LON01 Pure Data Centres Group
Ecology Statement, July 2021

QA

LON01 – Ecology Statement

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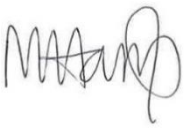
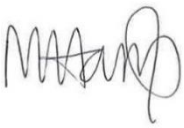
Signature:		
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CONTENTS

1.0 EXECUTIVE SUMMARY 1

2.0 INTRODUCTION 2

DEVELOPMENT PROPOSALS 2

BRENT RESERVOIR SSSI 2

AIR QUALITY ASSESSMENT CONTEXT 4

COMPETENCIES 5

3.0 DISCUSSION 7

POTENTIAL ECOLOGICAL IMPACT 7

AQA FINDINGS 8

Commentary on Critical Load Selection 8

Commentary on Critical Level Selection 13

4.0 SUMMARY 16

REFERENCES

1.0 EXECUTIVE SUMMARY

1.1 Greengage Environmental Ltd was commissioned to undertake a desk-based assessment of potential ecological impacts associated with the operation of the proposed data centre known as LON01 in the London Borough of Brent. This Ecology Statement is a report of the assessment and presents discussion focusing on potential air quality impacts associated with the running of emergency generators upon the adjacent Brent Reservoir Site of Special Scientific Interest (SSSI).

1.2 Critical load data are not available for the habitats or qualifying species present in the adjacent SSSI and interpretation of the predicted impact of NOx emissions has therefore been completed based on a review of literature and professional judgement.

1.3 On the basis of the critical levels and critical loads suggested in this report and associated predicted nitrogen deposition and airborne concentrations, no significant impacts are predicted upon the conservation status of the SSSI. The area subject to short term exceedance of the 24-hour mean NOx critical level is small and will not in itself be responsible for maintenance of ecosystem functioning throughout the site.

1.4 The conclusions of the Air Quality Assessment are therefore considered appropriate.

2.0 INTRODUCTION

2.1 Greengage Environmental Ltd was commissioned to undertake a desk-based assessment of potential ecological impacts associated with the operation of the proposed data centre known as LON01 in the London Borough of Brent. This Ecology Statement is a report of the assessment and presents discussion focusing on potential air quality impacts associated with the running of emergency generators upon the adjacent Brent Reservoir Site of Special Scientific Importance (SSSI).

DEVELOPMENT PROPOSALS

2.2 The Data Centre will be equipped with sixteen standby generators fired on diesel to provide power to the data centre in the event of an emergency outage. The generators will be installed in two phases of eight generators each. Emissions from the generators will occur during testing of the generators and during an unplanned outage.

BRENT RESERVOIR SSSI

2.3 The SSSI citation[1] states:

The Brent Reservoir is of interest primarily for breeding wetland birds and in particular for significant numbers of nesting great crested grebe. The diversity of wintering waterfowl and the variety of plant species growing along the water margin are also of special note for Greater London.

The reservoir, formed in 1835 by damming the valley of the River Brent below the confluence of its two constituent tributaries, is among the oldest of London's many large artificial lakes. It is unusual in being characterised by naturally sloping earth banks and a shallow depth, features which have encouraged the development of a rich mixture of wetland and waterside habitats.

Along much of the shoreline there is a fringe of fenland plants and several of the species have a restricted distribution in Greater London, the more notable include common spotted orchid Dactylorhiza fuchsii and greater spearwort Ranunculus lingua. Toward the head of the northern and eastern areas where, respectively, the Silk Stream and Dollis Brook enter the reservoir, wetland plant communities are more extensive, in places covering large areas of in washed silt deposits. Here there are varied gradations from open water, through swamp and mixed species fen to willow carr, with damp willow woodland occupying the higher ground. The juxtaposition and expanse of these habitats is of particular value in attracting a noteworthy variety of breeding wetland birds.

Breeding birds of the swamp, fen and willow carr include reed and sedge warblers, reed bunting, redpoll and willow tit. The more secluded areas adjoining open water are the favoured nesting sites for waterfowl species. Coot, great crested grebe, little grebe,

moorhen, mute swan, pochard, shoveler and tufted duck regularly breed and gadwall are normally resident during summer. The numbers of nesting great crested grebe are of special significance with recent marked increases making the colony the largest in Greater London and among the largest in Britain. Artificial raft islands anchored across the eastern reservoir arm attract another breeding species, common tern, and are used by waterfowl as loafing places. Further breeding species are recorded in the willow woodland, these include: bullfinch, greenfinch, jay, willow warbler and wren.

