Habitats Regulations Assessment of published Proposed Submission Greater Norwich Local Plan – Gypsy and Traveller sites Addendum

for

Greater Norwich Development Partnership

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Status: Issue

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Quality standards

This report is certified BS 42020 compliant and has been prepared in accordance with The Chartered Institute of Ecology and Environmental Management's (CIEEM) Technical Guidance Series '*Ecological Report Writing'* and Code of Professional Conduct.

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Non-technical summary

The Landscape Partnership was commissioned by the Greater Norwich Development Partnership to undertake a Habitat Regulations Assessment (HRA) of proposed allocations for Gypsy and Traveller sites, as an addition to the Greater Norwich Local Plan (GNLP). This report is a Habitats Regulations Assessment of that addition to the GNLP. There are seven proposed site allocations for Gypsy and Traveller pitches with one further proposed allocation subject to consultation. Five unreasonable alternatives, two of which are subject to consultation, are also assessed for completeness.

Impacts considered for the proposed distribution of pitches include water cycles (use and disposal); air pollution, especially from new roads and an increase or change in the pattern of distribution of road users; water pollution or enrichment resulting from discharge to water; and the impacts of increased visitors to European sites. In addition to considering the potential impacts of the growth proposed by the Gypsy and Travellers sites, other development in the GNLP area and the wider area was also considered for in-combination impacts.

No allocations will be within or close to any European site such that there would be construction impacts such as land-take or disturbance from the construction activities, and all but one allocations are further from within 1.5km of a European site. Site GNLP5027 is just over 1km from Buxton Heath, a component of Norfolk Valley Fens SAC, but the walking route to the SAC is around 2.3km one-way. There would be no direct recreational impacts.

Natural England has advised all Local Planning Authorities in Norfolk that large developments (defined as fifty houses or more) include green space which is proportionate to its scale to minimise any predicted increase in recreational pressure to designated sites, by containing the majority of recreation within and around the developed site. No evidence has been provided to support the threshold of 50 or more dwellings, and it is assumed that each and every new home could potentially have an identical impact. Greater Norwich Local Plan requires all residential development to provide green infrastructure. If a development site is too small to provide green infrastructure on site, a contribution secured by S106 to green infrastructure elsewhere will be required. This requirement applies to Gypsy and Traveller sites as well as to standard housing.

The Green Infrastructure and Recreational Impact Avoidance Strategy (GIRAMS) proposes a tariff based payment taken from residential, and other relevant accommodation e.g. tourist accommodation, that will be used to fund packages of avoidance and mitigation measures to be delivered at Habitat Sites. Mitigation comprises a team of Rangers to influence visitor behaviour, signage, monitoring, a dog project, delivery of strategic mitigation projects, and various other measures. A tariff payment of £185.93 per dwelling (Gypsy and Traveller Pitch) has been set. The GIRAMS measures will be sufficient that the assessment is able to ascertain no adverse effect upon the integrity of any European site from the in-combination effects of residential developments across the plan area and beyond.

A new Country Park has been created by Broadland District Council between Felthorpe and Horstead, which is being designed and managed to attract a larger number of recreational visitors. It will also act to reduce visitor pressure on European sites by providing an attractive alternative destination for countryside visits.

There would be no impact on European sites from water abstraction as there would be no additional abstraction to meet water needs in the Local Plan area, including the Gypsy and Traveller sites.

On 16th March 2022, Natural England advised that Wensum SAC and The Broads SAC were being harmed by excess nitrate and phosphate in the water. New residential development would need to demonstrate that it would not exacerbate the existing problem by adding further nitrate and phosphate from sewage and run-off to these SAC sites. This requirement applies to Gypsy and Traveller pitches as well as to standard dwellings. The proposed pitch allocations are therefore in the same situation as housing allocations with respect to Nutrient Neutrality; all pitch allocations are within the catchments of either the River Wensum SAC or The Broads SAC / Ramsar. Policy amendments are expected to tie the delivery of housing growth more tightly to nutrient levels impacting on internationally protected habitats, including, as appropriate, a county-wide mitigation strategy. The availability of a mitigation strategy will affect the timing of the delivery of housing sites and Gypsy and Traveller pitches as opposed to the principle of their development. Subject to satisfactory policy modification with respect to Nutrient Neutrality, it is ascertained that the proposed allocations for Gypsy and Traveller sites will have no adverse effect upon the integrity of any European site acting alone, in combination with other development in the GNLP or any other plan or project.

1 Introduction

1.1 The plan being considered and context

1.1.1 Broadland District Council, Norwich City Council and South Norfolk Council, working with Norfolk County Council and Broads Authority, are working together to prepare the Greater Norwich Local Plan (GNLP). This will replace the Joint Core Strategy for Broadland, Norwich and South Norfolk (JCS), which was adopted in March 2011, and other more recently adopted 'lower tier' Development Plan Documents. The three local Planning Authorities have come together to form the Greater Norwich Development Partnership to deliver the GNLP.

1.1.2 The submission draft Greater Norwich Local Plan, and its Habitats Regulations Assessment, were Examined by Inspectors in February and March 2022. The Examination hearings were carried out virtually using internet video calls and the recordings of the hearing can be found at https://www.youtube.com/channel/UCdRKsvFkvWzVLWhEQwY0x0w/videos (accessed on 7th May 2022).

1.1.3 The Inspectors have not yet reported on the Examination. However, various questions have been asked by them of the Greater Norwich Development Partnership, including a question about recent issues regarding Nutrient Neutrality. The question, and the Greater Norwich development Partnership's response, is available on the Examination website[1].

1.1.4 This document is an Addendum to the Greater Norwich Local Plan Habitats Regulations Assessment dated July 2021. Since the Examination hearings, the Greater Norwich Development Partnership has proposed sites to be allocated for Gypsy and Traveller pitches. **This addendum assesses the impact on European sites of the proposed allocations and alternatives for Gypsy and Traveller pitches**. The methodology of the assessment is similar to that in the July 2021 HRA, with the exception of now including the assessment of waste water impacts. It is assumed that the impact of one Gypsy and Traveller site is similar to that of one house used by the settled community; there is no evidence to the contrary.

1.1.5 It is considered that there is a need for 52 Gypsy and Traveller pitches within the Plan period. Windfall sites may arise in addition to allocations, to meet demand.

1.2 The Greater Norwich Local Plan (GNLP)

1.2.1 The Submission Draft Greater Norwich Local Plan (GNLP) Strategy document follows previous iterations of the emerging Greater Norwich Local Plan. It provides the broad strategy for growth in Greater Norwich from 2018 to 2038 and supporting thematic policies.

1.2.2 The draft plan identifies where growth needed to 2038 should be built. There are plans in place already which identify locations for around 80% of the new homes, along with new jobs, green spaces and additional infrastructure (Section 1.2 above). The main locations include brownfield sites in Norwich, the major urban extension to its north-east, expanded strategic employment sites such as the Norwich Research Park and growth at most of our towns and larger villages. This plan provides additional sites in these areas to create new communities and support growth of the economy, as well as sites in villages to support rural services.

1.2.3 When adopted, the GNLP will supersede the current Joint Core Strategy and the Site Allocations documents in each of the three districts except for the smaller villages in South Norfolk that will be addressed through a new South Norfolk Village Clusters Housing Allocations Local Plan; and the Diss, Scole and Burston area, for which a Neighbourhood Plan is being produced which will allocate sites in these locations. The GNLP will not replace existing adopted Area Action Plans for Long Stratton, Wymondham and the Growth Triangle (NEGT) or Neighbourhood Plans, though in some cases additional allocations are made through the GNLP in these areas. The GNLP will also not amend existing adopted Development Management policies for the three districts except in

[1] https://www.gnlp.org.uk/local-plan-examination-local-plan-examination-document-library-d-post-submission-examination/d5 accessed on 7th May 2022

circumstances where limited policy changes, identified in this plan, are required to implement the strategy.

1.3 What are the Habitats Regulations?

1.3.1 The Conservation of Habitats and Species Regulations 2017 (as amended) generally follow the Birds Directive and Habitats Directive but unlike the Directives there is no role for the European Union; the UK Government has taken that role following the end of the Brexit transition period on 31st December 2020. The following paragraphs consider the case in England only, with Natural England given as the appropriate nature conservation body.

1.3.2 Special Protection Areas and Special Areas of Conservation are defined in the regulations as forming a national network of 'European sites'. The Regulations regulate the management of land within European sites, requiring land managers to have the consent of Natural England before carrying out management. Byelaws may also be made to prevent damaging activities and if necessary land can be compulsorily purchased to achieve satisfactory management.

1.3.3 The Regulations define competent authorities as public bodies or statutory undertakers. Competent authorities are required to make an appropriate assessment of any plan or project they intend to permit or carry out, if the plan or project is likely to have a significant effect upon a European site. The permission may only be given if the plan or project is ascertained to have no adverse effect upon the integrity of the European site. If the competent authority wishes to permit a plan or project despite a negative assessment, imperative reasons of over-riding public interest must be demonstrated, and there should be no alternatives to the scheme. The permissions process would involve the Secretary of State and the option of consulting the European Commission. In practice, there will be very few cases where a plan or project is permitted despite a negative assessment. This means that a plan such as the Greater Norwich Local Plan has to be assessed, and the assessment must either decide that it is likely to have no significant effect on a European site or ascertain that there is no adverse effect upon the integrity of the European site.

1.4 Habitats Regulations Assessment process

1.4.1 A Habitats Regulations Assessment is a step-by-step process which is undertaken in order to determine whether a project or plan will have a likely significant effect (LSE) upon a European site. Before a competent authority can authorise a proposal, they must carry out an Appropriate Assessment of a plan or project in line with procedure detailed in the Habitats Regulations. The whole procedure is called a Habitats Regulations Assessment, with the Appropriate Assessment being part of one of four stages necessary to complete an HRA. The results of the HRA are intended to influence the decision of the competent authority when considering whether or not to authorise a proposal.

Stages of Habitats Regulations Assessment

1.4.2 *Stage One of the HRA is 'Screening'.* Plans or projects will be investigated for their potential to have a likely significant effect upon a European site. If the plan is likely to have a significant effect, and is not connected to the management of the site, an Appropriate Assessment is required. Proposals that are found not likely to have a significant effect upon a European site will be 'screened out' at this stage and no further investigation will be required.

1.4.3 *Stage Two of the HRA is the 'Appropriate Assessment and the Integrity Test'.* The plan-making authority must undertake an Appropriate Assessment which seeks to provide an objective and scientific assessment of how the proposed Local Plan may affect the qualifying features and conservation strategies of European sites. The whole plan must be assessed, but a 'scoping' exercise helps decide which parts of the plan have potential to give rise to significant effects and therefore where assessment should be prioritised. Natural England is an important consultee in this process and the public may also be consulted.

1.4.4 The UK Government accepts the definition for the 'integrity' of a site as *'the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which the site is (or will*

be) designated.' Other factors may also be used to describe the 'integrity' of a site. The plan-making authority must ascertain, using scientific evidence and a precautionary approach, that the plan will not adversely affect the integrity of a European site, prior to adopting the plan. Information provided in the Appropriate Assessment will be used when considering the Integrity test.

1.4.5 *Stage Three of the HRA is 'Imperative reasons of overriding public interest and compensatory measures'.* If the Competent Authority determines that there are imperative reasons of overriding public interest notwithstanding adverse impacts upon the integrity of the European site, and there are no alternatives, the plan may be given effect. In this case, the plan-making authority must notify the Secretary of State at least 21 days before authorisation; the Secretary of State may give a direction prohibiting the plan from being given effect. It is unlikely that this stage would be reached.

Consultations

1.4.6 Natural England is a statutory consultee, and so should be consulted at the draft and final plan stage. The public may also be consulted if it is considered appropriate, for example if the appropriate assessment is likely to result in significant changes to the plan. In practice, Natural England has been consulted upon previous stages of the Local Plan and HRA, and the HRA has been included in previous public consultations of the emerging Local Plan.

Iterations and revision

1.4.7 The process is iterative; the conclusions of an earlier assessment may result in changes to the plan, and so a revision of the assessment would be required. If the revised assessment suggests further plan changes, the iteration will continue.

1.4.8 Iterative revisions typically continue until it can be ascertained that the plan will not have an adverse affect on the integrity of any European site.

1.4.9 There are further provisions for rare cases where over-riding public interest may mean that a land-use plan may be put into effect, notwithstanding a negative assessment, where there are no alternatives to development, but these provisions are not expected to be routinely used.

Guidance and good practice

1.4.10 This report has taken account of published guidance and good practice. A key source of information which summaries of legislative requirements, good practice guidance and case law (Tyldesley and Chapman 2013, regularly updated)[2] has been used during the writing of this report.

1.5 Why is Appropriate Assessment required?

1.5.1 The appropriate assessment process is required under the Conservation of Habitats and Species Regulations 2017 (as amended). Regulation 105 states that

> (1) Where a land use plan—
>
> (a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and
>
> (b) is not directly connected with or necessary to the management of the site,
>
> the plan-making authority for that plan must, before the plan is given effect, make an appropriate assessment of the implications for the site in view of that site's conservation objectives.
>
> (2) The plan-making authority must for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority specify.

[2] Tyldesley, D., & Chapman, C. (2013). *The Habitats Regulations Assessment Handbook*. DTA Publications Ltd

> (3) The plan-making authority must also, if it considers it appropriate, take the opinion of the general public, and if it does so, it must take such steps for that purpose as it considers appropriate.
>
> (4) In the light of the conclusions of the assessment, and subject to regulation 107, the plan-making authority must give effect to the land use plan only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be).
>
> (5) A plan-making authority must provide such information as the appropriate authority may reasonably require for the purposes of the discharge by the appropriate authority of the obligations under this chapter.
>
> (6) This regulation does not apply in relation to a site which is—
>
> (a) a European site by reason of regulation 8(1)(c); or
>
> (b) a European offshore marine site by reason of regulation 18(c) of the Offshore Marine Conservation Regulations (site protected in accordance with Article 5(4) of the Habitats Directive.

1.5.2 The plan-making authorities, as defined under the Regulations, are Broadland District Council, Norwich City Council and South Norfolk District Council and the appropriate nature conservation body is Natural England.

1.5.3 This report is the assessment carried out on behalf of these three local authorities under Regulation 105. At Regulation 19 Submission Draft stage, this report determines any changes required so that the GNLP may progress to being adopted in due course.

1.6 European sites

1.6.1 European sites (also known as Natura 2000/N2K sites) are sites that have been classified or designated by Defra/Welsh Ministers or Natural England/Natural Resources Wales, as Special Protection Areas (SPA) for those sites where birds are the special interest feature, and Special Areas of Conservation (SAC) where the habitats or species (other than birds) are the reason for designation.

1.6.2 Wetlands of International Importance, designated under the Ramsar Convention, are not European sites. There may often be considerable overlap between the special interest features and boundaries of Ramsar sites, with European sites. However, for the purposes of planning and development, Government policy in the National Planning Policy Framework states that Ramsar sites should be treated equally/in the same way as European sites. The same applies for sites under consideration for designation including potential Special Protection Area (pSPA), Site of Community Importance (SCI), Candidate Special Area of Conservation (cSAC) and proposed Ramsar sites. In summary, although Appropriate Assessment only legally applies to European sites, National Planning Policy provides further obligations to ensure that all those sites previously mentioned are subject to assessment. Therefore, for the purposes of this report, the term 'European site(s)' refers to all sites under assessment.

1.6.3 As the interest features of the Ramsar sites are usually very similar to the interest features of the SPA and / or SAC designations, both geographically and ecologically, the assessment below, for clarity does not always repeat Ramsar site names. The assessment does however consider Ramsar sites fully, and if an assessment for a Ramsar site was found to differ from that for the respective SPA / SAC, this would be clearly identified.

1.6.4 European Marine Site (EMS) is a term that is often used for a SPA or SAC that includes marine components (i.e. land/habitats up to 12 nautical miles out to sea and below the Mean High Water Mark). A European Marine Site does not have a statutory designation of its own but is designated for the same reasons as the relevant SPA or SAC, and because of this they are not always listed as a site in their own right, to save duplication. For the purpose of this document, an EMS is referred to as an Inshore SPA (or SAC) with Marine Components and it will be made clear if an SPA/SAC has marine components.

1.7 Iteration and consultation

1.7.1 An interim Habitats Regulations Assessment (HRA)[3] was published in January 2018. It is available on Greater Norwich Development Partnership's website[4]. It identifies in detail how internationally designated ecological habitats and wildlife sites in the wider area, including the Broads and the Norfolk coast, would be potentially impacted by recreational pressures likely to be generated by growth in Greater Norwich. It looked at 22 strategic growth options.

1.7.2 This report was issued to stakeholders, and a meeting was held with stakeholders on 3rd April 2018. Attendees were John Hiskett (Norfolk Wildlife Trust) and Andrea Kelly (Broads Authority) with Nick Sibbett (The Landscape Partnership (TLP)) and Paul Harris (Broadland District Council) representing Greater Norwich Development Partnership.

1.7.3 A second stakeholder meeting was held on 28th March 2019. Attendees were Nick Sibbett (TLP, for Greater Norwich Development Partnership), Paul Harris (Broadland District Council, for Greater Norwich Development Partnership), Mike Jones (Norfolk Wildlife Trust), Kate Warwick (Environment Agency), Louise Oliver (Natural England), and Philip Pearson (RSPB).

1.7.4 Anglian Water representatives were unable to attend the stakeholder meetings but provided advice by email.

1.7.5 A Habitats Regulations Assessment for the Regulation 18 Draft Plan dated December 2019 was published in January 2020. It was open for public consultation with the draft Local Plan from 29 January - 16 March 2020. Comments on the HRA were received from Natural England and Norfolk Wildlife Trust. Comments on the Local Plan relating to HRA issues were also received from RSPB. Concerns were expressed on a number of topics such as whether the Local Plan policies were strong enough to prevent harm to European sites, over-reliance on studies not yet completed including Water Cycle Study and Green Infrastructure Recreation Avoidance Strategy, and impact of the Norwich Western Link Road.

1.7.6 A Habitats Regulations Assessment for the Regulation 19 Submission Draft Plan dated December 2020 was published in February 2021. It was open for public consultation with the Proposed Submission Draft Local Plan from 1st February 2021 – 22nd March 2021. At that time the Habitats Regulations identified that the Water Cycle Study and GIRAMS were in draft stage. The Regulation 19 version (July 2021) of the HRA was amended following completion of the Water Cycle Study and updating the position of the GIRAMS for adoption by the local planning authorities.

1.7.7 This report includes sites put forward by Agents following a public Gypsy and Traveller Sites Focussed Consultation between 30th January and 30th March 2023.

