natural England guidance is based upon potential impacts to sites of European Nature Conservation importance and that SSSI are of National importance and as such are considered to have a lesser conservation importance.

[1] Highways Agency (2019) Design Manual For Bridges and Roads (DMBR) Sustainability & Environment Appraisal LA 105: Air quality.
[2] Natural England (2018). Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. NE Internal Guidance, V1.4 Final, June 2018

1.8 Modelling of the air quality levels and assessment against critical levels and loads was provided by Vanguardia and published in Appendix 14.13 (Ecological Impacts) of the Environmental Statement Chapter for Air Quality produced for the Development.

Context

1.9 The Site lies to the west of the town of Goldthorpe and comprises farmland south of the A635 Barnsley Road and adjacent the west of Aldi Goldthorpe Regional Distribution Centre. Carr Dike (a small watercourse) bisects the Site running in a south-westerly direction from Doncaster Road (see Figure 1 for Site location and context).

1.10 The Site comprises predominately arable agricultural land arranged in irregularly shaped fields bound by hedgerows (some of which are defunct). Carr Dike bisects the central part of the Site with a thin area of plantation woodland on the northern bank, the stream flows in a general south-westerly direction cutting through the Site from north-east to south-west. Small areas of plantation woodland are located in the north of the Site and provide screening from Barnsley Road to the north and isolated residences located in the northern central area of the Site.

1.11 The wider landscape is varied, with further agricultural land to the north, west and directly south of the Site, wetlands to the south and south-west of the Site are associated with Dearne Valley Wetlands SSSI and RSPB nature reserves, and directly east of the Site is an area of commercial and light industrial development with residential areas beyond.

2.0 DEARNE VALLEY WETLANDS SSSI

2.1 Dearne Valley Wetlands SSSI is located approximately 100m south-west of the Site at its nearest point. The Dearne Valley Wetlands is a relatively dispersed cluster of 22 Units including wetland, scrub, and woodland areas along the valley of the River Dearne and includes privately owned nature reserves, RSPB reserves, and parkland. The SSSI is designated for:

- Breeding gadwall *Mareca strepera*, shoveler *Spatula clypeata*, garganey *Spatula querquedula*, pochard *Aythya ferina*, bittern *Botaurus stellaris*, black-headed gull *Chroicocephalus ridibundus* and willow tit *Poecile montanus klienschmidti*.
- Non-breeding gadwall and shoveler.
- Diverse assemblages of breeding birds of Lowland damp grasslands, Lowland scrub, a mixed assemblage of Lowland open waters and their margins, and Lowland fen.

2.2 Within 200m of the A6195 there are five SSSI Units associated with Dearne Valley Wetlands, these include:

- Unit 012 Gypsy Marsh: FEN, MARSH, AND SWAMP - Lowland.
- Unit 013 Broomhill Park: BROADLEAVED, MIXED AND YEW WOODLAND - Lowland.
- Unit 014 The Mullins: BROADLEAVED, MIXED AND YEW WOODLAND - Lowland
- Unit 016 Warbler Way: ROADLEAVED, MIXED AND YEW WOODLAND - Lowland
- Unit 017 Old Moor: STANDING OPEN WATER AND CANALS

2.3 Woodland and open water were considered to be less sensitive habitats in relation to potential impacts from air pollution from traffic and as such were scoped out from further assessment. In addition, only relatively small areas of units 014 and 016 are within 200m of the A6195.

2.4 Unit 012 Gypsy Marsh is classified as fen, marsh, and swamp and as such is considered to be a more sensitive habitat and required further assessment. However, Gypsy Marsh is not specifically named or described within the SSSI citation and is not designated for the fen, marsh, and swamp habitat present, but for the assemblage of breeding birds which the habitat supports.

Walkover Survey

2.5 A walkover survey was undertaken at Gypsy marsh on the 6th April 2023. During the walkover, the habitats present were identified and associated plant species lists were compiled. Vascular plant nomenclature followed Stace (2019)[3].