The wetlands are also of interest for their plant communities. The swamps are characteristically dominated by a single species, mainly bulrush Typha latifolia and common reed Phragmites australis. In contrast the fen communities comprise a complex mixture of many wetland plants including: lesser pond-sedge Carex acutiformis, great willowherb Epilobium hirsutum, meadow-sweet Filipendula ulmaria, soft rush Juncus effusus, gypsywort Lycopus europaeus, water forget-me-not Myosotis scorpioides, reed canary-grass Phalaris arundinacea, branched bur-reed Sparganium erectum and marsh woundwort Stachys palustris. It is in this community type that most of the locally uncommon species are to be found, for example: water-plantain Alisma plantago-aquatica, flowering rush Butomus umbellatus, water dock Rumex hydrolapathum and lesser bulrush Typha angustifolia.

In winter the combination of secluded wetland, shallows and extensive open water serves to attract a wide range of waterfowl. Maximum counts of pochard and gadwall occasionally reach levels of national significance while wintering waders include snipe and jack snipe. The reservoir has also long been noted as one of the major wintering sites in Greater London for smew, the scarcest of the regularly wintering species of duck in Britain. Recently, in common with a regional trend, numbers have declined but it is still occasionally recorded in winter.

2.4 The most recent status review was in November 2018 in which all three units of the SSSI were found to be in a favourable condition. The review stated:

The interest feature for this site is the breeding bird assemblage that is associated with the open water and its margins. An assessment was carried out using breeding bird data provided by the BTO. Only data for species occurrences with 'probable' or 'confirmed' breeding codes were used (based on the BTO's breeding status codes) and species were only counted once. The assessment was based upon the scoring system on the criteria sheet from when the site was first notified. From these data a total assemblage score of 34 is achieved, which is above target set for the site (26) and above the minimum score threshold for the assemblage type (31). The suitability of the habitats that support the assemblage of breeding birds was also considered. These are the open water and their margins, including fringing fen, carr and woodland. A basic objective is that there should be no loss of 5% or more of important supporting habitat and that the habitats should

be in suitable condition to support breeding birds associated with the assemblage type. These objectives are being met but there will be a need to ensure that encroachment of scrub into fen and reed bed is kept in check. The site continues to support good numbers of pochard, shoveler and reed warbler.

2.5 However, this is contrary to news reports on the state of the reservoir[2] which question the ecological condition of the site.

2.6 Furthermore, the Chartered Institute of Ecological and Environmental Management (CIEEM) Air Quality Advice Note (January 2021)[3] states '*it is also important that people using [condition status information] are aware of its limitations, as it uses the Common Standards Monitoring approach that is focused on identifying the presence or abundance of particular indicator species, for example, which are not necessarily good indicators of the effects of poor air quality'*

2.7 The list of operations listed as potentially damaging to the special interest does not include air quality or specifically airborne NOx[4], but again this is not an indication that air quality impact does not pose a threat to the designation.

AIR QUALITY ASSESSMENT CONTEXT

2.8 Potential impact pathways for the SSSI as a consequence of the data centre development are considered to be limited to those relating to potential changes in surrounding air quality through the associated emissions from fossil fuel combustion.

2.9 The origin of these potential emissions is limited to the running of sixteen standby diesel generators intended to power the data centre in the event of emergency outage; this outage would be at Elstree Power Station which is understood to have experienced no more than 3 outages in the past decade, each of which occurring for a maximum of 2 minutes.

2.10 Nonetheless, it is understood that these emergency generators will run under three scenarios:

- Every month (for ten months) each generator will be tested for thirty minutes. This test is designed to test start signals and generator run up and would be at no or very low load. Each generator would be tested separately to minimise short-term impacts on local air quality.
- Every six months each generator will be tested for four hours and will be at or near 100% load. Again, generators would be tested separately to minimise the short-term impact on local air quality. It is noted that this level of testing is a contractual requirement and cannot be altered.
- In the event of a power outage at Elstree substation.

2.11 On this basis an air quality assessment (AQA) has been undertaken by Gair Consulting Ltd to consider the resultant concentrations of long-term (annual mean) and short-term (15-minute, hourly, 8-hourly and 24-hourly mean) pollutants under the above regime. The assessment considered the individual operating scenarios and the cumulative impact of the three scenarios.