[3] Interim Habitats Regulations Assessment of Greater Norwich Local Plan Issues and Options stage, The Landscape Partnership, December 2017
[4] https://gnlp.jdi-consult.net/documents/pdfs_14/reg.18_gnlp_interim_hra.pdf

2 European sites potentially affected

2.1 European sites

2.1.1 A search using Natural England's Interactive 'Magic Map'[5] revealed that a number of European sites lie within, near or partially within the Greater Norwich area, i.e. the land within Broadland District Council (outside the Broads Authority area), South Norfolk District Council or Norwich City Council areas. Each European site is listed below with a brief description of its qualifying features and is shown on Figure 01. Because some of the European sites cross Local Planning Authority boundaries and because some of the European Sites are made up of component Sites of Special Scientific Interest (SSSI) which are located in different Planning Authority areas, no attempt has been made to differentiate those European sites and Ramsar sites which lie within the plan area, which lie within the boundaries of Broadland District, South Norfolk District and Norwich City Council areas and which are within Local Authority Districts beyond these.

2.1.2 Component Sites of Special Scientific Interest forming the European sites, and the European site Conservation Objectives, are presented in Appendix 1.

River Wensum SAC		
Site description summary	**Qualifying features**[6]	
A calcareous lowland river considered one of the best areas in the UK for Ranunculion fluitantis and Callitricho-Batrachion vegetation. Also significant for the presence of Brook Lamprey, Bullhead and Desmoulin's whorl snail. One of the best areas in the UK for the native White-clawed Crayfish. At the upper reaches, run-off from calcareous soils rich in plant nutrients feeds beds of submerged and emerged vegetation characteristic of chalk streams. Lower, the chalk is overlain by boulder clay, resulting in aquatic plant communities more characteristic of rivers with mixed substrates.	3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
	7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	1092	Austropotamoblus pallipes (White-clawed (or Atlantic steam) Crayfish)
	1163	Cottus gobio (Bullhead)
	1096	Lampetra planeri (Brook Lamprey)
	1016	Vertigo moulinsiana (Desmoulin's whorl snail)

Norfolk Valley Fens SAC		
Site description summary	**Qualifying features**[7]	
A series of valley-head spring-fed fens, typified by black-bog-rush - blunt-flowered rush *Schoenus nigricans* - *Juncus subnodulosus* mire. There are also transitions to reedswamp, other fen and wet grassland types, and gradations from calcareous fens into acidic flush communities. Plant species present include marsh helleborine *Epipactis palustris*, narrow-leaved marsh-orchid *Dactylorhiza traunsteineri*, and alder *Alnus glutinosa* which forms carr woodland in places	4010	North Atlantic wet heaths with Erica tetralix
	4030	European dry heaths
	6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites)
	6410	Molinia meadows on calcareous, peaty, or clayey-silt-laden soils (Molinion caeruleae)

[5] http://magic.defra.gov.uk/home.htm
[6] Taken from the Natura 2000 Standard data form for site UK0012647 River Wensum SAC dated 25-01-16.
[7] Taken from the Natura 2000 Standard data form for site UK0012892 Norfolk Valley Fens SAC dated 25-01-16.

by streams. Marginal fens associated with pingos-pools originating from the thawing of large blocks of ice at the end of the last Ice Age support several large populations of Desmoulin's whorl snail *Vertigo moulinsiana*.	7150	Depressions on peat substrates of the Rhynchosporion
	7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
	7230	Alkaline fens
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	1355	Lutra lutra (Eurasian Otter)
	1166	Triturus cristatus (Great Crested Newt)
	1014	Vertigo angustior (Narrow-mouthed whorl snail)
	1016	Vertigo moulinsiana (Desmoulin's whorl snail)

The Broads SAC/ Broadland SPA, Ramsar		
Site description summary	**SAC qualifying features**[8]	
A low-lying wetland complex connecting the Bure, Yare, Thurne, and Waveney River systems. Wetland habitats form a mosaic of open water, reedbeds, carr woodland, grazing marsh, and fen meadow, with an extensive network of medieval peat excavations. The Site boasts a rich array of flora and fauna. The SPA is designated for supporting a number of rare or vulnerable (Article 4.1) Annex I bird species during the breeding season. In addition, the SPA is designated for supporting regularly occurring migratory (Article 4.2) species during the breeding season and over winter.	3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.
	3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
	6410	Molinia meadows on calcareous, peaty, or clayey-silt-laden soils (Molinion caeruleae)
	7140	Transition mires and quaking bogs
	7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
	7230	Alkaline fens
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	4056	Anisus vorticulus (Little whorlpool ram's-horn snail)
	1903	Liparis loeselii (Fen Orchid)
	1355	Lutra lutra (Eurasian Otter)
	1166	Triturus cristatus (Great Crested Newt)

[8] Taken from the Natura 2000 Standard data form for site UK0013577 The Broads SAC dated 25-01-16.

	1016	Vertigo moulinsiana (Desmoulin's whorl snail)
	SPA qualifying features[9]	
	A056	Anas clypeata (Shoveler) (over winter)
	A050	Anas penelope (Wigeon) (over winter)
	A051	Anas strepera (Gadwall) (over winter)
	A021	Botaurus stellaris (Bittern) (breeding)
	A081	Circus aeruginosus (Marsh Harrier) (breeding)
	A082	Circus cyaneus (Hen Harrier) (over winter)
	A037	Cygnus columbianus bewickii (Bewick's Swan) (over winter)
	A038	Cygnus cygnus (Whooper Swan) (over winter)
	A151	Philomachus pugnax (Ruff) (over winter)
	Ramsar qualifying features[10]	
	H7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae Calcium-rich fen dominated by great fen sedge (saw sedge).
	H7230	Alkaline fens Calcium-rich springwater-fed fens.
	H91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) Alder woodland on floodplains, and the Annex II species
	S1016	Vertigo moulinsiana (Desmoulin`s whorl snail)
	S1355	Lutra lutra (Eurasian Otter)
	S1903	Liparis loeselii Fen Orchid
		Cygnus columbianus bewickii, NW Europe (Tundra (Bewick's) Swan)
		Anas penelope (Eurasian Wigeon)
		Anas strepera strepera (Gadwall)
		Anas clypeata (Shoveler)

Breydon Water SPA/Ramsar/SPA (Marine)		
Site description summary	**SPA qualifying features**[11]	
An inland tidal estuary at the mouth of the River Yare and its confluence with the Rivers Bure and Waveney. Extensive areas of mud-flats form the only tidal flats on the east Norfolk coast. The Site also features much	A037	Cygnus columbianus bewickii (Bewick's (Tundra) Swan) (over winter)
	A151	Philomachus pugnax (Ruff) (concentration)

[9] Taken from the Natura 2000 Standard data form for site UK9009253 Broadland SPA dated 25-01-16.
[10] Taken from the Ramsar Information Sheet for Broadland dated 21-09-94.
[11] Taken from the Natura 2000 Standard data form for site UK9009181 Breydon Water SPA dated 25-01-16.

floodplain grassland, which lies adjacent to the intertidal areas. It is internationally important for wintering waterbirds, some of which feed in the Broadland Ramsar that adjoins this site at Halvergate Marshes. This SPA is part of the Breydon Water European Marine Site.	A140	Pluvialis apricaria (Golden Plover) (over winter)
	A132	Recurvirostra avosetta (Avocet) (over winter)
	A193	Sterna hirundo (Common Tern) (breeding)
	A142	Vanellus vanellus (Northern Lapwing) (over winter)
		Waterbird assemblage
	Ramsar qualifying features[12]	
	Internationally important waterfowl assemblage (greater than 20000 birds)	
	Over winter the site regularly supports internationally important numbers of: Bewick's Swan Cygnus columbianus bewickii and Lapwing Vanellus vanellus	

Great Yarmouth North Denes SPA		
Site description summary	**Qualifying features**[13]	
Low dunes stabilised by marram grass *Ammophila arenaria* with extensive areas of grey hair-grass *Corynephorus canescens*. The Site supports important numbers of little tern *Sterna albifrons* that feed in waters close to the SPA. This SPA is part of the Great Yarmouth North Denes European Marine Site (EMS).	A195	Sterna albifrons (Little Tern) (breeding)

Winterton – Horsey Dunes SAC		
Site description summary	**Qualifying features**[14]	
The only significant area of dune heath on the east coast of England, which occur over an extremely base-poor dune system, and include areas of acidic dune grassland as an associated acidic habitat. These acidic soils support swamp and mire communities, in addition to common dune slack vegetation, including creeping willow *Salix repens* subsp. *argentea* and Yorkshire fog *Holcus lanatus*. The drought resistant grey hair-grass *Corynephorus canescens* is characteristic of open areas.	2110	Embryonic shifting dunes
	2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")
	2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)
	2160	Dunes with Hippophae rhamnoides
	2190	Humid dune slacks
	1166	Triturus cristatus (Great Crested Newt)

[12] Taken from the Ramsar Information Sheet for Breydon Water dated Feb 2000.
[13] Taken from the Natura 2000 Standard data form for site UK9009271 Great Yarmouth North Denes SPA dated 25-01-16.
[14] Taken from the Natura 2000 Standard data form for site UK0013043 Winterton – Horsey Dunes SAC dated 25-01-16.

Paston Great Barn SAC		
Site description summary	**Qualifying features**[15]	
Nationally, this is an extremely rare example of a maternity roost of barbastelle bats *Barbastella barbastellus* in a building. A 16th century thatched barn with associated outbuildings. The maternity colony inhabits many crevices and cracks in the roof timbers.	1308	Barbastella barbastellus (Barbastelle bat) (permanent population)

Overstrand Cliffs SAC		
Site description summary	**Qualifying features**[16]	
Vegetated soft cliffs composed of Pleistocene clays and sands, subject to common cliff-falls and landslips. Vegetation undergoes cycles whereby ruderal-dominated communities develop on the newly exposed sands and mud, succeeded by more stable grassland and scrub vegetation. In areas where freshwater seepages occur there are fen communities and occasional perched reedbeds. The diverse range of habitats support a large number of invertebrate species.	1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts

Waveney & Little Ouse Valley Fens SAC		
Site description summary	**Qualifying features**[17]	
Calcareous fen containing extensive beds of great fen-sedge *Cladium mariscus*. Purple moor-grass – meadow thistle *Molinia caerulea – Cirsium dissectum* fen-meadows, associated with the spring-fed valley fen systems, occur in conjunction with black bog-rush – blunt-flowered rush *Schoenus nigricans – Juncus subnodulosus* mire and calcareous fens with great fen-sedge. Grazed areas of fen-meadow are more species-rich, and frequently support southern marsh-orchid *Dactylorhiza praetermissa*.	6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
	7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
	1016	Vertigo moulinsiana (Desmoulin's whorl snail)

[15] Taken from the Natura 2000 Standard data form for site UK0030235 Paston Great Barn SAC dated December 2015.
[16] Taken from the Natura 2000 Standard data form for site UK0030232 Overstrand Cliffs SAC dated December 2015.
[17] Taken from the Natura 2000 Standard data form for site UK0012882 Waveney and Little Ouse Valley Fens SAC dated December 2015.

Redgrave and South Lopham Fens Ramsar	
Site description summary	**Qualifying features**[18]
An extensive area of spring-fed valley fen at the headwaters of the River Waveney which supports a variety of fen plant community types, including *Molinia*-based grasslands, mixed sedge-fen, and reed-dominated fen. Small areas of wet heath, sallow carr, and birch woodland also occur, and the Site is known to support the fen raft spider *Dolomedes plantarius*.	The site is an extensive example of spring-fed lowland base-rich valley, remarkable for its lack of fragmentation.
	The site supports many rare and scarce invertebrates, including a population of the fen raft spider *Dolomedes plantarius*. This spider is also considered vulnerable by the IUCN Red List.
	The site supports many rare and scarce invertebrates, including a population of the fen raft spider *Dolomedes plantarius*. The diversity of the site is due to the lateral and longitudinal zonation of the vegetation types characteristic of valley mires.

Breckland SPA/SAC		
Site description summary	**SPA qualifying features**[19]	
A gently rolling plateau underlain by cretaceous chalk bedrock covered with thin deposits of sand and flint. The climate and free-draining soils has produced dry heath and grassland communities. Pingos with biological interest occur in some areas. The highly variable soils of Breckland, with underlying chalk being largely covered with wind-blown sands, have resulted in mosaics of heather-dominated heathland, acidic grassland and calcareous grassland that are unlike those of any other site. Breckland is the most extensive surviving area of the rare sheep's fescue – mouse-ear hawkweed – wild thyme *Festuca ovina – Hieracium pilosella – Thymus praecox* grassland type. A number of the water bodies within the site support populations of amphibians, including great crested newts *Triturus cristatus*.	A133	Burhinus oedicnemus (Stone Curlew) (breeding)
	A224	Caprimulgus europaeus (Nightjar) (breeding)
	A246	Lullula arborea (Woodlark) (breeding)
	SAC qualifying features[20]	
	2330	Inland dunes with open Corynephorus and Agrostis grasslands
	3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
	4030	European dry heaths

[18] Taken from the Ramsar Information Sheet for Redgrave and South Lopham Fen Ramsar dated May 2005.
[19] Taken from the Natura 2000 Standard data form for site UK9009201 Breckland SPA dated December 2015.
[20] Taken from the Natura 2000 Standard data form for site UK0019865 Breckland SAC dated December 2015.

	6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	1308	Barbastella barbastellus (Barbastelle bat)
	1166	Triturus cristatus (Great Crested Newt)

Benacre to Easton Bavents Lagoons SAC/Benacre to Easton Bavents SPA		
Site description summary	**SAC qualifying features**[21]	
Situated on the east coast of Suffolk, this site includes semi-natural broadleaved woodland, tall fen vegetation, shingle, dunes and grassland, saltmarsh and coastal lagoons. The habitats are important for breeding, wintering and passage birds. There are a series of percolating lagoons that have formed behind shingle barriers and are a feature of a geomorphologically dynamic system. The site supports a number of specialist lagoonal species. The SPA is part of the Benacre to Easton Bavents European Marine Site.	1150	Coastal lagoons
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	SPA qualifying features[22]	
	A021	Botaurus stellaris (Bittern) (breeding)
	A081	Circus aeruginosus (Marsh Harrier) (breeding)
	A195	Sterna albifrons (Little Tern) (breeding)
Component SSSI/s[23]		
Pakefield to Easton Bavents SSSI	Covers 735.45ha and contains 51 units. 48.73% of area in Favourable condition, 38.98% of area in Unfavourable-Recovering condition, 8.73% of area in Unfavourable-No change condition, 3.11% Unfavourable-Declining condition, 0.45% of area Partially destroyed.	
SAC Conservation Objectives[24]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of qualifying natural habitats • The structure and function (including typical species) of qualifying natural habitats, and • The supporting processes on which qualifying natural habitats rely.	
SPA Conservation Objectives[25]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving	• The extent and distribution of the habitats of the qualifying features	

[21] Taken from the Natura 2000 Standard data form for site UK0013104 Benacre to Easton Bavents Lagoons SAC dated December 2015.
[22] Taken from the Natura 2000 Standard data form for site UK9009291 Benacre to Easton Bavents SPA dated December 2015.
[23] Condition status taken from Natural England data on 17th June 2019.
[24] Taken from Natural England's European Site Conservation Objectives for Benacre to Easton Bavents Lagoons SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[25] Taken from Natural England's European Site Conservation Objectives for Benacre to Easton Bavents SPA dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice, and should be used in conjunction with the Regulation 35 Conservation Advice Package for the EMS.

the aims of the Wild Birds Directive, by maintaining or restoring;	• The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

Dew's Ponds SAC		
Site description summary	**Qualifying features**[26]	
A series of 12 ponds located in rural East Suffolk, in formerly predominantly arable land. Great Crested Newt has been found in all ponds. Some of the arable land has been converted to grassland and there are also hedgerows and ditches.	1166	Triturus cristatus (Great Crested Newt)

The Wash and North Norfolk Coast SAC (inshore)		
Site description summary	**Qualifying features**[27]	
The Wash is the largest embayment in the UK and is connected to the North Norfolk Coast via sediment transfer systems. Together The Wash and North Norfolk Coast form one of the most important marine areas in the UK and European North Sea coast, and include extensive areas of varying, but predominantly sandy, sediments subject to a range of conditions. Communities in the intertidal include those characterised by large numbers of polychaetes, bivalve and crustaceans. Subtidal communities cover a diverse range from the shallow to the deeper parts of the embayments and include dense brittlestar beds and areas of an abundant reef-building worm ('ross worm') Sabellaria spinulosa. The embayment supports a variety of mobile species, including a range of fish, otter Lutra lutra and common seal Phoca vitulina. The extensive intertidal flats provide ideal conditions for common seal breeding and hauling-out. This SAC is part of The Wash and North Norfolk Coast European Marine Site.	1110	Sandbanks which are slightly covered by sea water all the time
	1140	Mudflats and sandflats not covered by seawater at low tide
	1150	Coastal lagoons
	1160	Large shallow inlets and bays
	1170	Reefs
	1310	Salicornia and other annuals colonizing mud and sand
	1320	Spartina swards (Spartinion maritimae)
	1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
	1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)
	1364	Halichoerus grypus (Grey Seal)
	1355	Lutra lutra (Eurasian Otter)
	1365	Phoca vitulina (Harbour/Common Seal)

North Norfolk Coast SPA (marine)/SAC (inshore)/Ramsar		
Site description summary	**SAC qualifying features**[28]	
Important within Europe as one of the largest areas of undeveloped coastal habitat of its	1150	Coastal lagoons

[26] Taken from the Natura 2000 Standard data form for site UK0030133 Dew's Ponds SAC dated December 2015.
[27] Taken from the Natura 2000 Standard data form for site UK0017075 The Wash and North Norfolk Coast SAC dated December 2015.
[28] Taken from the Natura 2000 Standard data form for site UK0019838 North Norfolk Coast SAC dated December 2015.

type, supporting intertidal mudflats and sandflats, coastal waters, saltmarshes, shingle, sand dunes, freshwater grazing marshes, and reedbeds. Large numbers of waterbirds use the Site throughout the year. In Summer, the Site and surrounding area are important for breeding populations of four species of tern, waders, bittern *Botaurus stellaris*, and wetland raptors including marsh harrier *Circus aeruginosus*. In Winter, the Site supports large numbers of geese, sea ducks, other ducks and waders using the Site for roosting and feeding. The Site is also important for migratory species during the Spring and Autumn. This SAC is part of the North Norfolk Coast European Marine Site. The SPA is designated for supporting a number of rare or vulnerable (Article 4.1) Annex I bird species during the breeding season. In addition, the SPA is designated for supporting regularly occurring migratory (Article 4.2) species during the breeding season and over winter. This SPA is part of The Wash and North Norfolk Coast European Marine Site (EMS).	1220	Perennial vegetation of stony banks
	1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)
	2110	Embryonic shifting dunes
	2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")
	2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")
	2160	Dunes with Hippophae rhamnoides
	2190	Humid dune slacks
	1355	Lutra lutra (Eurasian Otter)
	1395	Petallophyllum ralfsii (Petalwort)
	1166	Triturus cristatus (Great Crested Newt)
	SPA qualifying features[29]	
	A040	Anser brachyrhynchus (Pink-footed Goose) (over winter)
	A050	Anas penelope (Wigeon) (over winter)
	A021	Botaurus stellaris (Bittern) (breeding)
	A675	Branta bernicla bernicla (Dark-bellied Brent Goose) (over winter)
	A143	Calidris canutus (Red Knot) (over winter)
	A081	Circus aeruginosus (Marsh Harrier) (breeding)
	A132	Recurvirostra avosetta (Avocet) (breeding and over winter)
	A195	Sterna albifrons (Little Tern) (breeding)
	A193	Sterna hirundo (Common tern) (breeding)
	A191	Sterna sandvicensis (Sandwich Tern) (breeding)
	WATR	Waterfowl assemblage
	Ramsar qualifying features[30]	
	The site is one of the largest expanses of undeveloped coastal habitat of its type in Europe. It is a particularly good example of a marshland coast with intertidal sand and mud, saltmarshes, shingle banks and sand dunes. There are a series of brackish-water lagoons and extensive areas of freshwater grazing marsh and reed beds.	