2.6 The survey undertaken by Ian Hunter (BSBI Field Identification Skills Certificate Level 5), an experienced Associate Ecologist from FPCR, with over fourteen years' relevant experience in habitat surveying. He is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

Gypsy Marsh Habitat Description

2.7 Gypsy marsh is a 4.6ha area of wetland to the west of RSPB Old Moor Wetland reserve. The A6915 is borders Gypsy marsh to the south-east, present at the top of a 1.5m high embankment

[3] Stace, C (2019) New Flora of the British Isles. 4th edn. C&M Floristics

and a footpath runs on an east to west axis through the marsh. The western extent of the marsh comprises an unmanaged wet grassland community, which features significant encroachment of scrub. Further east, in proximity to the round-a-bout, ground conditions become increasingly saturated with standing water present at the time of survey to a depth of 20-30cm across much of the habitat. Here, the community is characterised by encroaching grey willow *Salix cinerea* scrub, with open areas being broadly representative of NVC community S12: *Typha latifolia* swamp, in particularly the *Mentha* sub-community.

2.8 A review of publicly accessible historical aerial imagery showed that around 2020 Broomhill Round-a-bout was expanded and a strip of habitat approximately 20m wide was cleared on the eastern edge of Gypsy Marsh. This had previously been an area of scrub/woodland on the embankment of the road which was not replaced subsequent to the construction of the round-a-bout. At the time of the survey this area comprised a public pavement approximately 2m wide with tarmacadam hardstanding and an embankment of approximately 8m sloping down to Gypsy Marsh and a boundary fence (wooden post and rail). The embankment was noted to support only rough grasses and ruderal vegetation.

2.9 To the south of the footpath (which leads into Gypsy Marsh from the A6915 and is generally oriented east/west), the *Typha* swamp is characterised by a tall upper layer of reed-mace *Typha latifolia*, with a sub-layer featuring mint *Mentha sp.* and heart-leaved spear-moss *Calliergon cordifolium*. The invasive species New Zealand pygmyweed C*rassula helmsii* was recorded within this community, but only as an occasional associate and it did not appear to be negatively influencing species richness or community composition. Locally, this community grades into areas dominated by hard-rush *Juncus inflexus*, again with a mint and heart-leaved spear-moss understorey.

2.10 At the bottom of the embankment slope, adjacent to the road, a small inlet had been cut into the community, which held deeper standing water. In this area floating sweet-grass *Glyceria fluitans* was frequent along with water-plantain *Alisma plantago-aquatica* and jointed rush *Juncus articulatus* at lower frequencies. Where the dredged material from the ditch had been dumped adjacent to the ditch, ruderal species such as broad-leaved dock *Rumex obtusifolius* and marsh thistle *Cirsium palustre* were noted.

2.11 To the north of the footpath, willow scrub was increasingly abundant, with the Typha swamp community limited to a central clearing. Within this area a zonation was noted whereby a band of yellow iris *Iris pseudacorus* was present at the clearing edges, grading into an area of soft-rush *Juncus effusus* dominated vegetation, which in-turn graded into the more typical reed mace swamp centrally.

Table 1 Typha swamp species list

Common Name	Scientific Name	Abundance (DAFOR)
Reed-mace	*Typha latifolia*	A - O
Hard rush	*Juncus inflexus*	LA
Floating sweet-grass	*Glyceria fluitans*	LF
Grey willow	*Salix cinerea*	O
Mint sp.	*Mentha sp.*	O
Heart-leaved spear-moss	*Calliergon cordifolium*	O
New Zealand pigmyweed	*Crassula helmsii*	O

Common Name	Scientific Name	Abundance (DAFOR)
Great willowherb	*Epilobium hirsutum*	R
Water figwort	*Scrophularia auriculata*	R
Bramble	*Rubus fruticosus agg.*	R
Marsh woundwort	*Stachys palustris*	R
Michaelmas daisy	*Aster sp.*	R
Water-plantain	*Alisma plantago-aquatica*	R
Jointed rush	*Juncus articulatus*	R
Creeping buttercup	*Ranunculus repens*	R
Alder	*Alnus glutinosa*	R
Marsh thistle	*Cirsium palustre*	R
Broad-leaved dock	*Rumex obtusifolius*	R
Tufted hair-grass	*Deschampsia caespitosa*	R
Common reed	*Phragmites australis*	R
Wild teasel	*Dipsacus fullonum*	R
Soft-rush	*Juncus effusus*	O LF
Yellow iris	*Iris pseudacorus*	R LF