2.12 Pollutants assessed include:

- oxides of nitrogen (NOx), the sum of nitric oxide (NO) and nitrogen dioxide (NO_2), expressed as nitrogen dioxide;
- particulate matter (PM_{10} and $PM_{2.5}$);
- gaseous and vaporous organic substances, expressed as total organic carbon (VOCs) or total organic carbon (TOC);
- sulphur dioxide (SO_2); and
- carbon monoxide (CO).

2.13 An atmospheric dispersion model has been used to predict concentrations of these pollutants at key receptors, including Brent Reservoir SSSI.

2.14 Herein this document presents and discusses the key findings of the Gair Consulting AQA in the context of potential ecological impact pathways relating to the SSSI.

COMPETENCIES

2.15 Morgan Taylor, who wrote this report, has a first class bachelor's and master's degree in marine biology (MSci Hons), a Natural England CL17 Bat Survey Level 2 Class Licence (2015-7369-CLS-CLS) and CL10 Dormouse Survey Licence (2017-30817-CLS-CLS). Morgan is a Chartered Environmentalist, Full member of CIEEM and has over 10 years' experience in ecological surveying, having undertaken assessments of numerous development sites of this type. He leads the Ecology team at Greengage.

2.16 Mike Harris, who reviewed this report, has a bachelor's degree in Environmental Biology (BSc Hons), a Natural England Great Crested Newt Licence (2015-17819-CLS-CLS) and Dormouse Licence (2016-21291-CLS-CLS), is a Chartered Environmentalist (CEnv) and is a Full member of CIEEM. Mike has over 17 years' experience in ecological surveying and has undertaken and managed numerous ecological surveys and assessments.

2.17 This report was written by Morgan Taylor and reviewed and verified by Mike Harris who confirms in writing (see the QA sheet at the front of this report) that the report is in line with the following:

- Represents sound industry practice;
- Reports and recommends correctly, truthfully and objectively;

- Is appropriate given the local site conditions and scope of works proposed; and
- Avoids invalid, biased and exaggerated statements.

3.0 DISCUSSION

POTENTIAL ECOLOGICAL IMPACT

3.1 The Air Pollution Information System (APIS) and the scientific literature identifies a wide range of potential impacts caused through exceedances of critical levels and loads. These include, but are not limited to:

NOx

- Visible symptoms for example, leaf discoloration;
- Direct damage to mosses, liverworts and lichens, which receive their nutrients largely from the atmosphere;
- Direct Eco physiological impact to fauna, e.g. responses in birds to air pollution include respiratory distress and illness, increased detoxification effort, elevated stress levels, immunosuppression, behavioural changes, and impaired reproductive success[5]; and
- Changes in species composition.

Nitrogen deposition

- Terrestrial impacts:
    - Changes in species composition especially in nutrient poor ecosystems with a shift towards species associated with higher nitrogen availability (e.g. dominance of tall grasses);
    - Reduction in species richness;
    - Increases in plant production;
    - Decrease or loss of sensitive lichens and bryophytes;
    - Increases in nitrate leaching.
- Freshwater impacts:
    - Potential in N-limited systems to change algal productivity and nutrient regimes in upland lakes;
    - Increase rate of succession.

Acid deposition

- Terrestrial impacts:
    - A decrease in soil base saturation, increasing the availability of aluminium (Al3+) ions, which may cause toxicity to plants and mycorrhiza, and have a direct effect on Lower plants (bryophytes and lichens);
- Freshwater impacts:

- An increase in Al3+ concentrations, impacts on invertebrate populations, and toxicity to fish.

AQA FINDINGS

3.2 The AQA summarises predicted habitat impacts as (key statements are in bold):

For airborne SO_2, acidification and nutrient nitrogen deposition, the impact of the generators on habitat sites is assessed as not significant for the testing regimes or during an outage event.