[29] Taken from the Natura 2000 Standard data form for site UK9009031 North Norfolk Coast SPA dated December 2015.
[30] Taken from the Ramsar Information Sheet for North Norfolk Coast dated 13-06-08.

	Supports at least three British Red Data Book and nine nationally scarce vascular plants, one British Red Data Book lichen and 38 British Red Data Book invertebrates.
	98462 waterfowl peak count in winter (assemblages of international importance)
	Sterna sandvicensis (Sandwich Tern) (breeding)
	Sterna hirundo (Common Tern) (breeding)
	Sterna albifrons (Little Tern) (breeding)
	Calidris canutus (Red Knot) (over winter)
	Anser brachyrhynchus (Pink-footed Goose) (over winter)
	Branta bernicla bernicla (Dark-bellied Brent goose) (over winter)
	Anas penelope (Wigeon) (over winter)
	Anas acuta (Pintail) (over winter)

Southern North Sea cSAC (offshore and inshore)		
Site description summary	**Qualifying features**[31]	
The Southern North Sea site has been recognised as 'an area of predicted persistent high densities of harbour porpoise'. Therefore, the Southern North Sea site has been submitted to the EU and is a candidate for designation as an Inshore and Offshore SAC for the Annex II species, Harbour Porpoise. The Southern North Sea site extends down the North Sea from the River Tyne, south to the River Thames. The aim of the SAC is to support the maintenance of harbour porpoise populations throughout UK waters (the Southern North Sea supports higher number of porpoises compared to many other parts of their UK range). Seasonal differences in the use of the site by harbour porpoises which show the elevated densities of the species in some parts of the site compared to others during the summer and winter, have been identified. The main threats to harbour porpoise are from incidental catch, pollution and noise/physical disturbance.	1351	Phocoena phocoena (Harbour Porpoise)

Outer Thames Estuary SPA (marine)/Outer Thames Estuary Extension pSAC (marine)		
Site description summary	**Qualifying features**[32]	
This SPA is entirely marine and is designated because its habitats support 38% of the Great British population of over-wintering Red-throated Diver *Gavia stellata*, a qualifying species under Article 4.1 of the Birds	A001	Gavia stellata (Red-throated Diver) (over winter)

[31] Taken from the Natura 2000 Standard Data Form for Site UK0030395 Southern North Sea SCI dated January 2017.
[32] Taken from the Natura 2000 Standard Data Form for Site UK9020309 Outer Thames Estuary SPA dated December 2015.

Directive. The Outer Thames Estuary SPA covers vast areas of marine habitat off the east coast between Caister-on-Sea, Norfolk in the north, down to Margate, Kent in the south. The habitats covered by the SPA include marine areas and sea inlets where Red-throated Diver is particularly susceptible to noise and visual disturbance e.g. from wind farms and coastal recreation activities. Threats from effluent discharge, oil spillages and entanglement/drowning in fishing nets are significant. The addition of two new protected features and associated boundary amendments was consulted on in January to July 2016. The proposed extension would afford protection for Little tern and Common tern foraging areas, enhancing protection already afforded to their feeding and nesting areas in the adjacent coastal SPAs (Foulness SPA, Breydon Water SPA and Minsmere to Walberswick SPA).		

Haisborough, Hammond and Winterton SAC		
Site description summary	**Qualifying features**[33]	
The site lies off the north east coast of Norfolk and contains a series of sandbanks as well as Sabellaria spinulosa reefs. Small numbers of Harbour Porpoise are regularly observed within the site boundary and a large colony of breeding Grey Seal is known adjacent to the site.	1110	Sandbanks which are slightly covered by sea water all the time
	1170	Reefs
	1364	Halichoerus grypus (Grey Seal)
	1351	Phocoena phocoena (Harbour Porpoise)

2.2 Other relevant Plans or Projects potentially affecting these sites

2.2.1 In addition to the potential impact that Greater Norwich Local Plan may have upon the nearby European sites described above, other plans/documents/guidance may also impact upon these sites, in particular the plans of the neighbouring local planning authorities. The most relevant documents are likely to be those concerned with planning policy and infrastructure provision.

2.2.2 The neighbouring local authorities as well as those that contain European sites within the Zone of Influence of the Greater Norwich Growth Area are listed below. Their planning policy documents, including adopted and emerging Local Plans are likely to be the most relevant when considering potential for cumulative impacts upon European sites.

- Broads Authority
- Breckland Council
- Borough Council of King's Lynn & West Norfolk
- North Norfolk District Council
- Great Yarmouth Borough Council
- East Suffolk Council
- Mid Suffolk District Council

[33] Taken from the Natura 2000 Standard data form for site UK0030369 Haisborough, Hammond and Winterton SAC dated December 2015.

- West Suffolk Council
- South Holland District Council
- Boston Borough Council
- East Lindsey District Council
- Norfolk County Council – Minerals site specific allocations DPD
- South Norfolk Village Clusters Housing Site Allocations Local Plan in progress. This plan will include sites for a minimum of 1,200 homes in addition to the 1,392 already committed in the village clusters.

2.2.3 Plans or projects connected with infrastructure planning and management also have potential to impact European sites, whether alone or in combination. Such plans are listed below and will need to be considered further in the report.

- Greater Norwich Water Cycle Study
- Green Infrastructure Strategy (2007) and Green Infrastructure Delivery Plan (2009)
- River Basin Management Plan for the Anglian Water Basin District (2015)
- North East Norwich Growth Triangle Green Infrastructure Delivery Plan (2016)
- East Broadland Green Infrastructure Delivery Plan (2015)
- West Broadland Green Infrastructure Project Plan (2018)
- Norwich River Wensum Green Infrastructure Strategy (not currently available)
- Green Infrastructure sections of the Wymondham Area Action Plan (2015)
- Green Infrastructure sections of the Long Stratton Area Action Plan (2016)

2.2.4 A Norwich Western Link Road is proposed by Norfolk County Council which is working towards a planning application and subsequent construction. Greater Norwich Local Plan recognises the existence of the proposed road but does not promote the road or take part in decision-making regarding the road's construction. See https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/norwich/norwich-western-link/ for further details.

2.2.5 Anglian Water's 2019 Water Resource Management Plan outlines how Anglian Water will maintain a sustainable balance between water supplies and demand over the next 25 years. It describes how it proposes to maintain that balance by investing in demand management – metering and water efficiency for example – and developing new water resources. No new boreholes or increase in abstraction from existing boreholes are explicitly proposed.

2.2.6 Anglian Water's Long Term Water Recycling Plan (September 2018) sets out a long term strategy to identify the need for further investment by Anglian Water at existing water recycling centres or within foul sewerage catchments to accommodate the anticipated scale and timing of growth. Growth in Greater Norwich as well as in the remainder of the area served by Anglian Water is included in this plan.

2.2.7 A scheme to assist developers with mitigation for Nutrient Neutrality is being progressed by Local Planning Authorities in Norfolk.

3 Likely significant effects of Greater Norwich Local Plan proposed allocations for Gypsy and traveller sites on European sites

3.1 The sites being assessed

3.1.1 The proposed allocations for Gypsy and Traveller sites are included in Appendix 2. The table includes proposed allocations, sites subject to consultation and unreasonable alternative sites.

Reference	Address	Parish	Number of proposed pitches (approx.)
GNLP5004R	Land off Buxton Road, Eastgate	Cawston	4
GNLP5013	Depot	Ketteringham	10
GNLP5019	Woodland Stable, Shortthorn Road	Stratton Strawless	8
GNLP5020	Romany Meadow, The Turnpike	Carlton Rode	6
GNLP5022	The Oaks	Foulsham	5
GNLP5024	Upgate Street	Carleton Rode	4
GNLP5028A & B	Strayground Lane	Wymondham	12
GNLP5025 (unreasonable alternative, subject to consultation)	Woodyard, Reepham Road,	Foulsham	2
GNLP5026 (unreasonable alternative, subject to consultation)	Peddlars Turnpike	Guestwick	2
GNLP5027 (subject to consultation)	Adjacent to Larkeys Farm, Brick Kiln Road	Hevingham	5
VCHAP GT Site 1 and VCHAP GT site 2 (unreasonable alternatives)	Grove Farm, Middle Road	Denton	
VCHAP GT site 3 (unreasonable alternative)	London Road, Suton	Wymondham	

3.2 Necessary or connected with management of European sites?

3.2.1 It is considered that the Gypsy and Traveller site proposed allocations or alternatives are not necessary for, or connected with, the nature conservation management of any European sites.

3.3 Likely significant effects which might arise from policies and allocations within Greater Norwich Local Plan

3.3.1 There are a number of potential impacts arising from policies and allocations within the Local Plan. These include

- Increased recreational pressure: trampling of vegetation or disturbance to birds, or providing difficulties in site management for example.
- Increased pressure on water resources: The new homes and businesses would require a reliable source of drinking water which could affect wetlands from increased abstraction.
- Pollution impacts: Waste water discharge from new developments, including foul water discharges may reduce the water quality of rivers or wetlands.
- Pollution impacts: Additional traffic movements increasing emissions to air such as Nitrogen oxides NO_x and Sulphur dioxide SO_2 which have the potential to result in adverse impact upon vegetation or water quality.
- Increased urbanisation of the countryside: predation by cats, fly-tipping, increase in arson, vandalism of European site infrastructure such as fences, disturbance of livestock, etc.

3.3.2 There are no direct land-take impacts on any European site in the allocations.

3.3.3 Impacts arising from any of the above factors upon a designated European site could occur result from development of a single large housing site, for example in the immediate vicinity of Norwich; or through a combination of dispersed developments including the Gypsy and Traveller sites elsewhere in the Growth Area. Some European sites would be more vulnerable to recreational pressure whilst others might be more sensitive to other types of impacts. In isolated incidences, a European designated site may be sensitive to several different types of impact, for example both recreational pressure and an impact upon water resources.

3.3.4 There may be cumulative effects of a large number of smaller developments. For example, the recreational impact on European sites of a small residential development may in itself have imperceptible impact, but the total recreational impact of a number of residential developments could be significant.

3.4 Conclusion of assessment of likely significant effect ('screening' stage)

3.4.1 It is concluded that the proposed allocations and alternatives for Gypsy and Traveller sites, as part of the Regulation 19 Submission Draft Local Plan, may be likely to have a significant effect upon one or more European sites. The Local Plan is not necessary for, or connected with, nature conservation management of European sites. It is concluded that an appropriate assessment of impacts is necessary.

4 Appropriate Assessment of proposed Gypsy and Traveller sites

4.1 Introduction to the Appropriate Assessment

4.1.1 This appropriate assessment considers impacts of the Gypsy and Traveller sites individually and collectively, and in the context of the whole Greater Norwich Local Plan. Cumulative impacts with other plans or projects are then considered.

4.2 Assessment of construction impacts on any European site

4.2.1 No allocations are within or close to any European site, so there would not be any construction impacts such as land-take or disturbance from the construction activities.

4.3 Increased recreational pressure: potential impacts.

4.3.1 Recreational use of a European site has the potential to:

- Cause damage to soils and vegetation through trampling and erosion;
- Cause disturbance to sensitive species, particularly ground-nesting birds and wintering wildfowl.
- Cause eutrophication as a result of dog fouling;
- Cause littering, giving rise to potential animal mortality, nutrient enrichment and small-scale pollution
- Prevent appropriate management or exacerbate existing management difficulties, for example grazing being restricted.

4.3.2 Different types of European sites are subject to different types of recreational pressures and have different vulnerabilities. Studies across a range of species have shown that the effects from recreation can be complex. Recreational pressure is likely to be generated by an increase in residents associated with the new housing but less so for employment development.

Trampling pressure and mechanical/abrasive damage

4.3.3 Most types of terrestrial European site can be affected by trampling, which in turn causes soil compaction and erosion, depending upon soil conditions, or changes to the vegetation. Motorcycle scrambling and off-road vehicle use can cause serious erosion, as well as disturbance to sensitive species but significant impacts can also arise from walkers, cyclists and horses, resulting in reduction in vegetation cover.

4.3.4 Studies in a variety of vegetation types have shown that low-growing, mat-forming grasses appear most resistant to trampling, while tall forbs (non-woody vascular plants other than grasses, sedges, rushes and ferns) were considered least resistant. Cover of hemicryptophytes and geophytes (plants with buds below the soil surface) was heavily reduced after two weeks of trampling pressure, but had recovered well after one year and as such these were considered to have resilience in respect of trampling pressure. Chamaephytes (plants with buds above the soil surface) were least resilient to trampling.

4.3.5 In practice this can mean changes to the vegetation community compromising the viability of taller growing fragile plant species in favour of species which have a leaf rosette which lies flat to the ground and often leading to a loss of rarer, more vulnerable plant species in favour of more robust, common species.

4.3.6 Dune habitat and other coastal ecosystems, heathlands and wetlands are amongst the most sensitive to trampling and erosion, whereas woodlands and meadowlands are more robust.

Eutrophication

4.3.7 Walkers with dogs contribute to pressure on sites through nutrient enrichment via dog fouling and the total volume of dog faeces deposited on sites can be surprisingly large. For example, at

Burnham Beeches National Nature Reserve over one year, Barnard[34] estimated the total amounts of urine and faeces from dogs as 30,000 litres and 60 tonnes respectively. Nutrient-poor habitats such as heathland, chalk grassland and certain types of fen vegetation are particularly sensitive to the fertilising effect of inputs of phosphates, nitrogen and potassium from dog faeces. Most impacts occur close to paths.

Disturbance

4.3.8 The deleterious effect of disturbance on birds stems from the fact that the birds are expending energy unnecessarily and the time they spend responding to disturbance is time that is not spent feeding. This can adversely affect the 'condition' and ultimately survival of the birds. In addition, displacement of birds from one feeding site to others can increase the pressure on the resources available within the remaining sites, as they have to sustain a greater number of birds. Disturbance of ground-nesting birds may result in the bird leaving the nest and exposing the eggs or chicks to predators or bad weather. Disturbed areas become unavailable for nesting even though the habitat may otherwise be suitable.

4.3.9 Walkers with dogs have potential to cause greater disturbance to fauna as dogs are less likely to keep to marked footpaths and move more erratically and this has been shown by number of studies, with birds flushing more readily, more frequently, at greater distances and for longer periods of time when dogs are present, particularly off-lead.

4.3.10 Where increased recreational use is predicted to cause adverse impacts on a site, avoidance and mitigation should be considered. Avoidance of recreational impacts at European sites involves location of new development away from such sites or provision of an alternative recreational resource.

Site management

4.3.11 Public access can cause conflict between people and habitats in terms of compromising effective site management. Dogs, rather than people, tend to be the cause of many management difficulties, notably by worrying grazing animals or necessitating moving cattle away from footpaths.

4.4 European sites unlikely to be affected by recreational impacts

4.4.1 It is not likely that there would be a significant effect from recreational impacts on seven European sites. These sites are tabulated below, and the reasons why recreational impact is considered unlikely are given in the second column.

European site	Reason for no recreational impact
Paston Great Barn SAC	Small site with no public access
Overstrand Cliffs SAC	More-or-less vertical cliff which, although open to the public, in practice is rarely walked upon
Dews Pond SAC	Small site with no public access
Southern North Sea cSAC	Offshore site with no pedestrian access and low levels of dispersed recreational boating activity
Outer Thames Estuary SPA / pSAC extension	Offshore site with no pedestrian access and low levels of dispersed boating activity
Haisborough, Hammond and Winterton SAC	Offshore site with no pedestrian access and low levels of dispersed boating activity
River Wensum SAC	Aquatic interest is not affected by bankside recreation and public access to the river is in any case very limited. Boating is very limited in the SAC but encouraged downstream beyond the SAC in Norwich

[34] Barnard, A. (2003) Getting the Facts - Dog Walking and Visitor Number Surveys at Burnham Beeches and their Implications for the Management Process. *Countryside Recreation*, 11, 16 - 19

4.5 European sites potentially affected by recreational impacts

4.5.1 European sites potentially affected by recreational impacts are tabulated below. Distances from development at which recreational impacts might occur are summarised from Panter and Liley's 2016 visitor study in Norfolk[35]. Most visits are for dog walking or walking with no dog.