Table 2 Willow Scrub species list

Common Name	Scientific Name	Abundance (DAFOR)
Woody Species: Canopy		
Grey willow	*Salix cinerea*	F
Woody Species: Understorey		
Grey willow	*Salix cinerea*	O
Hawthorn	*Crataegus monogyna*	R
Silver birch	*Betula pendula*	R
Dogwood	*Cornus sanguinea*	R
Dog rose	*Rosa canina*	R
Ground Flora		
Soft-rush	*Juncus effusus*	F
Michaelmas daisy	*Aster sp.*	O
Common hogweed	*Heracleum sphondylium*	R
Common sorrel	*Rumex acetosa*	R
Heart-leaved spear-moss	Calliergon cordifolium	R
Meadow vetchling	*Lathyrus pratensis*	R
Pointed Spear-moss	*Calliergon cuspidatum*	R
Rough-stalked feather-moss	*Brachythecium rutabulum*	R
Common nettle	*Urtica dioica*	R

Gypsy Marsh Sensitivity

2.12 The areas of willow scrub are considered to be less sensitive to air pollution, and may actually provide some screening from potential impacts (where present, particularly in the north of the unit).

2.13 The area from the road/round-a-bout to the boundary of Gypsy Marsh is around 10m wide, this had been previously cleared to allow for the expansion of the road/round-a-bout and now comprises mainly ruderal vegetation and rough grasses not considered to be particularly sensitive to air pollution in this context.

2.14 Beyond 10m from the road, within the SSSI Unit (Unit 012), the *Typha* swamp habitat is broadly consistent with the NVC S12 community present. As such, this area was considered to be a relatively sensitive habitat, although not containing any specifically sensitive mosses or bryophytes, but still considered to require further detailed assessment.

3.0 DETAILED ASSESSMENT

3.1 Modelling of air quality scenarios has been provided by Vanguardia in Appendix 14.13 of the Air Quality chapter to the ES and should be cross referenced when reading this report.

3.2 As detailed within Chapter 14 (Air Quality) the Development in isolation and in conjunction with other schemes does trigger a requirement of an impact assessment on Dearne Valley SSSI – Gypsy Marsh in a number of scenarios, due to the exceedances of both the DMRB (2019) and Natural England (2018) criteria and the 1% screening criteria.

3.3 Nitrogen (as NO_X), nitrogen deposition, and ammonia (NH_3) were assessed by Vanguardia with two transects of 200m in length extending through Gypsy Marsh (see diagram included in Chapter 14 Appendix 14.13).

3.4 Transect E1 was oriented in a general south-east to north-west direction beginning at E1_00 at the bottom of the embankment from the round-a-bout and extends to point E1_120 at the northern edge of the Gypsy Marsh site. Points E1_130 to E1_200 were located outside of Gypsy Marsh and are not considered to be relevant to this assessment (see diagram included in Chapter 14 Appendix 14.13).

3.5 Transect E2 was oriented in a general east to west direction beginning at E2_00 at the top of the embankment directly adjacent to the round-a-bout. Points E2_00 to E2_10 were located on the road embankment comprising of ruderal vegetation or willow scrub and not considered to be indicative of the more sensitive swamp habitat. The transect extends into the western reach of Gypsy marsh, and habitats beyond point E2_150 are considered to be more representative of acid and neutral grassland rather than the more sensitive swamp habitats located in the eastern part of the site. As such, only points E2_10 – E2_150 are considered to be relevant to this assessment (see diagram included in Chapter 14 Appendix 14.13).

3.6 Site specific critical loads/levels were not available from the APIS website for Dearne Valley Wetlands SSSI or the Gypsy Marsh Unit. This is likely due to the relatively recent designation of the SSSI. As such, generic loads/levels for the Fen, Marsh, and Swamp habitat type were used from the APIS website[4].