For annual mean NOx, the impact would also be assessed as not significant. ***However, there is a potential risk that the 24-hour mean critical level for NOx may be exceeded at the Brent Reservoir SSSI during the 4-hour testing (only where two or more tests per day are carried out) and for a prolonged interruption to the supply.***

The cumulative impact of testing and an event on long-term (annual mean) concentrations of NOx, SO_2, acidification and nutrient nitrogen deposition has been provided. For SO_2 and acidification the cumulative impacts would be assessed as not significant. ***For airborne NOx, the cumulative annual mean NOx concentration varies between 1.5% and 4.9% of the critical level and is potentially significant.*** *For nutrient nitrogen deposition, the cumulative deposition rate exceeds 1% of the critical load but the PEC is less than 50%. Therefore, the critical load is unlikely to be exceeded.*

Commentary on Critical Load Selection

3.3 Critical loads refer to the threshold beyond which deposition of pollutants to water or land results in measurable damage to vegetation and habitats. This takes the form of either gravitational settling of particulate matter (dry deposition) or wet deposition, where atmospheric pollutants dissolve in water vapour and then precipitate to the ground (e.g. as rain, snow, fog etc.).

3.4 The form of impact for deposition of pollutants in this instance would be through eutrophication and/or acidification.

3.5 APIS defines the critical loads for designated sites (SSSIs and Natura 2000 sites) in the UK.

3.6 The nutrient nitrogen critical load is based on a habitat and species' ability to tolerate high nutrient conditions, with habitats that are typically nutrient rich usually able to tolerate higher nutrient input levels, and vice versa.

3.7 The acidification critical load is based on a habitat's underlying soil and geology and requires a more complex assessment of the relative abundance of SO_2, nitrogen oxides and acid gases.

It is defined by a critical load function which describes the relationship between the relative contributions of sulphur (S) and nitrogen (N) to the total acidification. The critical load function is defined by the following parameters:

- *CLmaxS, the maximum critical load of acidity for S, assuming there is no N deposition;*
- *CLminN, is the critical load of acidity due to nitrogen removal processes in the soil only (i.e. independent of deposition); and*
- *CLmaxN, is the maximum critical load of acidity for N, assuming there is no S deposition.*

3.8 APIS does not however hold records for the critical load of Brent Reservoir SSSI[6] and an arbitrary proxy habitat has therefore been used in the AQA when drawing the conclusions reproduced above at 3.2.

3.9 The AQA uses a critical load of nutrient nitrogen deposition of 20 – 30 kg N $ha^{-1}a^{-1}$.

3.10 For acidification, the AQA also uses a proxy in the form of neutral grassland (on the presumption that the reservoir is a relatively neutral environment).

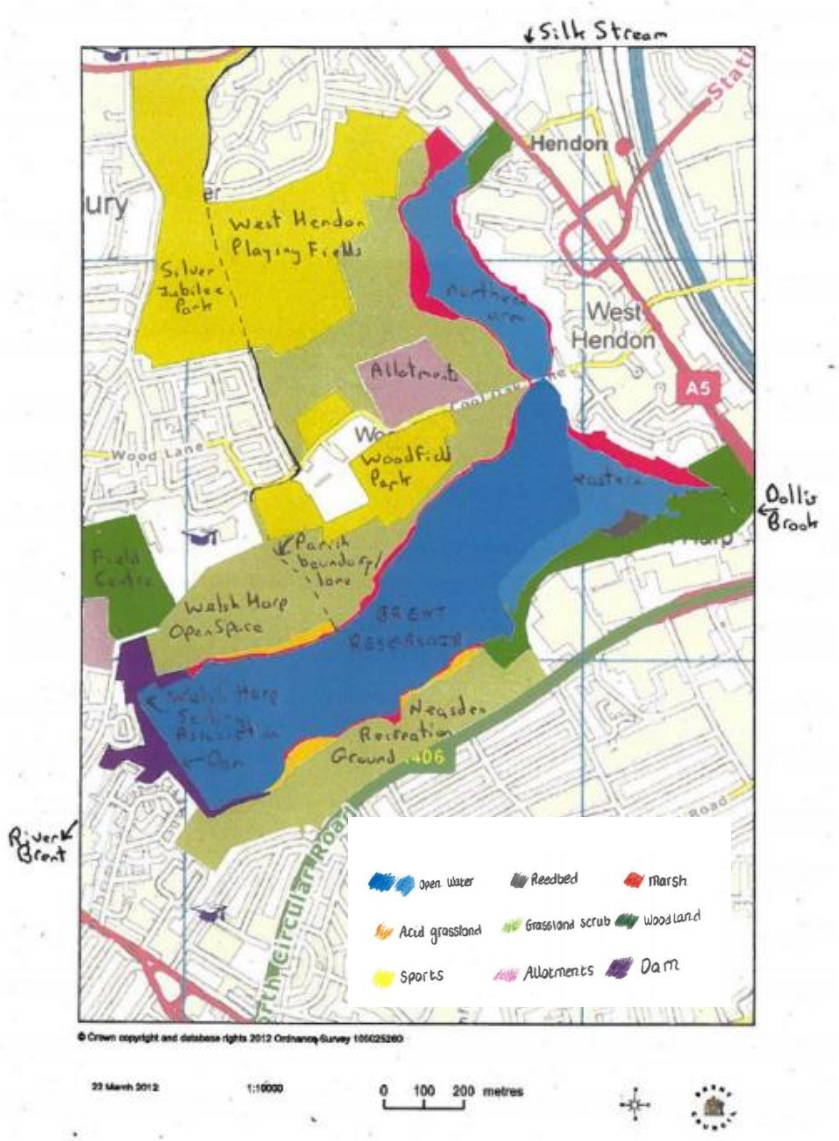
3.11 The critical load used is as follows:

- CLmaxS of 4.0 keq $ha^{-1}a^{-1}$;
- CLminN of 1.071 keq $ha^{-1}a^{-1}$; and
- CLmaxN of 5.071 keq $ha^{-1}a^{-1}$.

3.12 In assessing the reliability of the proxy critical loads used to assess significance a review of critical loads assigned to other designated sites which support similar receptors, as well as a more detailed analysis of habitats present within the SSSI, has been undertaken.

3.13 A Habitat management Plan[7] was produced for the site in 2016. This maps habitat distribution and provides descriptions of the risks and opportunities associated with each habitat.

Figure 3.1 Habitat map extracted from HMP



3.14 The dominant habitat at the site is open water. With regard to nitrogen impact on this habitat APIS states:

'deposition of ammonia, nitrate and other forms of nitrogen from the atmosphere is unlikely to be the largest source of [NOx] to eutrophic standing waters and, therefore, in general, N deposition is unlikely to be very harmful to eutrophic standing waters, even when close to sources'.

3.15 Past issues with eutrophication in the open water habitats at the site are described within the HMP however, any excess nutrient deposition could accordingly exacerbate this, impacting both habitats and species[8].

3.16 Furthermore, the ecological functionality of the reservoir will be associated with the interaction between habitats, with no habitat alone forming the ecosystem. The citation lists a range of habitats as being of importance for the designation, with many of the species relying on a range of habitat types, as well as the open water habitats indirectly relying on the health and status of surrounding terrestrial habitats.

3.17 Succession of habitats from open water is described as below:

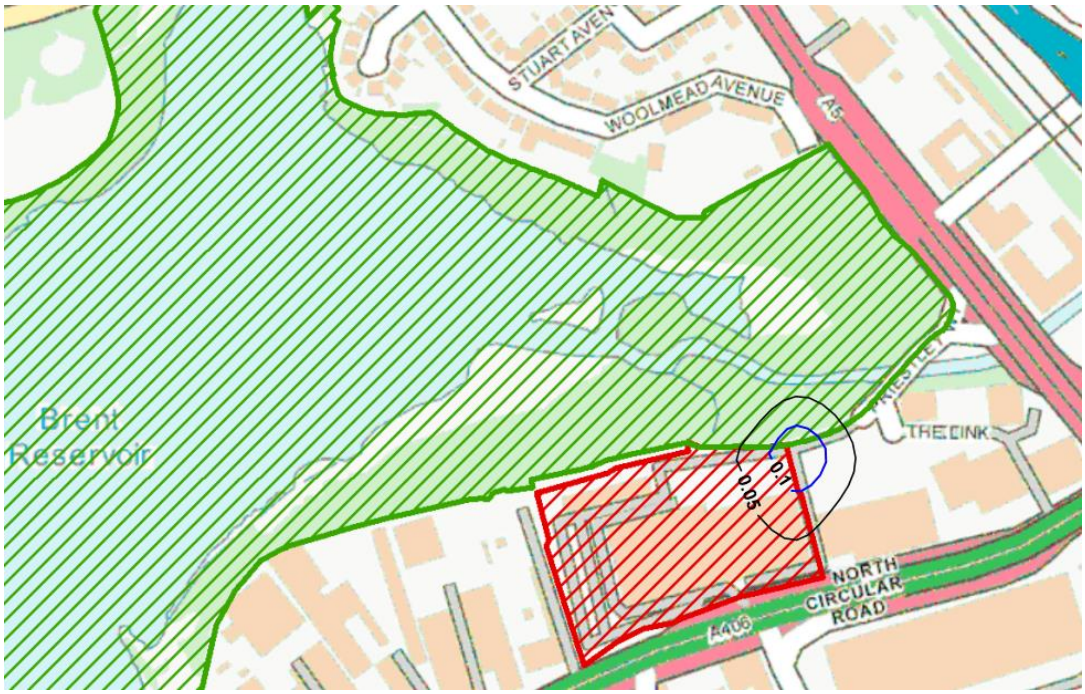
The Reservoir sits within a flooded London Clay valley, though deposits of alluvium of various depths have accumulated over the clay during the past 175 years since the reservoir was constructed. A narrow band of Taplow Gravels occurs, coincidently at about the current water level, so the marshland vegetation can variously be growing on the gravel, London Clay or alluvium. The marshland extends from the shallow water to damp areas above the water line. Above that the well-drained, nutrient-poor vegetation is of acid grassland. Slightly higher up the slope, the London Clay is again apparent and provides a more neutral pH substrate, though less well drained during wet weather. Here the vegetation is of rough grassland, mown amenity grassland or of other features with some scrub and areas of woodland.