European site	Potential recreational impact
Norfolk Valley Fens SAC	These are a group of small scattered fens, some with limited value for walking / dog walking except for very local users, and varied access arrangements and parking facilities. Those fens with public access but no car park are likely to be visited by those within 1km only. Buxton Heath, Holt Lowes and Marsham Heath all have car parks, and some other sites might have informal roadside parking even if no car park exists. The median distance travelled by car to these sites is 3 – 6km although few people resident in the area travel further than 2km.
The Broads SAC / Broadland SPA/Ramsar	Many of the habitats present in the designated sites of the broads are wet or very wet and unlikely to be favoured for recreation, with public usage almost entirely restricted to well managed nature reserves which feature boat-trails, footpaths and boardwalks. Most car parks serving the Broads / Broadland are located in villages, where walking is not the prime attraction, or associated with nature reserves where visitors are well managed. Recreational impact might occur where there is a large car park providing access to habitat used by SPA birds where a nature conservation organisation is not managing the land as a nature reserve, but these locations are rare. Such localised examples might, for example include minor disturbance to bird species on Halvergate by people walking out from public car parks in Yarmouth (anecdotal evidence), but such usage is restricted for the most part to long-distance walkers along the footpath and there is no access to habitats at marsh level. Although few people may walk along the riverside adjacent to Halvergate Marshes, each walker could create significant disturbance (Andrea Kelly, meeting on 3rd April 2018). Other recreational impact would occur where development is within walking distance of a Broadland site, such as in adjacent or close-by villages, with, again, access being restricted to floodbank footpaths. Where people drive from home to a car park on the Broads, the median distance travelled is up to 28km although few people resident in the area travel further than 5km. The number of boats on the Broads is controlled by the Broads Authority, a Competent Authority under the Habitats Regulations. Boat numbers are out of the control of the Greater Norwich Development Partnership. Currently the Broads Authority does not limit the number of boat licences it issues, and the number of licences is declining.
Breydon Water SPA / Ramsar	Although a 'coastal' site, this is not an attractive site for family recreational purposes as access requires either a boat trip or a walk from Great Yarmouth Railway Station or from public parking within the town in order to gain access it. There are very limited circular walk opportunities, the only option including crossing and then walking alongside the busy A47 for a short distance. There are few visitors, who almost all come by car, and the median distance travelled is 12km although few people resident in the area travel further than 5km.

[35] Panter, C., & Liley, D. (2016). Visitor Surveys at European Protected Sites across Norfolk during 2015 and 2016. Footprint Ecology

European site	Potential recreational impact
Great Yarmouth North Denes SPA	This site has an attractive beach in association with other coastal amenities. Car parks, including free beach-front parking, are readily available but appear to be used by holiday-makers because the median distance travelled by those who come from home is just 1km.
Winterton – Horsey Dunes SAC	The site has an attractive beach and circular walk options including a long-distance trail taking in the fragile dune system, with other major attractions including the seal colony. Car parks are readily available. Visitors do not keep to paths and can walk anywhere on or behind the dunes. The median distance to various parts of this site is up to 44km at Horsey Gap although visitor numbers are very low above a distance of 5km from home.
Waveney and Little Ouse Valley Fens SAC	The Redgrave and South Lopham Fen component of the SAC is attractive to many visitors, and visitors are actively encouraged by the landowner and site manager, Suffolk Wildlife Trust. A modest increase in visitors would be acceptable as paths through the site are routed so as to avoid vulnerable habitats. Sensitive vegetation away from the path network is in any case avoided by visitors as usually wet or uncomfortable to walk on. Other component fens are small, and scattered fens, with limited value for walking / dog walking except for very local users, and varied access arrangements and parking facilities. Where parking exists, there is usually a managed access scheme in place. Those fens with public access are likely to be regularly visited by those living within 2km, similar to the Norfolk Valley Fens. There is no visitor data.
Redgrave and South Lopham Fen Ramsar	The Redgrave and South Lopham Fen component of the SAC is attractive to many visitors, and visitors are actively encouraged by the landowner and site manager, Suffolk Wildlife Trust. A modest increase in visitors would be acceptable as paths through the site are routed so as to avoid vulnerable habitats. Sensitive vegetation away from the path network is in any case avoided by visitors as usually wet and uncomfortable to walk on. As above, the fen with public access is likely to be regularly visited by those within 2km only, similar to the Norfolk Valley Fens. There is no visitor data.
Breckland SPA / SAC	Research has shown that even at honeypot sites, nesting of woodlark and nightjar continues. Modest increases in recreation are unlikely to affect these species. Nesting sites for stone-curlew are either closed for public access (heathland sites) in the nesting season, or are on farmland with no public access so disturbance would not occur. No likely recreational effect except in circumstances where a large increase in visitors to a little-disturbed part of the SPA would occur such as a large allocation adjacent to Breckland. Trampling of SAC vegetation is generally low, with visitors from distance often visiting a few honeypot visitor centres outside the SAC e.g. High Lodge visitor centre, West Stow Heath Country Park. Median distances travelled by people coming from home vary from 23 – 47km but visitor rates are low above 10km distant.
Benacre to Easton Bavents SAC / SPA	Despite being remote from towns and villages, and with limited parking, this site is (in the experience of the report authors) already very popular with, and vulnerable to disturbance effects from visitors travelling from Norwich and Broadland towns and villages. The visitors then use several local circular walking

European site	Potential recreational impact
	routes, including a long-distance trail, which take in sections of coastal reedbed, heathland and dune systems. Some increase in recreational effect could occur as a consequence of major development in the southern Broads area or from site allocations in close proximity. There is no data on distance travelled but it could be reasonably similar to other eastern coastal sites with a 10km threshold distance.
The Wash and North Norfolk Coast SAC	The site is an attractive and accessible coast designated for marine and intertidal habitats / species. Car parks are readily available. The median distance travelled from home varies from 2km to 30km for most parts of this site, with Morston (S) having a median distance of 41km; but visitor rates are lower for residents living over 14km distant.
North Norfolk Coast SPA / SAC / Ramsar	The site is a very attractive and accessible coast with a range of habitats and landscapes, and including a variety of circular walk options and a long-distance path. Car parks are readily available. Car parks are readily available. The median distance travelled from home varies from 2km to 29km for most parts of this site, with Morston (S) having a median distance of 41km but visitor rates are very low for residents beyond 14km.

4.5.2 The Green Infrastructure and Recreational Impact Avoidance Strategy (GIRAMS) uses this data to set impact risk zones for each European site.

4.5.3 Using the Local Plan documents available at the time, Panter and Liley (2016) estimated the increase in visitor numbers from the housing allocated at that time. The Local Plan documents used were

- Broadland District Council Site Allocations DPD (Adopted 2016)
- Broadland District Council Growth Triangle Area Action Plan (Adoption Imminent at that time)
- Norwich City Site Allocations Plan (Adopted 2014)
- South Norfolk Council Site Allocations and Policies Document (Adopted 2015)
- South Norfolk Council Wymondham Area Action Plan (Adopted 2015)
- Breckland Site Specific policies and Proposals (Adopted 2012)
- North Norfolk Site Allocations (Adopted 2011)
- Great Yarmouth Borough Council, Awaiting Development Policies and Site Allocations DPD, Previous allocations used (2001)
- Borough Council of King's Lynn and West Norfolk Preferred Options for Detailed Policies and Sites 2013, not yet adopted at that time

4.5.4 Key findings relating to housing change, links to allocated new housing at that time and implications included:

- A 14% increase in access by Norfolk residents to the sites surveyed (in the absence of any mitigation), as a result of new housing during the current plan period.
- The increase will be most marked in the Brecks, where an increase of around 30% was predicted. For the Broads the figure is 14%; 11% for the East Coast; 9% for North Norfolk; 15% for Roydon & Dersingham; 28% for the Valley Fens and 6% for the Wash (note these figures relate to the surveyed access points only and to visits by Norfolk residents).

4.5.5 With a median dog walk length of around 3km, it is considered that a housing allocation within 1km of a European site access point (i.e. a site freely available for public entry / use) is likely to result in an increased visitor use of that European site, especially for regular dog walking, by people walking to the European site. Housing allocations greater than 1km distant are less likely to generate increased visitor use from people walking to that site, and above 1.5km distance there is likely to be little or no increased visitor use by people walking to the entry point. European sites with car parking provision would be likely to experience impacts resulting from development within a larger radius as described in the table above.

4.5.6 For parts of the North Coast, the Broads, and parts of the East Coast, the links between an increase in local housing and recreation impacts are less clear as these sites attract a high number of visitors coming from a wide geographical area, both inside and outside Norfolk. There are therefore likely to be pressures from overall population growth both from within the county and further afield.

4.5.7 Visitor access to European sites by the Greater Norwich Local Plan allocations compared to the 2016 study would be an increase in visitors because of the additional allocations in the GNLP and also bearing in mind completed housing development since the study. The distribution of the allocations in Greater Norwich are such that the European sites likely to have the larger increases in visitor numbers would be The Broads / Broadland, Winterton – Horsey Dunes, Norfolk Valley Fens (Marsham Heath), and North Norfolk Coast SPA / SACs / Ramsar.

4.6 Increased pressure on water resources

4.6.1 The new homes would require a reliable source of drinking water. Proposed employment facilities would need a source of water for the domestic needs of the employees, and might also need water for manufacturing or other industrial processes such as washing.

4.6.2 The east and southeast of England have been identified by Environment Agency in 2013 as a region which is currently experiencing considerable pressure on water resources with the deficit situation within both the Essex and Suffolk Water and the Anglian Water areas being considered to be 'serious' at the present time due to limited water resources and high levels of demand. This situation is unchanged across 4 different future growth and climatic scenarios[36] and the study concluded that both the Anglian Water area and Essex and Suffolk Water areas are currently experiencing 'Serious Stress', this being the highest level.

4.6.3 The Environment Agency has advised the Secretary of State that the areas classified as under 'Serious Stress' should be designated as 'Areas of serious water stress' for the purposes of Regulation 4 of the Water Industry (Prescribed Condition) Regulation 1999 (as amended).

4.6.4 Anglian Water (AW), in its 2019 Water Resources Management Plan has identified the relevant Resource Zones (RZ) to this Greater Norwich Local Plan area as being Norwich and the Broads, Norfolk Rural, and the North Norfolk Coast. The AW assessment takes into account planned and predicted growth and climate change. All Resource Zones are forecast to be in deficit (i.e. not enough water being available) to 2045 prior to measures in the plan intended to prevent the deficit being implemented.

4.6.5 Pressure on water resources resulting in reduction in water levels or flow in groundwater-fed wetlands, and in streams, rivers and waterbodies would be a likely consequence of increased water demand requiring greater water abstraction from groundwater or surface water. Surface water abstraction could have a direct impact upon water levels and stream flow; groundwater abstraction would potentially lead to reduced flows in any watercourses which derive a significant proportion of their water from spring flow and also reduced surface and sub-surface flow through fen and mire habitats. Wetland European sites which are dependent upon a groundwater source may become too dry to support special interest features.

4.6.6 Water resources in the region are already under considerable pressure. For example, Environment Agency's Review of Consents work in 2009 resulted in the closure of a Public Water

[36] Environment Agency and Natural Resources Wales. 2013. Water Stressed Areas Final Classification https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressedclassification-2013.pdf

supply borehole in the vicinity of Sheringham and Beeston Regis Commons SSSI (part of the Norfolk Valley Fens SAC). A Public Water Supply borehole at Ludham in the vicinity of Catfield Fen (part of the Broads SAC) was closed in March 2021 to prevent further negative impact upon the flora and fauna of this groundwater-fed site[37].

4.6.7 Abstraction at a future major water supply borehole, could potentially give rise to an impact upon designated groundwater dependant wetland sites more than 10km away, depending upon the depth of the borehole, the nature of the strata from which abstraction is taking place and its relationship with local wetland sites. It is assumed that any future borehole might be as much as 10km from any proposed development location.

4.6.8 Depleted riverine flows may also result in an increased number, and severity of, saline incursion events and will also increase the concentration of pollutants and nutrients possibly to above set targets. Ground water abstraction from near-surface aquifers can also lead to saline incursion into the aquifer resulting in damage to coastal wetland sites, which receive a proportion of their irrigating water from groundwater.

4.6.9 A new body, Water Resources East (WRE) has been set up to address water demand deficit. It brings together partners from a wide range of industries including: water, energy, retail, the environment, land management and agriculture, to work in collaboration to manage these challenges, building on the area's unique opportunities for sustainable future growth, and pioneering a new approach to managing water resources.

4.6.10 Anglian Water's 2019 Water Resource Management Plan outlines how Anglian Water will maintain a sustainable balance between water supplies and demand over the next 25 years. It describes how it proposes to maintain that balance by investing in demand management – metering and water efficiency for example – and developing new water resources. Anglian Water's 2019 Water Resources Management Plan indicates that it will manage water resources by 'managing demand' from existing and proposed customers (i.e. supplying less water per customer) and by transferring water from other areas, with no increase in abstraction and no new abstractions. No new boreholes or increase in abstraction from existing boreholes are explicitly proposed and so there would be no impact on the water resources available to European sites.

4.7 Pollution impacts: Waste water discharge

4.7.1 Reduction of water quality, from increased discharges of sewage and surface water drainage, or from pollution incidents, either during, or after, construction has potential to impact upon riparian and wetland European sites downstream of a settlement. The types of habitat which might be sensitive to that change would depend very much upon the nature and scale of the impact.

4.7.2 It is assumed that waste water discharge from developments, including foul water discharges, would be treated, however may give rise to elevated levels of nitrates, and, depending upon whether phosphate stripping equipment is in place, phosphate, downstream of the discharge point. There is also potential for chemical spillages, or STW failure, to lead to discharge of untreated effluent.

4.7.3 Anglian Water is currently in the process of finalising a Long Term Water Recycling Plan which will set out a long term strategy to identify the need for further investment by Anglian Water at existing water recycling centres or within foul sewerage catchments to accommodate the anticipated scale and timing of growth. Anglian Water has a statutory duty to prevent pollution from sewage, so whilst there is a theoretical risk from water recycling centres there is also a mechanism in place to prevent the risk. Permits issued by Environment Agency are set for each water recycling centre and are specific to ensure sufficient water quality at the discharge point.

4.7.4 The impacts of water pollution would depend entirely on the nature of the effluent or chemicals being released and whether the release is slow or sudden, but may potentially result in consequences such as fish kill, extinction of invertebrate taxa, which are more sensitive to pollution or changes in Biological Oxygen Demand (BOD), loss of taxa of water plants which require low nutrient levels or eutrophication of floodplain fen habitats. These impacts could

[37] https://www.anglianwater.co.uk/news/anglian-water-completes-scheme-to-protect-unique-norfolk-environment/

potentially affect Annex II European designated species such as white clawed crayfish, Desmoulins whorl snail, brook lamprey or bullhead, directly or indirectly and may also result in the loss of Annex I habitats such as *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation.

4.8 Pollution impacts: Additional traffic movements increasing emissions to air

4.8.1 The main airborne pollutants of concern in the context of their potential to give rise to adverse impacts upon European sites are oxides of nitrogen (NOx), ammonia (NH_3) and sulphur dioxide (SO_2).

4.8.2 The primary pollutants SO_2, NO and NO_2 are oxidised in the atmosphere to form SO_4^{2-} and NO_3^- respectively, while NH_3 reacts with these oxidised components to form NH_4^+ (ammonium). These pollutants know as aerosols can travel long distances, and together with primary pollutants can be deposited in the form of wet or dry deposition[38].

4.8.3 The Air Pollution Information System (APIS) provides a useful summary of the main pollutants, the effects they have on vegetation and other features for which European sites might be designated. Concentrations and deposition of air pollutants are assessed against a range on criteria to protect both human health and the environment. Environmental criteria include critical loads[39] for nitrogen deposition (kg Nitrogen ha^{-1} $year^{-1}$) and acid deposition and critical levels for ammonia (µg m^{-3}), sulphur dioxide (µg m^{-3}), nitrogen dioxide (µg m^{-3}), and ozone (ppb hours). There are some critical loads for heavy metals but these are not currently used to assess impacts. There are no critical levels or loads for other pollutants but in some cases there are other assessment criteria such as environmental quality standards (EQS) and environmental assessment levels (EAL) which are not relevant to the present study.

4.8.4 NOx can have a directly toxic effect upon vegetation, but in addition to this, higher concentrations of NOx or ammonia within the atmosphere will lead to greater rates of nitrogen deposition to soils, leading to an increase in soil fertility, which can have a serious deleterious effect on the quality of semi-natural, nitrogen-limited terrestrial habitats. Most SAC sites are designated for the vegetation they support, and this is generally vegetation which would respond adversely to nutrient input, including increased input of Total Nitrogen. Both SO2 and NOx can lead to acid deposition and acidification of vegetation.

4.8.5 Housing development would be likely to give rise to increased levels of NOx arising from increased vehicle movements. Ammonia release is generally associated with increased numbers of agricultural livestock and certain industrial processes, including the production of energy from waste, and is unlikely to arise as a direct consequence of the Great Norwich Growth Plan.

4.8.6 The table below summarises the main airborne pollutants and discusses the mechanisms by which these might potentially impact upon European sites.