3.7 Given that no site-specific critical levels/loads were available the criteria used were the lowest levels/ worst case levels provided on the APIS website (used for the most sensitive wetland habitats) and as such, are considered to be precautionary in nature. The values below were derived for the modelling by Vanguardia and are provided in Chapter 14 Appendix 14.13.

Table 3: Critical Levels used in modelling.

Designated Feature	NO_X (µg/m^3)		NH_3 (µg/m^3)
	Annual	24-Hour	Annual
Fen, Marsh, and Swamp	30	75	1 -3

[4] https://www.apis.ac.uk/

Table 4: Critical Loads used in modelling.

Designated Feature	Nitrogen Deposition – Annual mean (kgN/ha/year)
Fen, Marsh, and Swamp	5 – 25
Nitrogen-derived acid deposition critical loads could not be derived for this ecological receptor, and therefore have not been considered further in this assessment	

3.8 The critical level for ammonia affecting wetland habitats (fen, marsh, swamp) is usually expressed as a range of 1-3 µg/m^3, the habitat observed on-site (Typha swamp) would be expected to be a less sensitive habitat (in comparison to a valley mire) and the higher level of 3 µg/m^3 would be considered to be more appropriate as a critical level.

3.9 Similarly, for nitrogen deposition, this ranges from 10-15 kg N/ha/year for nutrient poor wetlands and 15-30 kg N/ha/year for more nutrient rich habitats. The critical load used in the modelling is 5-25 kg/N/year. The swamp habitat present at Gypsy Marsh is more characteristic of being nutrient rich and the upper end of the 15-30 kg N/ha/year load would be considered more appropriate. As such those loads used in modelling are considered to be precautionary.

3.10 Although Nitrogen deposition values were derived for acid grassland, however only the more sensitive swamp habitat (closest to the road) is considered within this assessment. Modelled values provided within Appendix 14.13 indicate that the area of acid grassland would only equal 1% of the critical load in 2026 and would not be considered to be significant.

Construction Phase – Development in isolation

Nitrogen Oxide NOx

3.11 Modelled annual NO_X concentrations were indicated to have process contributions exceeding the Natural England guidance of 1% of critical level. The 1% of critical level threshold was exceeded on Transect E1 between transect points E1_00 and E1_40, up to 40m into the swamp habitat, by point E1_50 the process contribution was below the 1% threshold. And on transect E2 the 1% critical level was exceeded between point E2_00 and E2_30 up to 30m into the habitat. By point E2_40 the process contribution was below the 1% threshold.

3.12 The maximum exceedance of the 1% critical threshold was 3.3% at point E1_00.

3.13 Given the relatively small exceedance of the threshold and within the less suitable edge habitats, it is considered that the overall effect would be considered to be **negligible** to the habitat and to the SSSI designated bird assemblages.

3.14 Predicted 24-hour mean NO_X Process contributions were all below the 10% of critical level threshold and **no significant ecological effects** would be expected.

Ammonia NH_3

3.15 The predicted annual ammonia process contribution did not exceed the 1% threshold of the critical level at any point. The 1µg NH_3/m^3 critical level is also considered to be precautionary and **no significant ecological effects** would be expected within the habitat itself. It is noted that the background level of NH_3 in the OS grid square containing Gypsy Marsh is 2.4 µg/m^3 (APIS), which is already above the lower critical level 1µg/m^3.

Nitrogen Deposition

3.16 The modelled predicted process contribution for annual mean nitrogen deposition exceeds the 1% of critical load threshold on transect E1 between points E1_00 and E1_20 (20m into the habitat) and on transect E2 at E2_00 to E2_20 (20m into the habitat).

3.17 Overall the effect on the habitats present would be **negligible** given the already high levels of nitrogen deposition in the area, the relatively limited extent of the effect (within mainly less suitable habitat) and the relatively small input from the Development in this scenario.

Operational Phase – Development in Isolation

Nitrogen Oxide NOx

3.18 For the operational phase, the process contribution for NO_X exceeds the 1% of critical level at all points through both transects. On transect E1 ranging from 23.4% of the critical level at E1_00 at the edge of the habitat and reducing to 2.5% at the 150m point E1_150 at the opposite edge of the habitat. On transect E2 the exceedances range from 13.9% at point E2_00 to 2.1% at point E2_150 at the edge of the swamp habitat. In addition, the total critical level (30 µg/m^3) was exceeded at points up to 30m into the habitat.