3.18 The dominant habitat in areas of the SSSI closest to the site, and therefore subject to the highest concentrations of pollutant deposition, is broadleaved woodland, which is assigned a critical load range of 10-20 kg N ha^{-1} $year^{-1}$.

3.19 Furthermore, acid grassland is seemingly present around the fringes of the site ~700m west southwest. Whilst this grassland (as described in the HMP) does not appear to be directly reflective of any of the EUNIS categories described by APIS, *non-Mediterranean dry acid and neutral closed grassland*[9], is seemingly the closest proxy, which has a critical load of 10-15 kg N ha^{-1} $year^{-1}$.

3.20 The grassland is a considerable distance from the emission point. Contour plots showing the extent of areas subject to potential exceedance in critical load thresholds for this habitat evidence that no impact is predicted (figure 3.2).

Figure 3.2 Contour plot of the cumulative (testing plus 3-hour per annum event) nutrient nitrogen deposition rate (kg N $ha^{-1}a^{-1}$) for grassland habitats. Acid grassland is absent from the 1% contour (0.1 kg N $ha^{-1}a^{-1}$) this location being ~700m away.



3.21 Furthermore, whilst the woodland will play a role in the overall ecosystem function and is described in the citation, it does not feature as a primary designated feature, which is described as '*assemblages of breeding birds – lowland open waters and their margins*'.

3.22 Furthermore, contour modelling shows only a very small area of the SSSI woodland to be subject to impact (figure 3.3). As the woodland is also primarily wet woodland, located in an urban setting (where thresholds are often already exceeded), it also likely to be more resilient to nitrogen input, already being subject to selective pressure.

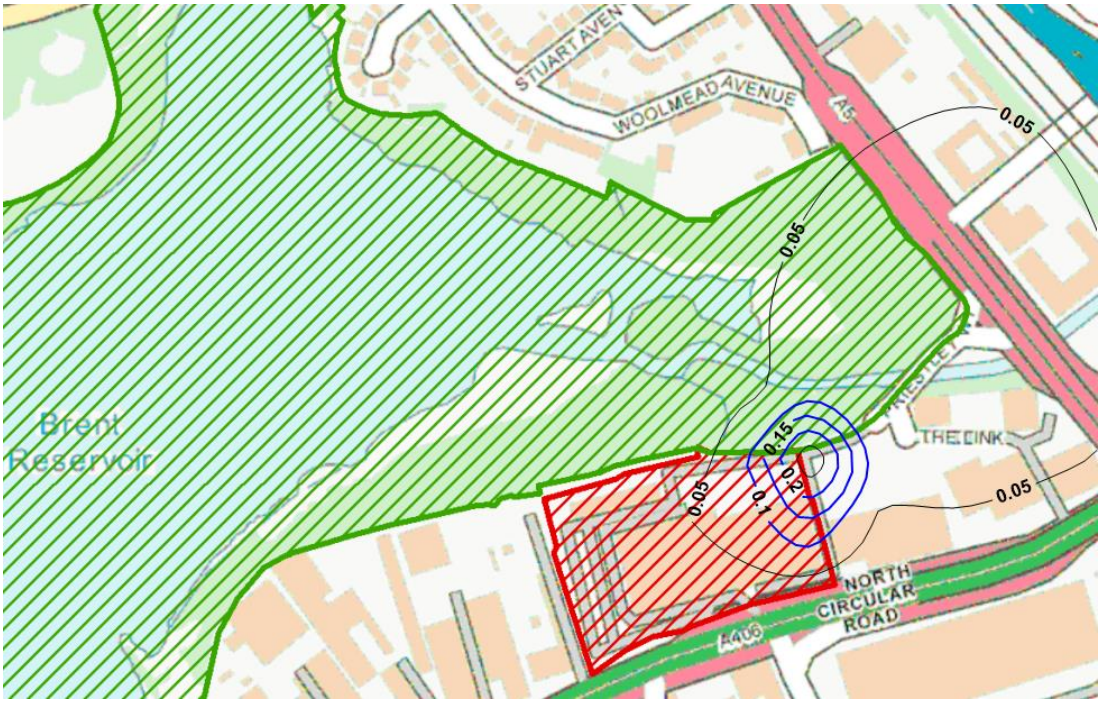
3.23 Accordingly, using a critical load of 20 kg N ha^{-1} a^{-1} (the upper range of the woodland CL on APIS) is considered reasonable in this instance.