Pollutant	Source	Potential effects on European sites	Significance
Sulphur Dioxide SO_2	SO_2 emissions are overwhelmingly influenced by the output of power stations and industrial processes that require the combustion of coal and oil, and to a lesser extent, motor vehicles.	Both wet and dry deposition of SO_2 acidifies soils and freshwater, and consequently alters the species composition of vegetation and hence associated animal communities. Some habitats will be more at risk than others depending on soil type and buffering capacity. The significance of impacts depends on levels of	It is not anticipated that the development of the Growth Area would necessitate construction of new power-producing facilities and the demographic of local industry is unlikely to shift towards the types of processes which would result in high levels of combustion. Total SO_2 emissions have decreased substantially in the UK since the 1980s and

[38] http://www.apis.ac.uk/starters-guide-air-pollution-and-pollution-sources
[39] http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm

Pollutant	Source	Potential effects on European sites	Significance
		deposition and the sensitivity of the habitat.	SO2 deposition is not considered to have potential to give rise to significant effects on vegetation and is not considered to be a significant factor in the context of this study
Ammonia (NH_3)	Ammonia is released following decomposition of animal wastes. Levels will increase with expansion in numbers of livestock and certain specific industrial processes, including the production of energy from waste	Ammonia can give rise to an adverse effect on vegetation through deposition and the consequent eutrophication of vegetation, leading to changes in the species composition of vegetation and hence associated animal communities. Some habitats will be more at risk than others depending on the ability of the vegetation type to 'absorb' nutrients without adverse change taking place.	The nature of the industries associated with employment allocations in the Greater Norwich Growth Area are as yet uncertain, do not provide a clear source of ammonia emissions. Significant release of NH3 is unlikely to arise as a direct consequence of the Great Norwich Growth Plan and is not considered to be a significant factor in the context of this study.
Nitrogen oxides (NOx)	Nitrogen oxides (nitrates (NO_3), nitrogen dioxide (NO_2) and nitric acid (HNO_3)) are produced through combustion processes. About one quarter of the UK's emissions are from power stations, one-half from motor vehicles, and the rest from other industrial and domestic combustion processes.	Deposition of nitrogen oxides can lead to both soil and freshwater acidification. Some habitats will be more at risk than others depending on soil type and buffering capacity. Mosses, liverworts and lichens, which received their nutrients directly from the atmosphere are particularly vulnerable to elevated NOx levels and grey dune and heathland ecosystems are perhaps the most sensitive. In addition, NOx can cause eutrophication of soils and water. This alters the species composition of plant communities and hence associated animal communities. Some habitats will be more at risk than others depending on ability of the vegetation type to 'absorb' nutrients without adverse change taking place.	It is not anticipated that the development of the Growth Area would necessitate construction of new power-producing facilities, but domestic and commercial heating and vehicle emissions could potentially be substantial given the number of proposed homes. The significance of impacts will depend on the background level, levels of deposition and the sensitivity of the habitat. NOx contributes to total N deposition – see below. Traffic-generated air pollution operates close to roads but falls off to almost nothing at a distance of 200m from the road[40].
Total Nitrogen (N)	The pollutants that contribute to nitrogen deposition derive mainly from NOX and NH3 emissions.	Species-rich plant communities with relatively high proportions of slow-growing perennial species, bryophytes and lichens are most at risk from N	The significance of impacts will depend on levels of deposition and the sensitivity of the habitat, however background levels of Total N deposition across east

[40] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf

Pollutant	Source	Potential effects on European sites	Significance
		eutrophication, due to its promotion of competitive and invasive species which can respond readily to elevated levels of N at the expenses of slow-growing species. The eventual impacts include changes in species composition, reduction of plant diversity, loss of sensitive species and an increased rate of succession in wetland ecosystems.	Norfolk and north Suffolk is typically already within the critical load range for many of the sensitive habitats in the area[41] and in some instances exceed the upper end of the range[42]. Total N is considered to be a potential significant factor in the context of this study for developments in close proximity to European sites with nutrient sensitive vegetation. Across the UK there has been a continued decline in Nitrogen Oxides since 1974, with emissions in 2017 being around half those in 2000[43].
Ozone (O_3)	A secondary pollutant generated by photochemical reactions from NOx and volatile organic compounds (VOCs). These are mainly released by the combustion of fossil fuels. Reducing ozone pollution is believed to require action at international level to reduce levels of the precursors that form ozone.	Concentrations of O3 above 40 ppb can be toxic to wildlife. Increased ozone concentrations may lead to a reduction in growth and altered species composition in seminatural plant communities.	Background levels in the region are typically below 30ppb[44]. Significant combustion of oil and coal is unlikely to arise as a direct consequence of the Great Norwich Growth Plan and O_3 is not considered to be a significant factor in the context of this study.

4.8.7 The distance over which additional traffic movements might give rise to emissions to air such as Nitrogen oxides NO_x which have the potential to result in adverse impact upon vegetation or water quality is closest to the road network and that, for NOx, levels have fallen to the background level within 200m of the road.

4.8.8 A Natural England literature search study[45] into the effects of specific road transport pollutants, found that, combining evidence from two fumigation experiments and a transect study suggests that NOx is the key phytotoxic component of exhaust emissions. While no new papers relating to roadside buffer zones were identified from recent literature, one group of researchers noted that based on their data and the literature, new road building and road expansion should avoid a buffer zone of up to 100–200m from sensitive sites, particularly those where bryophytes are an important component of habitats.

[41] http://www.pollutantdeposition.ceh.ac.uk/content/nitrogen-compounds

[42] http://www.apis.ac.uk/search-location

[43] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/778483/Emissions_of_air_pollutants_1990_2017.pdf

[44] https://uk-air.defra.gov.uk/assets/documents/reports/aqeg/aqeg-ozone-report.pdf

[45] https://publications.naturalengland.org.uk/file/5064684469223424

4.8.9 It is therefore surmised that the area affected by traffic emissions to air can be assumed to closely follow existing road corridors within the Growth Area and it is also assumed that any future road construction would be largely within the Growth Area.

4.8.10 The vegetation communities occurring within the study area and potentially at risk from atmospheric nitrogen deposition are as follows. It can be seen that dune systems are particularly vulnerable.

Habitat type (EUNIS code)	**Critical load (CL) range (kgN/ha/yr)**
Marine habitats	
Mid-upper saltmarshes (A2.53)	20-30
Pioneer & low-mid saltmarshes (A2.54 and A2.55)	20-30
Coastal habitats	
Shifting coastal dunes (B1.3)	10-20
Coastal stable dune grasslands (grey dunes) (B1.4)	8-15
Coastal dune heaths (B1.5)	10-20
Moist to wet dune slacks (B1.8)	10-20
Inland surface waters	
Dune slack pools (permanent oligotrophic waters) (C1.16)	10-20
Permanent dystrophic lakes, ponds and pools (C1.4)	3-10
Mire, bog and fen habitats	
Valley mires, poor fens and transition mires (D2)	10-15
Rich fens (D4.1)	15-30
Grasslands and tall forb habitats	
Non-Mediterranean dry acid and neutral closed grassland (E1.7)	10-15
Low and medium altitude hay meadows (E2.2) (includes floodplain grazing marsh)	20-30
Molinia caerulea meadows (E3.51)	15-25
Heathland, scrub & tundra	
Erica tetralix dominated wet heath (lowland)	10-20
Dry heaths (F4.2)	10-20
Forest habitats (general):	
Broadleaved woodland (G1)	10-20

4.8.11 Nitrogen oxide pollution could affect European sites within 200m of new roads, existing roads where daily traffic flows will change by 1,000 AADT or more; or Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or daily average speed will change by 10 km/hr or more; or peak hour speed will change by 20 km/hr or more.

4.9 Increased urbanisation of the countryside

4.9.1 This class of impacts is closely related to recreational pressure in the sense that both types of impact arise from having an increased human population close to protected wildlife sites. The list of such impacts is extensive, but some of the more significant ones include the following:

Predation impacts from domestic pets

4.9.2 Predation by domestic cats can potentially affect small mammals, birds, amphibians and reptiles and results in injury, mortality and elevated levels of disturbance.

4.9.3 A survey undertaken in 1997 found that nine million British cats brought home 92 million prey items over a five-month period[46].

4.9.4 A large proportion of domestic cats are found in urban situations, and thus increasing urbanisation is likely to lead to increased cat predation. Domestic cats will potentially range up to 5km from home, although 60% of forays are over a distance of less than 400m[47] and the typical average distance for hunting excursions is around 375m[48] according to 20th century studies.

4.9.5 There have been two studies of cat ranging behaviour published in more recent years. These used GPS collars on cats in Berkshire/Hampshire villages[49] and in Reading[50]. Both studies found that cats within the village and in urban / suburban areas of Reading has smaller home ranges than expected, with most cats in the villages travelling a mean distance of 64.9m into natural habitats around the village, with some cats ranging over 300m into these areas. Cats living in properties adjacent to woodland or heathland caught no more birds than those with little access to natural habitats.

4.9.6 The Reading study found that cats in dense urban areas travelled up to 79m, in suburban areas up to 141m and in town edge areas up to 148m. The suppression of cat travelling distances in areas of higher housing density suggests that as urban development progresses into the countryside, the cats on the former development edge would reduce their range in response to expansion of development into the area of countryside they formerly visited.

4.9.7 The predation impact of cats is therefore not cumulative as the introduction of 'new' cats because new development generally results in a reduction of 'existing' cats' range. The recent research suggests that even a 400m buffer zone from European in relation to cat predation may be over-precautionary and the 1km separation from allocations is adequate to prevent cat predation on qualifying features of European sites.

Fly-tipping

4.9.8 Fly-tipping tends to take place only a short distance from development and affects land alongside or close to highways[51]; often the terminus of a minor dead-end road, or adjacent to laybys on busier routes. The distance travelled will vary, but is likely to be usually less than 10km from source. Material dumped in this way is typically either household waste, including 'white goods' and green waste, tyres, or small-scale commercial waste. Depending upon the locality and nature of tipping, there may be harm to watercourses through pollution, damage to sensitive vegetation

[46] Woods, M. et al. 2003. Predation of wildlife by domestic cats Felis catus in Great Britain. *Mammal Review* 33, 2 174- 188

[47] Barratt, D.G. (1997). Home range size, habitat utilisation and movement patterns of suburban and farm cats Felis catus. *Ecography* 20 271-280

[48] Turner, D.C. & Meister, O. (1988). Hunting behaviour of the domestic cat. In: *The Domestic Cat: The Biology of Its Behaviour.* Ed. Turner, D.C. and Bateson, P. Cambridge University Press.

[49] Tara J Pirie, Rebecca L Thomas and Mark Fellowes (2022) Pet cats *Felis catus* from urban boundaries use different habitats, have larger home ranges and kill more prey than vats from the suburbs. Landscape and Urban Planning, 220, 1-10

[50] Hugh J. Hanmer, Rebecca L. Thomas and Mark Fellowes (2017) Urbanisation influences range size of the domestic cat (Felis catus): consequences for conservation. Journal of Urban Ecology, 2017, 1-11

[51] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/595773/Flytipping_201516_statistical_release.pdf

and in the case of green waste tipping in a woodland or wetland near to home, the release of alien invasive plant species into the wild; the species being dumped often being the more vigorous and hence potentially more invasive garden plants.

4.9.9 A 2016 report by Yorkshire Wildlife Trust[52] found that the greatest amount of fly-tipping and anti-social behaviour on its nature reserves, and theft from their nature reserves, were greatest when there were settlements within 100m. Where there were nature reserves 1km+ distant from the nearest settlement, these activities were still recorded but much less often.

Lighting

4.9.10 Light pollution can affect the foraging and commuting activities of bat species, although there may be minor impacts upon bird behaviour.

- The slower flying broad winged species, which include Barbastelle (a European site designated feature of Paston Great Barn SAC) generally avoid street lights[53] and well-lit areas.
- It is thought that insects are attracted to lit areas from further afield and this may result in adjacent habitats supporting reduced numbers of insects. This is a further impact on the ability of the light avoiding bats to be able to feed.
- Artificial lighting is thought to increase the chances of bats being preyed upon[54]. Many avian predators will hunt bats which may be one reason why bats avoid flying in the day. Observations have been made of kestrels (diurnal raptors) hunting at night under the artificial light along motorways. Lighting can be particularly harmful if used along commuting corridors such as river corridors, tree lines and hedgerows used by bats.

4.9.11 These urbanisation impacts are most likely to occur when a European site is within 1km of a settlement and therefore an allocation within 1km of a European site might increase urbanisation effects.

4.10 Avoidance and mitigation for potential impacts of the proposed Gypsy and traveller sites

Locational mitigation

4.10.1 Proposed Gypsy and Traveller sites allocations are all over 1km from any European site. The exception This avoids any potential land-take impacts during construction, cat predation, air pollution (no polluting factories are allocated but in any case if they arise would be subject to project-level HRA), urbanisation of the countryside, and recreational impacts of people walking to a European site to start a greenspace walk.

4.10.2 With a median dog walk length of around 3km, it is considered that a Gypsy and Traveller allocation within 1km of a European site access point (i.e freely available for public entry / use) is likely to result in an increased visitor use of that European site, especially for regular dog walking, by people walking to the European site. Allocations greater than 1km distant are less likely to generate increased visitor use from people walking to that site, and above 1.5km distance there is likely to be little or no increased visitor use by people walking to the entry point. The size of an allocation is also related to potential impact, with an allocation of, say, 100 dwellings likely to generate more visitor use of a European site than an allocation of 10 dwellings at the same distance.

4.10.3 The proposed Gypsy and Traveller sites are all except one site over 1.5km from the nearest European sites, and most are significantly further. Site GNLP5027 Brick Kiln Road Hevingham is just over 1km in a straight line from Buxton Heath, a component of Norfolk Valley Fens SAC, but around 2.3km walk length using roads and public rights of way. This avoids the likelihood of direct recreational impact arising from walks from any of the allocations to a European site.

[52] Rylatt, Garside and Robin (2017) Human Impacts on Nature Reserves – The Influence of Nearby Settlements. Yorkshire Wildlife Trust.

[53] http://www.bats.org.uk/data/files/bats_and_lighting_in_the_uk__final_version_version_3_may_09.pdf

[54] http://www.bats.org.uk/data/files/bats_and_lighting_in_the_uk__final_version_version_3_may_09.pdf

Recreational impacts. Provision of green infrastructure

4.10.4 Natural England has advised all Local Planning Authorities in Norfolk (letter of 2019 within the GIRAMS report) that large developments (defined as fifty houses or more) include green space which is proportionate to its scale to minimise any predicted increase in recreational pressure to designated sites, by containing the majority of recreation within and around the developed site. This advice applies across the whole of Norfolk because Natural England considers that development of this scale anywhere in the county could have a likely significant effect on a European site.

4.10.5 No evidence has been provided to support the threshold of 50 or more dwellings, and it is considered that each and every new home may have an identical impact. Greater Norwich Local Plan requires all residential development to provide green infrastructure, in Policy 3. The requirement is not restricted to 50 or more dwellings as advised by Natural England. If a development site is too small to provide green infrastructure on site, a contribution secured by S106 to green infrastructure elsewhere will be required.

4.10.6 Policy 3 applies to Gypsy and Traveller pitches in the same way as it does to standard dwellings.

Recreational impacts. In-combination effects of all housing developments

4.10.7 The Green Infrastructure and Recreational Impact Avoidance Strategy (GIRAMS) proposes a tariff based payment taken from residential, and other relevant accommodation e.g. tourist accommodation, that will be used to fund package of avoidance and mitigation measures to be delivered at Habitat Sites. This consists of a team of Rangers to influence visitor behaviour, signage, monitoring, a dog project, providing strategic mitigation projects, and various other tasks. A tariff payment of £185.93 per household is in place across Norfolk to provide enough money to pay for the mitigation works. The GIRAMS has been finalised for adoption by the local planning authorities and contributions are currently being collected by Norwich City Council[55], Broadland District Council[56] and South Norfolk Council[57]. This applies to Gypsy and Traveller pitches in the same way as it does to standard dwellings.

4.10.8 It is considered that the GIRAMS measures described above would be sufficient that the assessment is able to ascertain no adverse effect upon the integrity of any European site, subject to the adoption of the GIRAMS and its implementation by the local planning authorities.

Provision of new Country Park

4.10.9 Broadland Country Park was created by Broadland District Council between Felthorpe and Horstead and opened in March 2021[58]. This location is close to the Norwich Growth Triangle, and the site is being designed and managed to attract a larger number of recreational visitors. The Country Park will reduce visitor pressure on European sites by providing an attractive alternative.

Air pollution

4.10.10 No new roads are proposed in the Plan within 200m of any European site, and the siting of proposed allocations further than 1km from any European site indicates that road traffic associated with the developments would be sufficiently distant from European sites that there would be no pollution impacts.

Water resource use

4.10.11 A water cycle study by AECOM (March 2021) as evidence for the Greater Norwich Local Plan looked in detail into how new development can be supplied with water.

4.10.12 Anglian Water Services plans for the long term provision of water supplies through a five yearly planning cycle, through the production of statutory Water Resource Management Plans (WMRP). The WRMP sets out how changes in demand for water and changes in available water in the

[55] https://www.norwich.gov.uk/info/20017/planning_applications/1181/supporting_plans_and_documentation accessed on 7th May 2022
[56] https://www.southnorfolkandbroadland.gov.uk/planning-applications/apply/3 accessed on 7 May 2022
[57] https://www.southnorfolkandbroadland.gov.uk/planning-applications/apply/4 accessed on 7 May 2022
[58] https://www.southnorfolkandbroadland.gov.uk/broadlandcountrypark accessed on 7th May 2022

environment will be managed, including measures to manage how much water customers use (demand management) and measures to provide new sources of supply to current and future customers. The Anglian Water WRMP (2019) indicates that through the introduction of strategic demand management options and supply side schemes within the supply areas serving Greater Norwich Authorities, adequate water supplies will be available up to 2045 and will cater for the proposed levels of growth. No new abstraction from the environment is proposed

4.10.13 The Water Cycle Study confirms that Anglian Water's measures to improve efficiency of existing homes and businesses, reducing leakage by mending leaky watermains, and new homes being designed to be water-efficient, will mean that no new abstractions are required. Local Plan Policy 2 'Sustainable Communities' includes a requirement for housing development to meet the 'Building Regulations part G (amended 2016) water efficiency higher optional standard' which requires a calculated use of 110l per day.

4.10.14 Consequently it is clear that there would be no impact on European sites from water abstraction as there would be no additional abstraction to meet water needs.

Waste water discharge – 2021 GNLP HRA information, now superseded

4.10.15 The Water Cycle Study which forms part of the evidence base for the Local Plan (AECOM March 2021 Greater Norwich Water Cycle Study) looked in detail at discharge issues, including any risk of European sites having an increased nutrient loading. The report's summary states that

> *The WCS has identified that there are several WRCs within the study area that do not have sufficient capacity to treat all additional wastewater flows from the proposed level of growth within their catchments (Acle, Aylsham, Barnham Broom, Beccles, Ditchingham, Freethorpe, Long Stratton, Whitlingham Trowse, and Wymondham). The study also identified that some WRCs have capacity but using that capacity may impact significantly on the water quality and ecology of watercourses receiving the treated discharge (Cantley, Saxlingham and Woodton). Finally, future discharge volumes from Reepham and Foulsham WRC were also assessed, irrespective of capacity, due to their discharge within the River Wensum Special Area of Conservation (SAC). Water quality and ecological assessments have been undertaken for these future discharges focusing on demonstrating what is required to ensure no increase in pollution load as a result of growth.*
>
> *The assessment has shown that subject to the revision of discharge permits and the implementation of the necessary treatment process upgrades (using conventional treatment technologies), changes in water quality as a result of additional discharge can be managed to ensure there is no overall increase in pollutant load, and no adverse change in water quality or connected water dependent ecologically protected sites as a result of growth.*
>
> *However, the analysis has demonstrated that treatment upgrades required to deliver this outcome will be significant for several of the WRCs and this will require substantial investment from AWS over the longer term. This may affect phasing of development (up to 2025) in some locations of the study area, and longer term to 2030 in some cases. Key locations where this has been considered in the development of policy include Long Stratton, Wymondham and Whitlingham. It will be a requirement in these locations for development to demonstrate that there is sufficient capacity at WRC before that development can proceed.*
>
> *Through their Water Recycling Long-term Plan, AWS have already identified a potential need for planned investment to upgrade WRC capacity at Aylsham, Long Stratton and Woodton in the plan period as well as increased drainage capacity at Whitlingham and Wymondham*.

4.10.16 The July 2021 Habitats Regulations Assessment of the Greater Norwich Local Plan said that it was necessary to make improvements to Water Recycling Centres at Foulsham WRC and Reepham WRC to avoid an increase in nutrient discharge into River Wensum SAC, together with revised discharge permits from Environment Agency. This is not immediately necessary but would be required by 2025.