3.19 It would be expected that the willow scrub near the edge of E2 would in part act as a buffer to NOx in the east of the habitat. Additionally, the habitat nearest to the edge of the site, where the greatest exceedances are located is considered to be the least sensitive. The impacts of NO_X can also be variable, with most adverse effects on plants/habitats arising from NO_X being actually related to nitrogen deposition.

3.20 The modelled 24-hour mean for NO_X does not exceed 10% of the critical level up at any points along the transects. The total critical level is not exceeded.

3.21 Therefore, the input of additional NO_X as a result of the operational phase of the Development is considered unlikely to change the structure or composition of Gypsy Marsh but may have some effect on the health or condition of more sensitive botanical species nearer to the edge of the habitat. Given that the habitat is more nutrient rich swamp rather than nutrient poor fen/mire the broad habitat is considered to be less sensitive to the effects of NOx. Overall, it is considered that NOx inputs would be unlikely to impact upon the designated bird assemblages within the SSSI and the effect to habitats would be considered to be **minor adverse**.

Ammonia NH_3

3.22 The predicted annual mean ammonia levels due to the operational phase of the Development were reported to exceed the 1% of critical level threshold at all points across transect E1 and up to point E2_120 (120m into the habitat) on transect E2. Ranging from 5.5% of the critical level at E1_00 to 1.2% of the critical level at E1_150 at the edge of the site on transect E1. And from 5.6% at E2_00 to 1.0% at E2_120.

3.23 The critical level used in the modelling for ammonia impacting fen, marsh, and swamp habitats (1 - 3 µg/m^3) is considered to be precautionary. Taking 3 µg/m^3 as a more realistic critical level for the actual habitat present, exceedances of 1% of the critical load threshold and the critical load itself

would be limited to within 20m of the edge of the habitat, restricted to the less sensitive habitat areas and considered to have only a small effect on the health/condition of species present, with those species in the east of the Site (willow scrub) also acting as a buffer.

3.24 Overall, it is considered unlikely that these concentrations would result in a change in the structure or composition of the habitat or have any effect on the designated bird assemblages within the SSSI. Overall the effect would be expected to be **minor adverse.**

Nitrogen Deposition

3.25 The predicted loads reported indicate that the 1% of critical load threshold is exceeded at all points on both transects. On E1 the exceedances range from 15% of the critical load at E1_00 to 2% of the critical load at E1_150. On E2 the exceedances range from 11% at E2_00 to 2% at E2_150.

3.26 Given that the critical load of 10 kg N/ha/year is considered to be precautionary, a load of around 30 kg N/ha/year might be considered to be more representative of the actual swamp habitat. This would mean none of the transect points would exceed the critical load and only the area up to 30m within the habitat would exceed or meet the 1% of critical load threshold. Additionally the buffer effect of the willow scrub in the east of the site and less sensitive habitats at the edges of the swamp would reduce the overall impact.

3.27 As such, it is considered that the levels of nitrogen deposition predicted would have only a **minor adverse** effect on the habitat with minor effects on the health/condition of some more sensitive flora and very limited impact on the structure and composition of the habitat. It would be considered unlikely to have any effect on the designated bird assemblages within the SSSI.

Construction Phase – Including Cumulative Developments

Nitrogen Oxide NOx

3.28 Predicted increases in mean NO_X levels including cumulative contributions will exceed the 1% of critical load level at all points on both transects. On E1 exceedances range from 13.8% of the critical level at E1_00 to 2.3% of the level at E1_150. On E2 the exceedances range between 12.2% at E2_00 to 1.8% at E2_150. The total critical level would be exceeded up to 40m into the habitat.

3.29 None of the predicted 24-hour mean levels exceed the short-term threshold of 10% of the critical level.

3.30 Exceedance of critical levels will have some effect across the transect. These levels are considered unlikely to change the structure or composition of Gypsy Marsh but may have some small effect on the health or condition of more sensitive individual botanical species. Overall, it is considered unlikely to impact upon the designated bird assemblages within the SSSI and the effect would be considered to be **minor adverse.**

Ammonia NH_3

3.31 Predicted ammonia exceeds 1% of the critical level threshold up across all points on both transects. On E1 exceedances range from 6.3% of the critical level at E1_00 to 1.4% of the level at E1_150. On E2 the exceedances range between 6.7% at E2_00 to 1.0% at E2_150.