3.24 In terms of species sensitivity, great crested grebe and pochard both feature as qualifying species for a range of European sites through the UK, such as Nene Valley Special Protection Area for example, as well as appearing in the citation for Brent Reservoir SSSI. For the SPA these are both assigned a critical load of 20-30 kg N $ha^{-1}a^{-1}$. Wildfowl species in the Lee Valley SPA in northeast London, a site which is geographically similar and supports similar standing water habitats in parts, are also given this critical load range.

3.25 The critical loads used in the AQA modelling are therefore considered suitable.

3.26 Acidification data are almost universally missing given the complexity associated with such calculations. It is recommended that conclusions rely on those informed by the APIS tool as is the case with the AQA.

Figure 3.3 Contour plot of the cumulative (testing plus 3-hour per annum event) nutrient nitrogen deposition rate (kg N $ha^{-1}a^{-1}$) for woodland. The 0.1 kg N $ha^{-1}a^{-1}$ (1% of the lower critical load) and 0.2 kg N $ha^{-1}a^{-1}$ (1% of the upper critical load) are highlighted in blue.



Commentary on Critical Level Selection

3.27 Like Critical Loads, Critical Levels have been defined for *gaseous airborne concentrations of pollutants* above which environmental impacts are predicted. Again, these are typically set against individual ecological receptors however and have also not been prescribed for Brent Reservoir SSSI.

3.28 The levels used to assess the threshold of impact in the AQA have therefore referenced EU Directive on Ambient Air Quality / 2010 Air Quality Standards Regulations for the annual mean threshold (30 µg m^{-3}) and the Environment Agency Risk Assessment Guidance for the 24-hour mean threshold (75 µg m^{-3}).

3.29 The 75 ug/m^3 daily threshold is as per guidance in the *World Health Organisation (WHO) Air Quality Guidelines for Europe Second Edition 2020*, as referenced in the *Institute of Air Quality Management (IAQM) A guide to the assessment of air quality impacts on*

designated nature conservation sites. However, this threshold is only considered applicable where there is high ozone and/or SO_2 of which there will be neither. SO_2 concentrations in the UK now are very low and O_3 tends to be very low in urban areas. The IAQM guidance indicates that a more appropriate critical level for the 24-hour mean would be 200 µg m^{-3}. For the four-hour tests (two tests per day), it is noted that highest 24-hour mean concentration as the predicted contribution (PC) is 96.4 µg m^{-3}. With the addition of the background, the predicted environmental concentration (137.7 µg m^{-3}) is 69% of the more appropriate upper critical level suggested by the IAQM and it would be unlikely for the critical level to be exceeded.

3.30 Furthermore, background annual mean NOx concentrations are calculated as 35.0 µg m^{-3} and 24-hour means as 41.3 µg m^{-3}. The overall background taken as an annual mean is therefore already in exceedance of thresholds.

3.31 The key question is therefore whether short spikes in this background through 24-hour threshold exceedances would lead to negative effects upon species or habitats in the SSSI to a point where its conservation status is impacted.

3.32 Whilst the HMP acknowledges the eutrophication events that have taken place at site, the modelled airborne NOx exceedances over short periods are not however predicted to contribute to nutrient enrichment given lack of time for settlement in sufficient concentrations before dispersal.