4.10.17 It is necessary to make improvements to Water Recycling Centres at Aylsham WRC (which are already programmed) and at Whitlingham Trowse WRC to avoid an increase in nutrient discharge

into Broadland SAC/Ramsar, together with revised discharge permits from Environment Agency for those WRCs. This is not immediately necessary but would be required by 2025. Beyond 2025, if the improvements are not made, a moratorium on growth would be needed until the measures are in place.

4.10.18 Policy 4 of the Greater Norwich Local Plan committed the Greater Norwich planning authorities to working with utilities providers, to improve waste-water management including at Whitlingham Trowse WRC. This gave confidence in 2021 that the need for the improvements will be progressed.

Waste water discharge – 2022 update for Nutrient Neutrality

4.10.19 On 16th Match 2022, Natural England wrote to partner Councils within Greater Norwich Development Partnership to advise that River Wensum SAC and The Broads SAC were being harmed by excess nitrate and phosphate in the water. The origin of these plant nutrients is from agricultural run-off, urban run-off (e.g. from fertilised gardens and dog fouling), treated water from Water Recycling Centres, and others. New residential development would need to demonstrate that it would not exacerbate the existing problem by adding further nitrate and phosphate from its sewage and run-off. Natural England's advice is provided in Appendix 3 for The Broads SAC / Ramsar and in Appendix 4 for River Wensum SAC. A calculator spreadsheet was also provided by Natural England to facilitate calculation of nutrient change from the current land use. Subsequently a different calculator developed by Royal Haskoning has been made available by Councils in Norfolk which Natural England advises is less precautionary that its calculator (Appendix 5). The Royal Haskoning work therefore supersedes the Natural England calculator.

4.10.20 This advice applies to Gypsy and Traveller pitches as well as to standard dwellings. The proposed pitch allocations are therefore in the same situation as housing allocations with respect to Nutrient Neutrality; all pitch allocations drain to Water Recycling Centres within the catchments of either the River Wensum SAC or The Broads SAC / Ramsar. Site-specific assessments and solutions may be proposed, and a strategic solution is being progressed by partner Councils within Greater Norwich Development Partnership. At the time of writing, it is modification to the strategic policies of the GNLP have been proposed[59]. Policy amendments are expected to tie the delivery of housing growth more tightly to nutrient levels impacting on internationally protected habitats, including as appropriate, a county-wide mitigation strategy. The availability of a mitigation strategy will affect the timing of the delivery of housing sites and Gypsy and Traveller pitches as opposed to the principle of their development.

4.11 Assessment of proposed allocations for Gypsy and traveller sites

4.11.1 Subject to satisfactory policy modification with respect to Nutrient Neutrality, it is ascertained that the proposed allocations for Gypsy and Traveller sites will have no adverse effect upon the integrity of any European site. This conclusion is made for the proposed allocations and alternatives individually and collectively.

[59] https://www.gnlp.org.uk/sites/gnlp/files/2023-03/Matter%204%20NN%20Final.pdf accessed on 20th April 2023

5 Conclusions

5.1 The Greater Norwich Local Plan with the proposed Gypsy and Traveller site allocations, acting alone

5.1.1 It is ascertained that the published Greater Norwich Local Plan regulation 19 Proposed Submission Draft together with additional allocations for Gypsy and Traveller sites would have no adverse affect upon the integrity of any European site acting alone, subject to satisfactory policy modification with respect to Nutrient Neutrality.

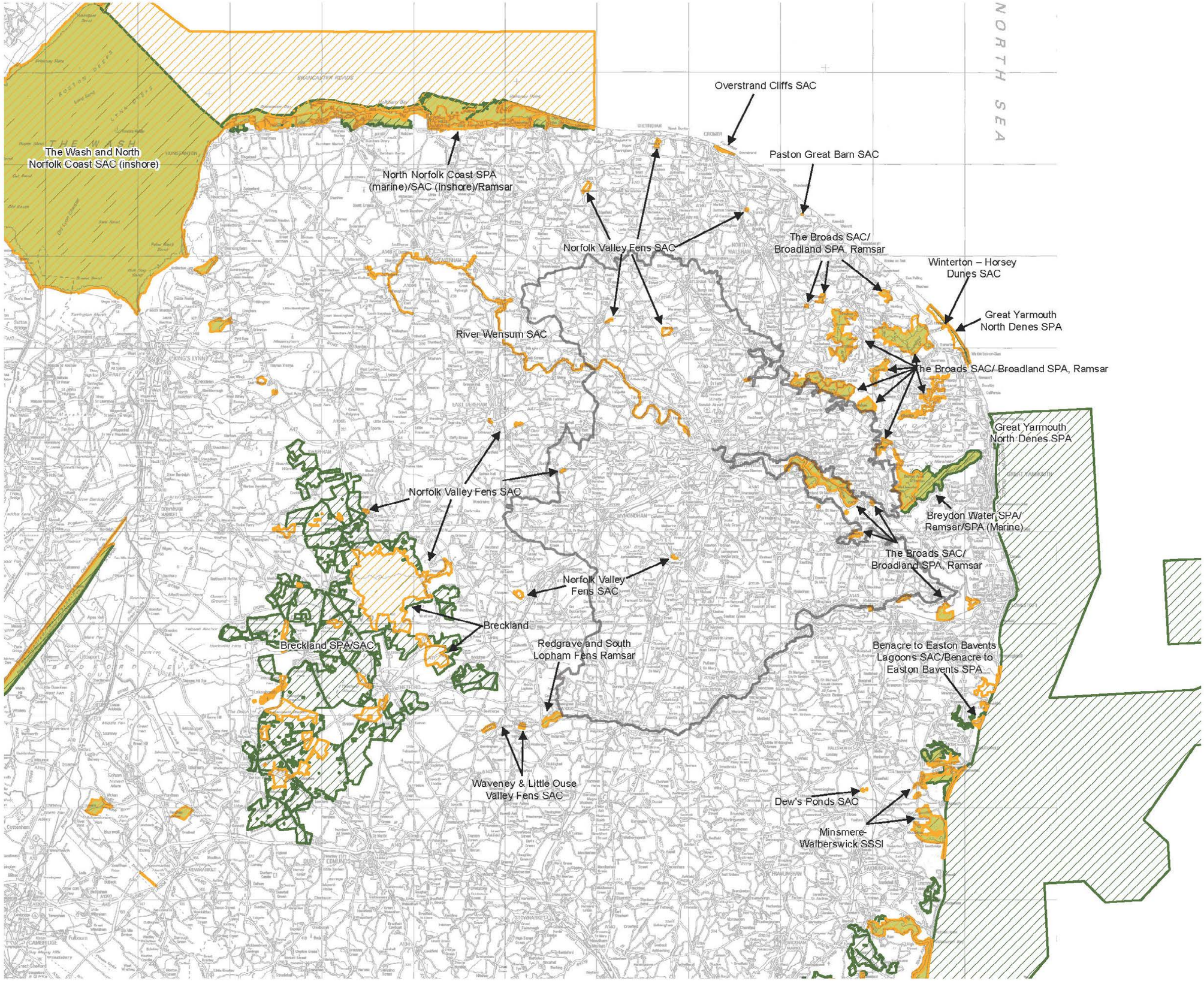
5.2 The Greater Norwich Local Plan in combination with other plans or projects

5.2.1 It is ascertained that the published Greater Norwich Local Plan regulation 19 Proposed Submission Draft together with additional allocations for Gypsy and Traveller sites would have no adverse affect upon the integrity of any European site, subject to satisfactory policy modification with respect to Nutrient Neutrality, in combination with any other Local Plan or other projects.

5.3 Overall conclusion

5.3.1 It is concluded that **subject to policy modification with respect to Nutrient Neutrality** there would be no adverse affect upon the integrity of any European site.

Figure 01



Key

- Greater Norwich Boundary
- Special Areas of Conservation
- Special Protection Areas
- RAMSAR

E16845 Greater Norwich Local Plan

European site locations

Figure 01

Scale 1:400,000 @ A3

August 2017

thelandscapepartnership

Appendix 1

European sites

River Wensum SAC		
Site description summary	**Qualifying features**[60]	
A calcareous lowland river considered one of the best areas in the UK for Ranunculion fluitantis and Callitricho-Batrachion vegetation. Also significant for the presence of Brook Lamprey, Bullhead and Desmoulin's whorl snail. One of the best areas in the UK for the native White-clawed Crayfish. At the upper reaches, run-off from calcareous soils rich in plant nutrients feeds beds of submerged and emerged vegetation characteristic of chalk streams. Lower, the chalk is overlain by boulder clay, resulting in aquatic plant communities more characteristic of rivers with mixed substrates.	3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
	7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	1092	Austropotamoblus pallipes (White-clawed (or Atlantic steam) Crayfish)
	1163	Cottus gobio (Bullhead)
	1096	Lampetra planeri (Brook Lamprey)
	1016	Vertigo moulinsiana (Desmoulin's whorl snail)
Component SSSI/s[61]		
River Wensum SSSI	Covers 385.96ha and contains 55 units. 11.05% of area in Favourable condition, 47.70% of area in Unfavourable-Recovering condition, 41.25% of area in Unfavourable-No change condition.	
Conservation Objectives[62]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.	

Norfolk Valley Fens SAC		
Site description summary	**Qualifying features**[63]	
A series of valley-head spring-fed fens, typified by black-bog-rush - blunt-flowered	4010	North Atlantic wet heaths with Erica tetralix

[60] Taken from the Natura 2000 Standard data form for site UK0012647 River Wensum SAC dated 25-01-16.
[61] Condition status taken from Natural England data on 3 December 2019.
[62] Taken from Natural England's European Site Conservation Objectives for River Wensum SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[63] Taken from the Natura 2000 Standard data form for site UK0012892 Norfolk Valley Fens SAC dated 25-01-16.

rush *Schoenus nigricans - Juncus subnodulosus* mire. There are also transitions to reedswamp, other fen and wet grassland types, and gradations from calcareous fens into acidic flush communities. Plant species present include marsh helleborine *Epipactis palustris*, narrow-leaved marsh-orchid *Dactylorhiza traunsteineri*, and alder *Alnus glutinosa* which forms carr woodland in places by streams. Marginal fens associated with pingos-pools originating from the thawing of large blocks of ice at the end of the last Ice Age support several large populations of Desmoulin's whorl snail *Vertigo moulinsiana*.	4030	European dry heaths
	6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (*important orchid sites)
	6410	Molinia meadows on calcareous, peaty, or clayey-silt-laden soils (Molinion caeruleae)
	7150	Depressions on peat substrates of the Rhynchosporion
	7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
	7230	Alkaline fens
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	1355	Lutra Lutra (Eurasian Otter)
	1166	Triturus cristatus (Great Crested Newt)
	1014	Vertigo angustior (Narrow-mouthed whorl snail)
	1016	Vertigo moulinsiana (Desmoulin's whorl snail)
Component SSSI/s[64]		
Badley Moor SSSI	Covers 18.33ha and contains 4 units. 100% of area in Favourable condition	
Booton Common SSSI	Covers 8.19ha and contains 1 unit. 100% of area in Unfavourable-Recovering condition.	
Buxton Heath SSSI	Covers 67.32ha and contains 1 unit. 100% of area in Unfavourable-Recovering condition.	
Coston Fen, Runhall SSSI	Covers 7.11ha and contains 1 unit. 100% of area in Unfavourable-No change condition.	
East Walton and Adcock's Common SSSI	Covers 62.41ha and contains 3 units. 100% of area in Unfavourable-Recovering condition.	
Flordon Common SSSI	Covers 9.91ha and contains 2 units. 19.57% of area in Favourable condition, 80.43% of area in Unfavourable-Recovering condition.	
Foulden Common SSSI	Covers 139ha and contains 7 units. 24.74% of area in Favourable condition, 61.51% of area in Unfavourable-Recovering condition, 13.75% of area in Unfavourable-Declining condition.	
Great Cressingham Fen SSSI	Covers 14.33ha and contains 1 unit. 100% of area in Unfavourable-Recovering condition.	
Holt Lowes SSSI	Covers 49.91ha and contains 2 units. 30.07% of area in Favourable condition, 69.93% of area in Unfavourable-Recovering condition.	

[64] Condition status taken from Natural England data on 3rd December 2019.

Potter & Scarning Fens, East Dereham SSSI	Covers 6.20ha and contains 2 units. 100% of area in Unfavourable-Recovering condition.
Sheringham and Beeston Regis Commons SSSI	Covers 24.94ha and contains 2 units. 100% of area in Unfavourable-Recovering condition.
Southrepps Common SSSI	Covers 5.57ha and contains 1 unit. 100% of area in Unfavourable-Recovering condition.
Swangey Fen, Attleborough SSSI	Covers 48.39ha and contains 6 units. 44.44% of area in Favourable condition, 55.56% of area in Unfavourable-Recovering condition.
Thompson Water, Carr and Common SSSI	Covers 154.74ha and contains 11 units. 73.05% of area in Favourable condition, 22.72% of area in Unfavourable-Recovering condition, 4.24% of area in Unfavourable-Declining condition.
Conservation Objectives[65]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.

The Broads SAC/ Broadland SPA, Ramsar		
Site description summary	**SAC qualifying features**[66]	
A low-lying wetland complex connecting the Bure, Yare, Thurne, and Waveney River systems. Wetland habitats form a mosaic of open water, reedbeds, carr woodland, grazing marsh, and fen meadow, with an extensive network of medieval peat excavations. The Site boasts a rich array of flora and fauna. The SPA is designated for supporting a number of rare or vulnerable (Article 4.1) Annex I bird species during the breeding season. In addition, the SPA is designated for supporting regularly occurring migratory (Article 4.2) species during the breeding season and over winter.	3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.
	3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
	6410	Molinia meadows on calcareous, peaty, or clayey-silt-laden soils (Molinion caeruleae)
	7140	Transition mires and quaking bogs
	7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
	7230	Alkaline fens
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

[65] Taken from Natural England's European Site Conservation Objectives for Norfolk Valley Fens SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[66] Taken from the Natura 2000 Standard data form for site UK0013577 The Broads SAC dated 25-01-16.

	4056	Anisus vorticulus (Little whorlpool ram's-horn snail)
	1903	Liparis loeselii (Fen Orchid)
	1355	Lutra Lutra (Eurasian Otter)
	1166	Triturus cristatus (Great Crested Newt)
	1016	Vertigo moulinsiana (Desmoulin's whorl snail)
	SPA qualifying features[67]	
	A056	Anas clypeata (Shoveler) (over winter)
	A050	Anas penelope (Wigeon) (over winter)
	A051	Anas strepera (Gadwall) (over winter)
	A021	Botaurus stellaris (Bittern) (breeding)
	A081	Circus aeruginosus (Marsh Harrier) (breeding)
	A082	Circus cyaneus (Hen Harrier) (over winter)
	A037	Cygnus columbianus bewickii (Bewick's Swan) (over winter)
	A038	Cygnus cygnus (Whooper Swan) (over winter)
	A151	Philomachus pugnax (Ruff) (over winter)
	Ramsar qualifying features[68]	
	H7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae Calcium-rich fen dominated by great fen sedge (saw sedge).
	H7230	Alkaline fens Calcium-rich springwater-fed fens.
	H91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) Alder woodland on floodplains, and the Annex II species
	S1016	Vertigo moulinsiana (Desmoulin`s whorl snail)
	S1355	Lutra lutra (Eurasian Otter)
	S1903	Liparis loeselii Fen Orchid
		Cygnus columbianus bewickii, NW Europe (Tundra (Bewick's) Swan)
		Anas penelope (Eurasian Wigeon)
		Anas strepera strepera (Gadwall)
		Anas clypeata (Shoveler)

[67] Taken from the Natura 2000 Standard data form for site UK9009253 Broadland SPA dated 25-01-16.
[68] Taken from the Ramsar Information Sheet for Broadland dated 21-09-94.

Component SSSI/s[69]	
Alderfen Broad SSSI	Covers 21.34ha and contains 3 units. 8.65% of area in Favourable condition, 91.35% of area in Unfavourable-Recovering condition.
Ant Broads and Marshes SSSI	Covers 745.27ha and contains 35 units. 54.39% of area in Favourable condition, 39.18% of area in Unfavourable-Recovering condition.
Barnby Broad & Marshes SSSI	Covers 192.69ha and contains 24 units. 59.93% of area in Favourable condition, 40.07% of area in Unfavourable-Recovering condition.
Broad Fen, Dilham SSSI	Covers 38.43ha and contains 1 unit. 100% of area in Unfavourable-Recovering condition.
Bure Broads and Marshes SSSI	Covers 741.15ha and contains 14 units. 43.08% in Favourable condition, 46.85% in Unfavourable-Recovering condition, 10.07% in Unfavourable-No change condition.
Burgh Common and Muckfleet Marshes SSSI	Covers 121.54ha and contains 9 units. 27.72% of area in Favourable condition, 68.76% of area in Unfavourable-Recovering condition, 3.52% of area in Unfavourable-No change condition.
Calthorpe Broad SSSI	Covers 43.54ha and contains 3 units. 97.68% of area in Favourable condition, 2.32% of area in Unfavourable-Recovering condition.
Cantley Marshes SSSI	Covers 272.11ha and contains 3 units. 100% of area in Favourable condition.
Crostwick Marsh SSSI	Covers 11.57ha and contains 1 unit. 100% of area in Unfavourable-No change condition.
Damgate Marshes, Acle SSSI	Covers 64.68ha and contains 10 units. 74.73% of area in Favourable condition, 25.27% of area in Unfavourable-Recovering condition.
Decoy Carr, Acle SSSI	Covers 56.01ha and contains 6 units. 70.21% of area in Favourable condition, 29.79% of area in Unfavourable-Recovering condition.
Ducan's Marsh, Claxton SSSI	Covers 3.58ha and contains 2 units. 100% of area in Unfavourable-Recovering condition.
Geldeston Meadows SSSI	Covers 13.98ha and contains 2 units. 97.18% of area in Unfavourable-No change condition, 2.82% of area in Unfavourable-Declining condition.
Hall Farm Fen, Hemsby SSSI	Covers 9.15ha and contains 1 unit. 100% of area in Favourable condition.
Halvergate Marshes SSSI	Covers 1432.72ha and contains 42 units. 72.75% of area in Favourable condition, 23.71% of area in Unfavourable-Declining condition, 3.54% of area in Unfavourable-No change condition.
Hardley Flood SSSI	Covers 49.79ha and contains 2 units. 100% of area in Favourable condition.
Limpenhoe Meadows SSSI	Covers 11.95ha and contains 1 unit. 100% of unit in Unfavourable-Recovering condition.