3.32 Given that the critical level for ammonia is considered to be precautionary (1 µg/m^3), a level of 3 µg/m^3 would be more representative of the actual habitats present, the predicted levels would only exceed the 1% of critical level threshold up to 30m into the habitat.

3.33 It is considered that the actual impacts on the habitat would be predominately limited to within 30m of the edge of the habitat, where the habitat is less sensitive and may also be buffered by the willow scrub. Overall the effects would be considered likely to be **minor adverse** and unlikely to impact upon the designated bird assemblages within the SSSI.

Nitrogen Deposition

3.34 The predicted loads reported indicate that the process contribution would exceed the 1% of critical load threshold across both transects. On E1 exceedances range from 12% of the critical level at E1_00 to 2.0% of the level at E1_150. On E2 the exceedances range between 12% at E2_00 to 2.0% at E2_150.

3.35 The critical loads used in the model are considered to be precautionary (10 kg N/ha/yr) and a load of 30 kg N/ha/yr would be expected to be more representative of the actual habitat present. As such, the 1% of critical load threshold would be expected to be exceeded to only 20m within the habitat and none of the transect points would exceed the total critical load.

3.36 As such, it is considered that the levels of nitrogen deposition predicted would have only a **minor adverse** effect on the habitat with minor effects on the health/condition of some sensitive flora and limited impact on the structure and composition of the habitat. It would be considered unlikely to have any effect on the designated bird assemblages within the SSSI.

Operational Phase – Including Cumulative Developments

Nitrogen Oxide NOx

3.37 The predicted levels of NO_X reported would be expected to exceed the 1% of critical level threshold at all points on both transects. On E1 the exceedances range 32.8% at E1_00 at the edge of the habitat and 4.2% at E1_150 at the edge of the site. On E2 the exceedances range from 22.8% at E2_00 at the edge of the habitat in the east to 3.4% at E2_150 at the edge of the swamp habitat in the west. In addition the critical level would be exceeded up to 40m within the habitat.

3.38 The predicted 24-hour mean levels of NO_X would exceed 10% of the short-term critical level at only E1_00 (11.6%) and E1_02 (10.8%. 2m into the edge of the habitat) and are not exceeded on transect E2.

3.39 Exceedance of the annual 1% critical levels will be present across the entire transect, though the greatest concentrations are within 40m of the edge, some buffering would also be expected from the willow scrub in the east of the habitat. The 24-hour critical levels would be only exceeded at the very edge of the habitat which is considered to be less sensitive. Although the annual levels are relatively high, these levels are considered unlikely to change the structure or composition of Gypsy Marsh from a Typha swamp habitat but may have some isolated effect on the health or

condition of individual botanical species, particularly those more sensitive to air pollution, with effects predominately at the edges of the habitat. Any effect would not be expected to impact upon the function of the habitat to support the designated bird assemblages within the SSSI and the as such the effect would be considered to be **minor adverse**.

Ammonia NH_3

3.40 Predicted ammonia exceeds 1% of the critical level across at all points on both transects. On E1 the exceedances range 11% at E1_00 at the edge of the habitat and 2.4% at E1_150 at the edge of the site. On E2 the exceedances range from 11.5% at E2_00 at the edge of the habitat in the east to 1.8% at E2_150 at the edge of the swamp habitat in the west.

3.41 Given that the critical level for ammonia is considered to be precautionary (1 µg/m^3), a level of 3 µg/m^3 would be more representative of the actual habitats present and the predicted levels would exceed the 1% of critical level threshold up to 70m into the habitat. The total critical level would not be exceeded at any point on either transect.