3.33 The primary pathway of impact would therefore be direct effects upon ecophysiology of plants and animals through increased airborne NOx exposure.

3.34 On this point, the CIEEM Air Quality Advice Note states:

It may also be useful to consider whether the NOx exceedance is for the annual mean critical level or the short-term critical level. The former is generally likely to be more important in determining the ultimate effect on plant communities due to the ability of many plants to recover from relatively short-term exposures even at high concentrations. According to work by the Centre for Ecology and Hydrology, the 'UN/ECE Working Group on Effects strongly recommended the use of the annual mean value, as the long-term effects of NOx are thought to be more significant than the short-term effects'

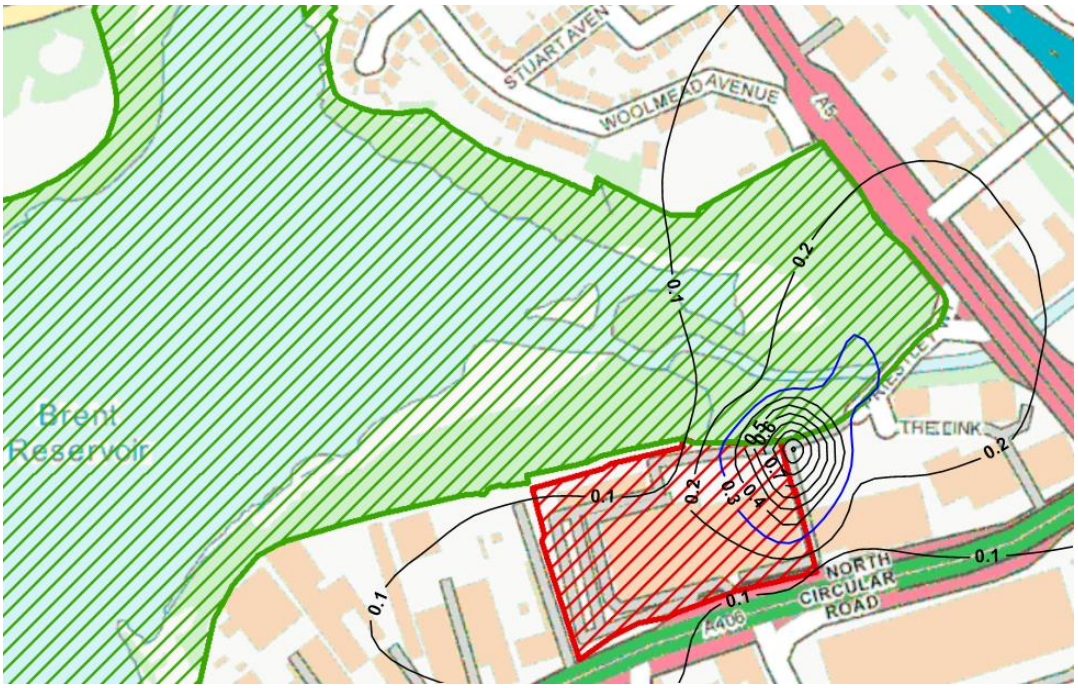
3.35 The modelled exceedance would only occur over a very discrete area of the site (see figure 3.4).

3.36 It is accordingly considered highly unlikely that the conservation status of the SSSI would be impacted by short periods of exceedance; particularly given the existing baseline in which the site has maintained a favourable status.

3.37 Whilst effects may therefore be felt by individual organisms and plants over short periods, the impact is not considered significant.

3.38 The conclusions drawn in the AQA are therefore considered appropriate.

3.39 **Figure 3.4 Contour plot of the cumulative (testing plus 3-hour per annum event) annual mean NO_x concentration (µg m^{-3}). The 0.3 µg m^{-3} contour (1% of the critical level) is highlighted in blue.**



4.0 SUMMARY

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4.2 Critical load data are not available for the habitats or qualifying species present in the adjacent SSSI and interpretation of the predicted NOx emission is therefore based on a review of literature and professional judgement.

4.3 On the basis of the critical levels and critical loads suggested in this report and associated predicted nitrogen deposition and airborne concentration no significant impacts are predicted upon the conservation status of the SSSI. The area subject to short term exceedance is small and will not in itself be responsible for maintenance of ecosystem functioning throughout the site.

4.4 The conclusions of the Air Quality Assessment are therefore considered appropriate.

REFERENCES

[1] Brent reservoir Citation (accessed 4th July 2021)
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