[69] Condition status taken from Natural England data on 17th June 2019.

Ludham – Potter Heigham Marshes SSSI	Covers 101.51ha and contains 6 units. 100% of area in Favourable condition.
Poplar Farm Meadows, Langley SSSI	Covers 7.55ha and contains 1 unit. 100% of area in Favourable condition.
Priory Meadows, Hickling SSSI	Covers 23.94ha and contains 2 units. 29.79% of area in Favourable condition, 70.21% of area in Unfavourable-Recovering condition.
Shallam Dyke Marshes, Thurne SSSI	Covers 69.80ha and contains 8 units. 4.44% of area in Favourable condition, 95.56% of area in Unfavourable-No change condition.
Smallburgh Fen SSSI	Covers 7.63ha and contains 1 unit. 100% of area in Favourable condition.
Sprat's Water and Marshes, Carlton Colville SSSI	Covers 57.14ha and contains 11 units. 80.48% of area in Favourable condition, 19.19% of area in Unfavourable-Recovering condition, 0.33% of area in Unfavourable-No change condition.
Stanley and Alder Carrs, Aldeby SSSI	Covers 42.68ha and contains 3 units. 100% of area in Unfavourable-Recovering condition.
Trinity Broads SSSI	Covers 316.83ha and contains 23 units. 45.48% of area in Favourable condition, 41.98% of area in Unfavourable-Recovering condition, 12.54% of area in Unfavourable-No change condition.
Upper Thurne Broads and Marshes SSSI	Covers 1185.93ha and contains 19 units. 63.97% of area in Favourable condition, 16.65% of area in Unfavourable-Recovering condition, 4.82% of area in Unfavourable-No change condition, 14.57% of area in Unfavourable-Declining condition.
Upton Broad & Marshes SSSI	Covers 195.44ha and contains 18 units. 7.43% of area in Favourable condition, 91.84% of Unfavourable-Recovering condition, 0.72% of area in Unfavourable-No change condition.
Yare Broads and Marshes SSSI	Covers 744.46ha and contains 28 units. 39.22% of area in Favourable condition, 11.30% of area in Unfavourable-Recovering condition, 47.27% of area in Unfavourable-No change condition, 2.20% of area in Unfavourable-Declining condition.
SAC Conservation Objectives[70]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.

[70] Taken from Natural England's European Site Conservation Objectives for The Broads SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.

SPA Conservation Objectives[71]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;	• The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

Breydon Water SPA/Ramsar/SPA (Marine)		
Site description summary	**SPA qualifying features**[72]	
An inland tidal estuary at the mouth of the River Yare and its confluence with the Rivers Bure and Waveney. Extensive areas of mud-flats form the only tidal flats on the east Norfolk coast. The Site also features much floodplain grassland, which lies adjacent to the intertidal areas. It is internationally important for wintering waterbirds, some of which feed in the Broadland Ramsar that adjoins this site at Halvergate Marshes. This SPA is part of the Breydon Water European Marine Site.	A037	Cygnus columbianus bewickii (Bewick's (Tundra) Swan) (over winter)
	A151	Philomachus pugnax (Ruff) (concentration)
	A140	Pluvialis apricaria (Golden Plover) (over winter)
	A132	Recurvirostra avosetta (Avocet) (over winter)
	A193	Sterna hirundo (Common Tern) (breeding)
	A142	Vanellus vanellus (Northern Lapwing) (over winter)
		Waterbird assemblage
	Ramsar qualifying features[73]	
	Internationally important waterfowl assemblage (greater than 20000 birds)	
	Over winter the site regularly supports internationally important numbers of: Bewick's Swan Cygnus columbianus bewickii and Lapwing Vanellus vanellus	
Component SSSI/s[74]		
Breydon Water SSSI	Covers 514.40ha and contains 15 units. 100% of area in Favourable condition.	
Halvergate Marshes SSSI	Covers 1432.72ha and contains 42 units. 72.75% of area in Favourable condition, 23.71% of area in Unfavourable-Declining condition, 3.54% of area in Unfavourable-No change condition.	

[71] Taken from Natural England's European Site Conservation Objectives for Broadland SPA dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[72] Taken from the Natura 2000 Standard data form for site UK9009181 Breydon Water SPA dated 25-01-16.
[73] Taken from the Ramsar Information Sheet for Breydon Water dated Feb 2000.
[74] Condition status taken from Natural England data on 17th June 2019.

Conservation Objectives[75]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;	• The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

Great Yarmouth North Denes SPA		
Site description summary	**Qualifying features**[76]	
Low dunes stabilised by marram grass *Ammophila arenaria* with extensive areas of grey hair-grass *Corynephorus canescens*. The Site supports important numbers of little tern *Sterna albifrons* that feed in waters close to the SPA. This SPA is part of the Great Yarmouth North Denes European Marine Site (EMS).	A195	Sterna albifrons (Little Tern) (breeding)
Component SSSI/s[77]		
Great Yarmouth North Denes SSSI	Covers 100.75ha and contains 2 units. 100% of area in Favourable condition.	
Winterton – Horsey Dunes SSSI	Covers 426.95ha and contains 12 units. 67.92% of area in Favourable condition, 9.88% of area in Unfavourable-Recovering condition, 22.20% of area in Unfavourable-No change condition.	
Conservation Objectives[78]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;	• The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.	

Winterton – Horsey Dunes SAC

[75] Taken from Natural England's European Site Conservation Objectives for Breydon Water SPA dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice, and should be used in conjunction with the Regulation 35 Conservation Advice Package for the EMS.
[76] Taken from the Natura 2000 Standard data form for site UK9009271 Great Yarmouth North Denes SPA dated 25-01-16.
[77] Condition status taken from Natural England data on 17th June 2019.
[78] Taken from Natural England's European Site Conservation Objectives for Great Yarmouth North Denes SPA dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice, and should be used in conjunction with the Regulation 35 Conservation Advice Package for the EMS.

Site description summary	Qualifying features[79]	
The only significant area of dune heath on the east coast of England, which occur over an extremely base-poor dune system, and include areas of acidic dune grassland as an associated acidic habitat. These acidic soils support swamp and mire communities, in addition to common dune slack vegetation, including creeping willow *Salix repens* subsp. *argentea* and Yorkshire fog *Holcus lanatus*. The drought resistant grey hair-grass *Corynephorus canescens* is characteristic of open areas.	2110	Embryonic shifting dunes
	2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")
	2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)
	2160	Dunes with Hippophae rhamnoides
	2190	Humid dune slacks
	1166	Triturus cristatus (Great Crested Newt)
Component SSSI/s[80]		
Winterton – Horsey Dunes SSSI	Covers 426.95ha and contains 12 units. 67.92% of area in Favourable condition, 9.88% of area in Unfavourable-Recovering condition, 22.20% of area in Unfavourable-No change condition.	
Conservation Objectives[81]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of the qualifying natural habitats • The structure and function (including typical species) of the qualifying natural habitats, and, • The supporting processes on which the qualifying natural habitats rely.	

Paston Great Barn SAC		
Site description summary	**Qualifying features**[82]	
Nationally, this is an extremely rare example of a maternity roost of barbastelle bats *Barbastella barbastellus* in a building. A 16th century thatched barn with associated outbuildings. The maternity colony inhabits many crevices and cracks in the roof timbers.	1308	Barbastella barbastellus (Barbastelle bat) (permanent population)
Component SSSI/s[83]		
Paston Great Barn SSSI	Covers 0.96ha and contains 1 unit. 100% of area in Favourable condition.	

[79] Taken from the Natura 2000 Standard data form for site UK0013043 Winterton – Horsey Dunes SAC dated 25-01-16.
[80] Condition status taken from Natural England data via Magic Map on 7th March 2017.
[81] Taken from Natural England's European Site Conservation Objectives for Winterton-Horsey Dunes SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[82] Taken from the Natura 2000 Standard data form for site UK0030235 Paston Great Barn SAC dated December 2015.
[83] Condition status taken from Natural England data on 17th June 2019.

Conservation Objectives[84]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of the habitats of qualifying species • The structure and function of the habitats of qualifying species • The supporting processes on which the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.

Overstrand Cliffs SAC		
Site description summary	**Qualifying features**[85]	
Vegetated soft cliffs composed of Pleistocene clays and sands, subject to common cliff-falls and landslips. Vegetation undergoes cycles whereby ruderal-dominated communities develop on the newly exposed sands and mud, succeeded by more stable grassland and scrub vegetation. In areas where freshwater seepages occur there are fen communities and occasional perched reedbeds. The diverse range of habitats support a large number of invertebrate species.	1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts
Component SSSI/s[86]		
Overstrand Cliffs SSSI	Covers 57.75ha and contains 2 units. 100% of area in Favourable condition.	
Conservation Objectives[87]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of the qualifying natural habitats • The structure and function (including typical species) of the qualifying natural habitats, and • The supporting processes on which the qualifying natural habitats rely.	

Waveney & Little Ouse Valley Fens SAC		
Site description summary	**Qualifying features**[88]	
Calcareous fen containing extensive beds of great fen-sedge *Cladium mariscus*. Purple moor-grass – meadow thistle *Molinia caerulea* – *Cirsium dissectum* fen-meadows, associated with the spring-fed valley fen systems, occur	6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

[84] Taken from Natural England's European Site Conservation Objectives for Paston Great Barn SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[85] Taken from the Natura 2000 Standard data form for site UK0030232 Overstrand Cliffs SAC dated December 2015.
[86] Condition status taken from Natural England data on 17th June 2019.
[87] Taken from Natural England's European Site Conservation Objectives for Overstrand Cliffs SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[88] Taken from the Natura 2000 Standard data form for site UK0012882 Waveney and Little Ouse Valley Fens SAC dated December 2015.

in conjunction with black bog-rush – blunt-flowered rush *Schoenus nigricans – Juncus subnodulosus* mire and calcareous fens with great fen-sedge. Grazed areas of fen-meadow are more species-rich, and frequently support southern marsh-orchid *Dactylorhiza praetermissa*.	7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae
	1016	Vertigo moulinsiana (Desmoulin's whorl snail)
Component SSSI/s[89]		
Blo' Norton and Thelnetham Fen SSSI	Covers 21.32ha and contains 6 units. 35.08% of area in Favourable condition, 64.92% of area in Unfavourable-Recovering condition.	
Redgrave and Lopham Fens SSSI	Covers 127.03ha and contains 4 units. 100% of area in Unfavourable-Recovering condition.	
Weston Fen SSSI	Covers 49.73ha and contains 10 units. 49.79% of area in Favourable condition, 33.02% of area in Unfavourable-Recovering condition, 17.19% of area in Unfavourable-No change condition.	
Conservation Objectives[90]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.	

Redgrave and South Lopham Fens Ramsar	
Site description summary	**Qualifying features**[91]
An extensive area of spring-fed valley fen at the headwaters of the River Waveney which supports a variety of fen plant community types, including *Molinia*-based grasslands, mixed sedge-fen, and reed-dominated fen. Small areas of wet heath, sallow carr, and birch woodland also occur, and the Site is known to support the fen raft spider *Dolomedes plantarius*.	The site is an extensive example of spring-fed lowland base-rich valley, remarkable for its lack of fragmentation.
	The site supports many rare and scarce invertebrates, including a population of the fen raft spider *Dolomedes plantarius*. This spider is also considered vulnerable by the IUCN Red List.

[89] Condition status taken from Natural England data on 17th June 2019.
[90] Taken from Natural England's European Site Conservation Objectives for Waveney and Little Ouse Valley Fens SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[91] Taken from the Ramsar Information Sheet for Redgrave and South Lopham Fen Ramsar dated May 2005.

	The site supports many rare and scarce invertebrates, including a population of the fen raft spider *Dolomedes plantarius*. The diversity of the site is due to the lateral and longitudinal zonation of the vegetation types characteristic of valley mires.
Component SSSI/s[92]	
Redgrave and Lopham Fens SSSI	Covers 127.03ha and contains 4 units. 100% of area in Unfavourable-Recovering condition.
Conservation Objectives	
n/a	

Breckland SPA/SAC		
Site description summary	**SPA qualifying features**[93]	
A gently rolling plateau underlain by cretaceous chalk bedrock covered with thin deposits of sand and flint. The climate and free-draining soils has produced dry heath and grassland communities. Pingos with biological interest occur in some areas. The highly variable soils of Breckland, with underlying chalk being largely covered with wind-blown sands, have resulted in mosaics of heather-dominated heathland, acidic grassland and calcareous grassland that are unlike those of any other site. Breckland is the most extensive surviving area of the rare sheep's fescue – mouse-ear hawkweed – wild thyme *Festuca ovina – Hieracium pilosella – Thymus praecox* grassland type. A number of the water bodies within the site support populations of amphibians, including great crested newts *Triturus cristatus*.	A133	Burhinus oedicnemus (Stone Curlew) (breeding)
	A224	Caprimulgus europaeus (Nightjar) (breeding)
	A246	Lullula arborea (Woodlark) (breeding)
	SAC qualifying features[94]	
	2330	Inland dunes with open Corynephorus and Agrostis grasslands
	3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
	4030	European dry heaths
	6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	1308	Barbastella barbastellus (Barbastelle bat)
	1166	Triturus cristatus (Great Crested Newt)

[92] Condition status taken from Natural England data on 17th June 2019.
[93] Taken from the Natura 2000 Standard data form for site UK9009201 Breckland SPA dated December 2015.
[94] Taken from the Natura 2000 Standard data form for site UK0019865 Breckland SAC dated December 2015.

Component SSSI/s[95] (within SPA, SAC or both)	
Barnham Heath SSSI	Covers 78.62ha and contains 2 units. 89.45% of area in Favourable condition, 10.55% of area in Unfavourable-Recovering condition.
Barnhamcross Common SSSI	Covers 69.08ha and contains 2 units. 100% of area in Unfavourable-Recovering condition.
Berner's Heath, Icklingham SSSI	Covers 235.86ha and contains 3 units. 97.09% of area in Favourable condition, 2.91% of area destroyed.
Breckland Farmland SSSI	Covers 13392.36ha and contains 70 units. 100% of area in Favourable condition.
Breckland Forest SSSI	Covers 18125.99ha and contains 7 units. 0.09% of area in Favourable condition, 99.91% of area in Unfavourable-Recovering condition.
Bridgham & Brettenham Heaths SSSI	Covers 439.91ha and contains 6 units. 12.75% of area in Favourable condition, 87.25% of area in Unfavourable-Recovering condition.
Cavenham – Icklingham Heaths SSSI	Covers 419.01ha and contains 27 units. 30.59% of area in Favourable condition, 65.03% of area in Unfavourable-Recovering condition, 1.78% of area in Unfavourable-No change condition. 2.59% destroyed.
Cranberry Rough, Hockham SSSI	Covers 81.13ha and contains 4 units. 21.62% of area in Favourable condition, 78.38% of area in Unfavourable-Recovering condition.
Cranwich Camp SSSI	Covers 13.10ha and contains 1 unit. 100% of area in Unfavourable-Recovering condition.
Deadman's Grave, Icklingham SSSI	Covers 127.33ha and contains 6 units. 14.17% of area I Favourable condition, 83.80% of area in Unfavourable-Recovering condition, 2.03% of area in Unfavourable-Declining condition.
East Wretham Heath SSSI	Covers 141.05ha and contains 6 units. 7% of area in Favourable condition, 89.08% of area in Unfavourable-Recovering condition, 3.92% of area in Unfavourable-Declining condition.
Eriswell Low Warren SSSI	Covers 7.42ha and contains 1 unit. 100% of area in Favourable condition.
Field Barn Heaths, Hilborough SSSI	Covers 17.86ha and contains 1 unit. 100% of area in Unfavourable-Recovering condition.
Foxhole Heath, Eriswell SSSI	Covers 85.17ha and contains 1 unit. 100% of area in Favourable condition.
Gooderstone Warren SSSI	Covers 21.63ha and contains 4 units. 100% of area in Unfavourable-Recovering condition.
Grime's Graves SSSI	Covers 66.12ha and contains 3 units. 26.79% of area in Favourable condition, 73.21% of area in Unfavourable-Recovering condition.
How Hill Track SSSI	Covers 3.11ha and contains 1 unit. 100% of area in Favourable condition.
Lakenheath Warren SSSI	Covers 588.33ha and contains 11 units. 1.62% of area in Favourable condition, 63.40% of area in

[95] Condition status taken from Natural England data via Magic Map on 3 December 2019.

	Unfavourable-Recovering condition, 34.99% of area in Unfavourable-No change condition.
RAF Lakenheath SSSI	Covers 111ha and contains 4 units. 100% of area in Favourable condition.
Little Heath, Barnham SSSI	Covers 46.25ha and contains 3 units. 13.52% of area in Favourable condition, 2.59% of area in Unfavourable-Recovering condition, 83.89% of area in Unfavourable-Declining condition.
Old Bodney Camp SSSI	Covers 32.76ha and contains 2 units. 100% of area in Favourable condition.
Rex Graham Reserve SSSI	Covers 2.76ha and contains 1 unit. 100% of area in Favourable condition.
Stanford Training Area SSSI	Covers 4677.96ha and contains 81 units. 42.12% of area in Favourable condition, 54.71% of area in Unfavourable-Recovering condition, 3.12% of area in Unfavourable-No change condition, 0.05% of area in Unfavourable-Declining condition.
Thetford Golf Course & Marsh SSSI	Covers 122.30ha and contains 8 units. 3.12% of area in Favourable condition, 67.83% of area in Unfavourable-Recovering condition, 29.05% of area in Unfavourable-No change condition.
Thetford Heaths SSSI	Covers 270.58ha and contains 4 units. 36.32% of area in Favourable condition, 57.06% of area in Unfavourable-Recovering condition, 6.62% of area in Unfavourable-No change condition.
Wangford Warren and Carr SSSI	Covers 67.79ha and contains 5 units. 22.65% of area in Favourable condition, 77.35% of area in Unfavourable-Recovering condition.
Weather and Horn Heaths, Eriswell SSSI	Covers 133.32ha and contains 3 units. 97.77% of area in Unfavourable-Declining condition, 2.23% of area Partially destroyed.
Weeting Heath SSSI	Covers 141.75ha and contains 6 units. 40.15% of area in Favourable condition, 38.97% of area in Unfavourable-Recovering condition, 20.88% of area in Unfavourable-No change condition.
West Stow Heath SSSI	Covers 44.30ha and contains 5 units. 14.51% of area in Favourable condition, 85.49% of area in Unfavourable-Recovering condition.
SPA Conservation Objectives[96]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;	• The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and,

[96] Taken from Natural England's European Site Conservation Objectives for Breckland SPA dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.