3.42 Overall it is considered that the impacts on the habitat would be limited, with the greatest impacts at the edge of the habitat and likely also buffered in the east by the willow scrub. The total annual critical level would not be exceeded though the 1% threshold from process contribution would be exceeded. Overall and that effects would not be expected to change the structure or function of the habitat present but may have some effect on individual botanical species, this would not be expected to adversely impact upon the designated bird assemblages within the SSSI and the effect would be considered to be **minor adverse**.

Nitrogen Deposition

3.43 The predicted loads reported indicate that the process contribution would exceed the 1% of critical load threshold across both transects. On E1 the exceedances range from 24% E1_00 at the edge and 4.0% of the critical load at E1_150 at the edge of the site. On E2 the exceedances range from 21% at E2_00 at the edge of the habitat in the east to 3.0% at E2_150 at the edge of the swamp habitat in the west. The total critical load (5-25 kg N/ha/yr) would be exceeded at all points across the transect at the lower range but would not be exceeded at any points at the higher range.

3.44 The critical loads used in the model are considered to be precautionary (5-25 kg N/ha/yr) and a load of 30 kg N/ha/yr would be expected to be more representative of the actual habitat present. As such, the 1% of critical load threshold would be expected to be exceeded to 80m within the habitat and none of the transect points would exceed the total annual critical load.

3.45 Overall it is considered that the levels of nitrogen deposition predicted would have only a **minor adverse** effect on the habitat with minor effects on the health/condition of some flora and limited impact on the structure and composition of the habitat. It would be considered unlikely to have any effect on the designated bird assemblages within the SSSI.

4.0 SUMMARY

4.1 Traffic and air quality modelling indicate that the Development will lead to an increase in traffic numbers on the A6195 which will in turn lead to increased levels of pollutants in the vicinity of Dearne Valley Wetlands SSSI which is designated for nationally important assemblages of breeding birds.

4.2 The majority of Dearne Valley Wetlands is either at distance from the A6195 or comprises less sensitive habitats unlikely to be significantly impacted by increases in airborne pollutants. However, SSSI Unit 012 – Gypsy Marsh is in close proximity to the road and is a wetland habitat which may be more sensitive to pollution.

4.3 A site visit indicated that the wetland habitat present was analogous to the NVC community S12 Typha latifolia swamp, and the mentha sub community. This wetland may still be somewhat sensitive to pollution but the larger species such as Typha latifolia (reedmace) are more resistant and the sublayers of the habitat have fewer sensitive species such as mosses and bryophytes.

4.4 Parts of the habitat were observed to have areas of scrub at the edges, particularly in the north-east which would offer some screening from airborne pollutants. Areas of the habitat were noted to be open water which is less sensitive to airborne pollutants. Additionally, the area closest to the road has in the past been disturbed when the road was expanded and there are still small areas where ruderal vegetation and disturbed ground have degraded the swamp habitat at the edges.

4.5 Critical levels used in modelling were noted to be precautionary due to a lack of site-specific critical levels available from APIS and are considered to be conservative. For ammonia, the level of 1 µg/m^3 was used, however a level of 3 µg/m^3 would be considered to be more representative of the actual sensitivity of the habitat. Similarly for nitrogen deposition a precautionary level of 5-25 kg N/ha/yr was used in modelling when a level of 30 kg N/ha/yr would be considered to be more representative of the actual conditions.

4.6 A summary of the effects across the various scenarios is presented in Table 5 below:

Table 5: Summary of Effects.

Pollutant	Effect	Description
Construction Phase in Isolation		
NOx Annual Mean	Negligible	Limited extent of effect, precautionary threshold
NOx 24 hour	No effect	No exceedances of thresholds
Ammonia (NH_3)	No effect	The 1 µg/m^3 critical level is exceeded at all points. However, the background levels of NH3 already exceed the critical level. The Natural England assessment criteria of an increase of 1% of the critical level is not exceeded at any point therefore no additional effect is expected.

Pollutant	Effect	Description
Nitrogen deposition	Negligible	The 10 kg N/ha/yr critical load is exceeded at all points. However, background levels are 9.85 kg N/ha/yr which are already close to the critical load. The critical load is considered to be precautionary. The Natural England assessment criteria of an increase of 1% of the critical level is not exceeded at any point therefore no significant additional effect is expected.
Construction Phase with Cumulative Developments		
NOx Annual Mean	Minor adverse	Exceedance of critical level limited to within 40m of habitat edge. Although threshold of 1% of critical level exceeded at all points. May have some effect on individual plant health but not likely to be significant to habitat structure or designated features.
NOx 24 hour	Negligible	No exceedance of the 10% of short-term critical level threshold. Total critical level not exceeded.
Ammonia (NH_3)	Minor adverse	The critical level used was precautionary. Using a more appropriate level the exceedance of level would be limited to 30m within the habitat.
Nitrogen deposition	Minor adverse	The critical level used was precautionary. A more appropriate level would not have any exceedance of critical load and increases above the 1% of critical load threshold only within 20m of the edge of the habitat.
Operational Phase in Isolation		
NOx Annual Mean	Minor adverse	Exceedance likely limited to effects on individual plants within 30m of habitat edge. Not likely to change structure or composition of habitat. Unlikely to impact upon the designated features of the SSSI (bird assemblages).
NOx 24 hour	Negligible	No exceedance of total critical level and no exceedance of 10% of critical level.

Pollutant	Effect	Description
Ammonia (NH_3)	Minor adverse	Critical level is precautionary and actual effects are likely to be minimal and limited to within 20m of the edge of the habitat. Not likely to change structure or composition of habitat. Unlikely to impact upon the designated features of the SSSI (bird assemblages).
Nitrogen deposition	Minor adverse	Critical load is precautionary and actual effects are likely to be minimal and limited to within 30m of the edge of the habitat. Not likely to change structure or composition of habitat. Unlikely to impact upon the designated features of the SSSI (bird assemblages).
Operational Phase with Cumulative Developments		
NOx Annual Mean	Minor adverse	Exceedance of total critical level within 40m of habitat edge, effects likely to be limited to individual plants. Not likely to change structure or composition of habitat. Unlikely to impact upon the designated features of the SSSI (bird assemblages).
NOx 24 hour	Negligible	No exceedance of total critical level. Exceedance of 10% of critical level within 2m of the edge to the habitat in less sensitive area. Not likely to change structure or composition of habitat. Unlikely to impact upon the designated features of the SSSI (bird assemblages).
Ammonia (NH_3)	Minor adverse	Critical level is precautionary and actual effects are likely to be minimal and only within 70m of the edge of the habitat. Not likely to change structure or composition of habitat. Unlikely to impact upon the designated features of the SSSI (bird assemblages).
Nitrogen deposition	Minor adverse	The critical level used was precautionary. A more appropriate level would not have any exceedance of total critical load and increases above the 1% of critical load threshold only within 80m of the edge of the habitat. Not likely to change structure or composition of habitat. Unlikely to impact upon the designated features of the SSSI (bird assemblages).

4.7 Modelled levels of nitrogen oxide, ammonia, and nitrogen deposition show that the increase in levels of all the pollutants would have some effect on the habitat across all scenarios.

4.8 Given that the levels used were considered to be precautionary, the more representative levels would be expected to have less impact.

4.9 The effects would be mostly confined to the peripheral area of the habitat and in particular in the south-east of Gypsy Marsh (closest to the road) as the north-east/east is afforded more protection due to the presence of willow scrub.

4.10 Increases in air pollution would be expected to have some minor adverse effect to individual plants in those areas most impacted. The overall composition and structure of the habitat is considered unlikely to be compromised.

4.11 The effects would not be expected to change the nature or function of the habitat to such extent as it would be reduced from favourable condition, nor would its function to support the designated bird assemblages be expected to be degraded.

4.12 Overall, there is expected to be only a **minor adverse effect** upon the habitats at the designated site (Dearne Valley Wetlands SSSI) due to the relatively limited extent of the impact (in relation to the entire SSSI, and the wider and the extent of the habitat within Unit 012 Gypsy Marsh), and the habitat being observed to be of a lesser sensitive wetland (Typha swamp), with some evidence of areas of past disturbance.

4.13 Additionally, the effect to designated features of the SSSI (nationally important bird assemblages) would be considered to be **negligible**, given that the predicted increases in air pollutants would not be expected to undermine the function of the habitat in supporting those assemblages.