	• The distribution of the qualifying features within the site
SAC Conservation Objectives[97]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.

Benacre to Easton Bavents Lagoons SAC/Benacre to Easton Bavents SPA		
Site description summary	**SAC qualifying features**[98]	
Situated on the east coast of Suffolk, this site includes semi-natural broadleaved woodland, tall fen vegetation, shingle, dunes and grassland, saltmarsh and coastal lagoons. The habitats are important for breeding, wintering and passage birds. There are a series of percolating lagoons that have formed behind shingle barriers and are a feature of a geomorphologically dynamic system. The site supports a number of specialist lagoonal species. The SPA is part of the Benacre to Easton Bavents European Marine Site.	1150	Coastal lagoons
	91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	SPA qualifying features[99]	
	A021	Botaurus stellaris (Bittern) (breeding)
	A081	Circus aeruginosus (Marsh Harrier) (breeding)
	A195	Sterna albifrons (Little Tern) (breeding)
Component SSSI/s[100]		
Pakefield to Easton Bavents SSSI	Covers 735.45ha and contains 51 units. 48.73% of area in Favourable condition, 38.98% of area in Unfavourable-Recovering condition, 8.73% of area in Unfavourable-No change condition, 3.11% Unfavourable-Declining condition, 0.45% of area Partially destroyed.	
SAC Conservation Objectives[101]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its	• The extent and distribution of qualifying natural habitats • The structure and function (including typical species) of qualifying natural habitats, and	

[97] Taken from Natural England's European Site Conservation Objectives for Breckland SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[98] Taken from the Natura 2000 Standard data form for site UK0013104 Benacre to Easton Bavents Lagoons SAC dated December 2015.
[99] Taken from the Natura 2000 Standard data form for site UK9009291 Benacre to Easton Bavents SPA dated December 2015.
[100] Condition status taken from Natural England data on 17th June 2019.
[101] Taken from Natural England's European Site Conservation Objectives for Benacre to Easton Bavents Lagoons SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.

Qualifying Features, by maintaining or restoring;	• The supporting processes on which qualifying natural habitats rely.
SPA Conservation Objectives[102]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;	• The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

Dew's Ponds SAC		
Site description summary	**Qualifying features**[103]	
A series of 12 ponds located in rural East Suffolk, in formerly predominantly arable land. Great Crested Newt has been found in all ponds. Some of the arable land has been converted to grassland and there are also hedgerows and ditches.	1166	Triturus cristatus (Great Crested Newt)
Component SSSI/s[104]		
Dew's Ponds SSSI	Covers 6.72ha and contains 4 units. 100% of area in Favourable condition.	
Conservation Objectives[105]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of the habitats of qualifying species • The structure and function of the habitats of qualifying species • The supporting processes on which the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.	

The Wash and North Norfolk Coast SAC (inshore)		
Site description summary	**Qualifying features**[106]	
The Wash is the largest embayment in the UK and is connected to the North Norfolk Coast	1110	Sandbanks which are slightly covered by sea water all the time

[102] Taken from Natural England's European Site Conservation Objectives for Benacre to Easton Bavents SPA dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice, and should be used in conjunction with the Regulation 35 Conservation Advice Package for the EMS.
[103] Taken from the Natura 2000 Standard data form for site UK0030133 Dew's Ponds SAC dated December 2015.
[104] Condition status taken from Natural England data on 17th June 2019.
[105] Taken from Natural England's European Site Conservation Objectives for Dew's Ponds SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice.
[106] Taken from the Natura 2000 Standard data form for site UK0017075 The Wash and North Norfolk Coast SAC dated December 2015.

via sediment transfer systems. Together The Wash and North Norfolk Coast form one of the most important marine areas in the UK and European North Sea coast, and include extensive areas of varying, but predominantly sandy, sediments subject to a range of conditions. Communities in the intertidal include those characterised by large numbers of polychaetes, bivalve and crustaceans. Subtidal communities cover a diverse range from the shallow to the deeper parts of the embayments and include dense brittlestar beds and areas of an abundant reef-building worm ('ross worm') Sabellaria spinulosa. The embayment supports a variety of mobile species, including a range of fish, otter Lutra lutra and common seal Phoca vitulina. The extensive intertidal flats provide ideal conditions for common seal breeding and hauling-out. This SAC is part of The Wash and North Norfolk Coast European Marine Site.	1140	Mudflats and sandflats not covered by seawater at low tide
	1150	Coastal lagoons
	1160	Large shallow inlets and bays
	1170	Reefs
	1310	Salicornia and other annuals colonizing mud and sand
	1320	Spartina swards (Spartinion maritimae)
	1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
	1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)
	1364	Halichoerus grypus (Grey Seal)
	1355	Lutra lutra (Eurasian Otter)
	1365	Phoca vitulina (Harbour/Common Seal)
Component SSSI/s		
The Wash SSSI	62045.64ha of which 67.98 is favourable, and 31.61% is unfavourable recovering. 0.41% of the area is unfavourable declining.	
Conservation Objectives[107]		
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of the habitats of qualifying species • The structure and function of the habitats of qualifying species • The supporting processes on which the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.	

North Norfolk Coast SPA (marine)/SAC (inshore)/Ramsar		
Site description summary	**SAC qualifying features**[108]	
Important within Europe as one of the largest areas of undeveloped coastal habitat of its type, supporting intertidal mudflats and sandflats, coastal waters, saltmarshes, shingle, sand dunes, freshwater grazing marshes, and reedbeds. Large numbers of waterbirds use the Site throughout the year. In Summer, the Site and surrounding area are important for breeding populations of four species of tern, waders, bittern *Botaurus stellaris*, and wetland raptors including marsh harrier *Circus aeruginosus*. In Winter, the Site	1150	Coastal lagoons
	1220	Perennial vegetation of stony banks
	1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)
	2110	Embryonic shifting dunes
	2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")

[107] Taken from Natural England's European Site Conservation Objectives for The Wash and North Norfolk SAC dated 30th June 2014- version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice, and should be used in conjunction with the Regulation 35 Conservation Advice Package for the EMS.

[108] Taken from the Natura 2000 Standard data form for site UK0019838 North Norfolk Coast SAC dated December 2015.

supports large numbers of geese, sea ducks, other ducks and waders using the Site for roosting and feeding. The Site is also important for migratory species during the Spring and Autumn. This SAC is part of the North Norfolk Coast European Marine Site. The SPA is designated for supporting a number of rare or vulnerable (Article 4.1) Annex I bird species during the breeding season. In addition, the SPA is designated for supporting regularly occurring migratory (Article 4.2) species during the breeding season and over winter. This SPA is part of The Wash and North Norfolk Coast European Marine Site (EMS).	2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")
	2160	Dunes with Hippophae rhamnoides
	2190	Humid dune slacks
	1355	Lutra Lutra (Eurasian Otter)
	1395	Petallophyllum ralfsii (Petalwort)
	1166	Triturus cristatus (Great Crested Newt)
	SPA qualifying features[109]	
	A040	Anser brachyrhynchus (Pink-footed Goose) (over winter)
	A050	Anas penelope (Wigeon) (over winter)
	A021	Botaurus stellaris (Bittern) (breeding)
	A675	Branta bernicla bernicla (Dark-bellied Brent Goose) (over winter)
	A143	Callidris canutus (Red Knot) (over winter)
	A081	Circus aeruginosus (Marsh Harrier) (breeding)
	A132	Recurvirostra avosetta (Avocet) (breeding and over winter)
	A195	Sterna albifrons (Little Tern) (breeding)
	A193	Sterna hirundo (Common tern) (breeding)
	A191	Sterna sandvicensis (Sandwich Tern) (breeding)
	WATR	Waterfowl assemblage
	Ramsar qualifying features[110]	
	The site is one of the largest expanses of undeveloped coastal habitat of its type in Europe. It is a particularly good example of a marshland coast with intertidal sand and mud, saltmarshes, shingle banks and sand dunes. There are a series of brackish-water lagoons and extensive areas of freshwater grazing marsh and reed beds.	
	Supports at least three British Red Data Book and nine nationally scarce vascular plants, one British Red Data Book lichen and 38 British Red Data Book invertebrates.	
	98462 waterfowl peak count in winter (assemblages of international importance)	
	Sterna sandvicensis (Sandwich Tern) (breeding)	
	Sterna hirundo (Common Tern) (breeding)	
	Sterna albifrons (Little Tern) (breeding)	

[109] Taken from the Natura 2000 Standard data form for site UK9009031 North Norfolk Coast SPA dated December 2015.
[110] Taken from the Ramsar Information Sheet for North Norfolk Coast dated 13-06-08.

	Calidris canutus (Red Knot) (over winter)
	Anser brachyrhynchus (Pink-footed Goose) (over winter)
	Branta bernicla bernicla (Dark-bellied Brent goose) (over winter)
	Anas penelope (Wigeon) (over winter)
	Anas acuta (Pintail) (over winter)
Component SSSI/s[111]	
North Norfolk Coast SSSI	Covers 7862.29ha and contains 70 units. 97.82% of area in Favourable condition, 2.18% of area in Unfavourable-Recovering condition.
SAC Conservation Objectives[112]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;	• The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.
SPA Conservation Objectives[113]	
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;	• The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

Southern North Sea cSAC (offshore and inshore)		
Site description summary	**Qualifying features**[114]	
The Southern North Sea site has been recognised as 'an area of predicted persistent high densities of harbour porpoise'. Therefore, the Southern North Sea site has been submitted to the EU and is a candidate for designation as an Inshore and	1351	Phocoena phocoena (Harbour Porpoise)

[111] Condition status taken from Natural England data on 17th June 2019.
[112] Taken from Natural England's European Site Conservation Objectives for North Norfolk Coast SAC dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice, and should be used in conjunction with the Regulation 35 Conservation Advice Package for the EMS.
[113] Taken from Natural England's European Site Conservation Objectives for North Norfolk Coast SPA dated 30th June 2014-version 2. Should be read in conjunction with the accompanying Supplementary Advice document which provides more detailed advice, and should be used in conjunction with the Regulation 35 Conservation Advice Package for the EMS.
[114] Taken from the Natura 2000 Standard Data Form for Site UK0030395 Southern North Sea SCI dated January 2017.

Offshore SAC for the Annex II species, Harbour Porpoise. The Southern North Sea site extends down the North Sea from the River Tyne, south to the River Thames. The aim of the SAC is to support the maintenance of harbour porpoise populations throughout UK waters (the Southern North Sea supports higher number of porpoises compared to many other parts of their UK range). Seasonal differences in the use of the site by harbour porpoises which show the elevated densities of the species in some parts of the site compared to others during the summer and winter, have been identified. The main threats to harbour porpoise are from incidental catch, pollution and noise/physical disturbance.		
Component SSSI/s		
n/a		
Conservation Objectives[115]		
The focus of the Conservation Objectives for harbour porpoise sites is on addressing pressures that affect site integrity and would include:	• killing or injuring significant numbers of harbour porpoise (directly or indirectly); • preventing their use of significant parts of the site (disturbance / displacement); • significantly damaging relevant habitats; or • significantly reducing the prey base.	
The Conservation Objectives document also contains the following guidance:	The seasonality in porpoise distribution should be considered in the assessment of impacts and proposed management.	

Outer Thames Estuary SPA (marine)/Outer Thames Estuary Extension pSAC (marine)		
Site description summary	**Qualifying features**[116]	
This SPA is entirely marine and is designated because its habitats support 38% of the Great British population of over-wintering Red-throated Diver *Gavia stellata*, a qualifying species under Article 4.1 of the Birds Directive. The Outer Thames Estuary SPA covers vast areas of marine habitat off the east coast between Caister-on-Sea, Norfolk in the north, down to Margate, Kent in the south. The habitats covered by the SPA include marine areas and sea inlets where Red-throated Diver is particularly susceptible to noise and visual disturbance e.g. from wind farms and coastal recreation activities. Threats from effluent discharge, oil spillages and entanglement/drowning in fishing nets are significant.	A001	Gavia stellata (Red-throated Diver) (over winter)

[115] Taken from Natural England's Harbour Porpoise (*Phocoena phocoena*) possible Special Area of Conservation: Southern North Sea Draft Conservation Objectives and Advice on Activities dated January 2016.
[116] Taken from the Natura 2000 Standard Data Form for Site UK9020309 Outer Thames Estuary SPA dated December 2015.

The addition of two new protected features and associated boundary amendments was consulted on in January to July 2016. The proposed extension would afford protection for Little tern and Common tern foraging areas, enhancing protection already afforded to their feeding and nesting areas in the adjacent coastal SPAs (Foulness SPA, Breydon Water SPA and Minsmere to Walberswick SPA).	
Component SSSI/s	
n/a	
Conservation Objectives[117]	
Subject to natural change, maintain or enhance the red-throated diver population and its supporting habitats in favourable condition.	

Haisborough, Hammond and Winterton SAC		
Site description summary	**Qualifying features**[118]	
The site lies off the north east coast of Norfolk and contains a series of sandbanks as well as Sabellaria spinulosa reefs. Small numbers of Harbour Porpoise are regularly observed within the site boundary and a large colony of breeding Grey Seal is known adjacent to the site.	1110	Sandbanks which are slightly covered by sea water all the time
	1170	Reefs
	1364	Halichoerus grypus (Grey Seal)
	1351	Phocoena phocoena (Harbour Porpoise)
Component SSSI/s		
n/a		
Conservation Objectives[119]		
For Annex 1 sandbanks which are slightly covered by seawater all the time:	Subject to natural change maintain the sandbanks in favourable condition, in particular the sub-features: • Low diversity dynamic sand communities • Gravelly muddy sand communities	
For Annex 1 Sabellaria spinulosa reefs:	Subject to natural change maintain or restore the reefs in favourable condition	

[117] Taken from Natural England's Draft advice under Regulation 35(3) of The Conservation of Habitats and Species Regulations 2010 (as amended) and Regulation 18 of The Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended) for Outer Thames Estuary SPA Version 3.7 March 2013.

[118] Taken from the Natura 2000 Standard data form for site UK0030369 Haisborough, Hammond and Winterton SAC dated December 2015.

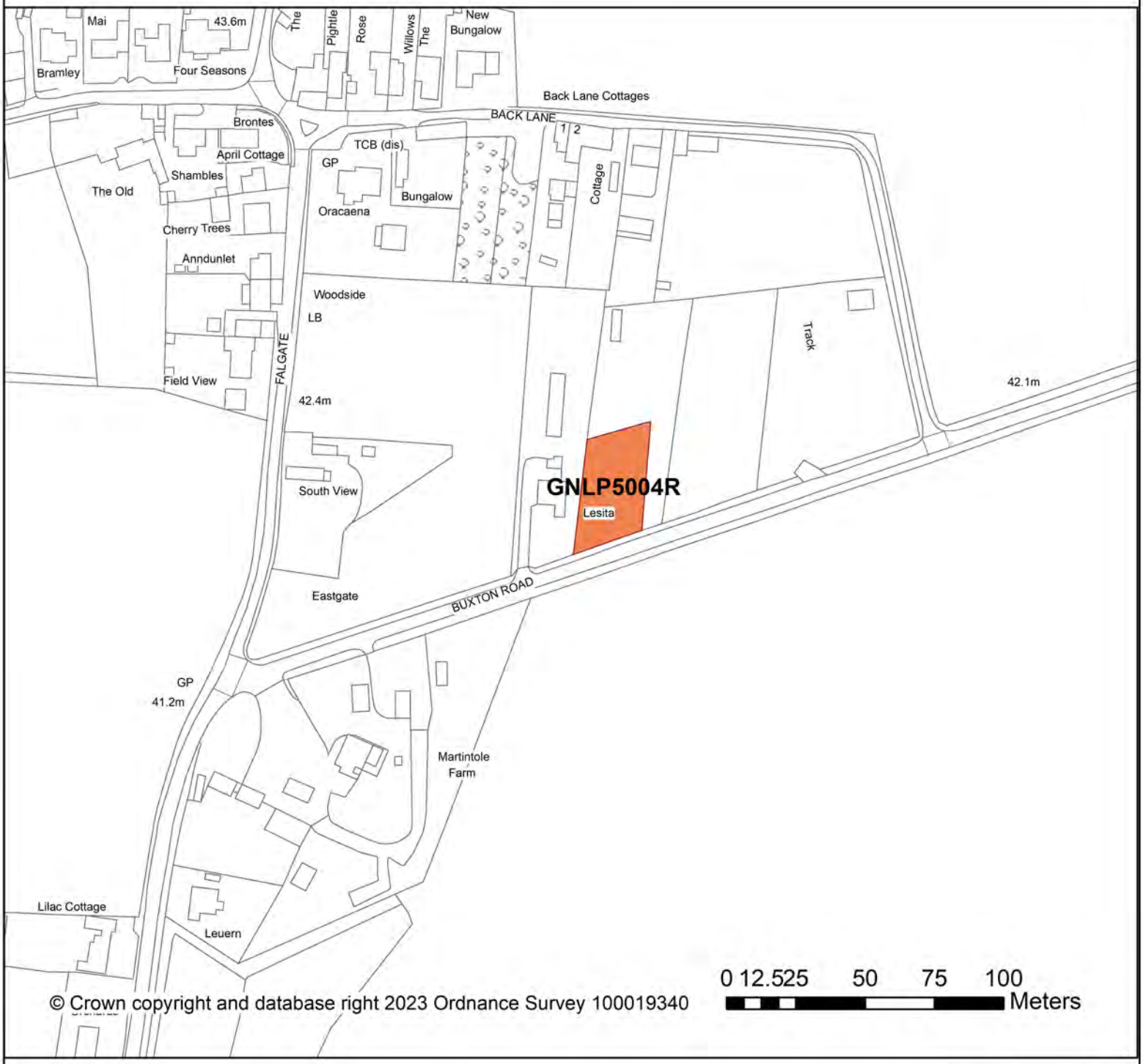
[119] Taken from JNCC and Natural England's Haisborough, Hammond and Winterton candidate Special Area of Conservation Formal advice under Regulation 35(3) of The Conservation of Natural Habitats and Species Regulations 2010 (as amended), and Regulation 18 of The Offshore Marine Conservation Regulations (Natural Habitats,&c.) Regulations 2007 (as amended). Version 6.0 (March 2013).

Appendix 2

CAWSTON

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference: GNLP5004R
Location: Land off Buxton Road, Eastgate, Cawston
Description: 4 residential pitches for Gypsies and Travellers
Site Area: 0.09 ha



Scale at A4:
1:2,000

N

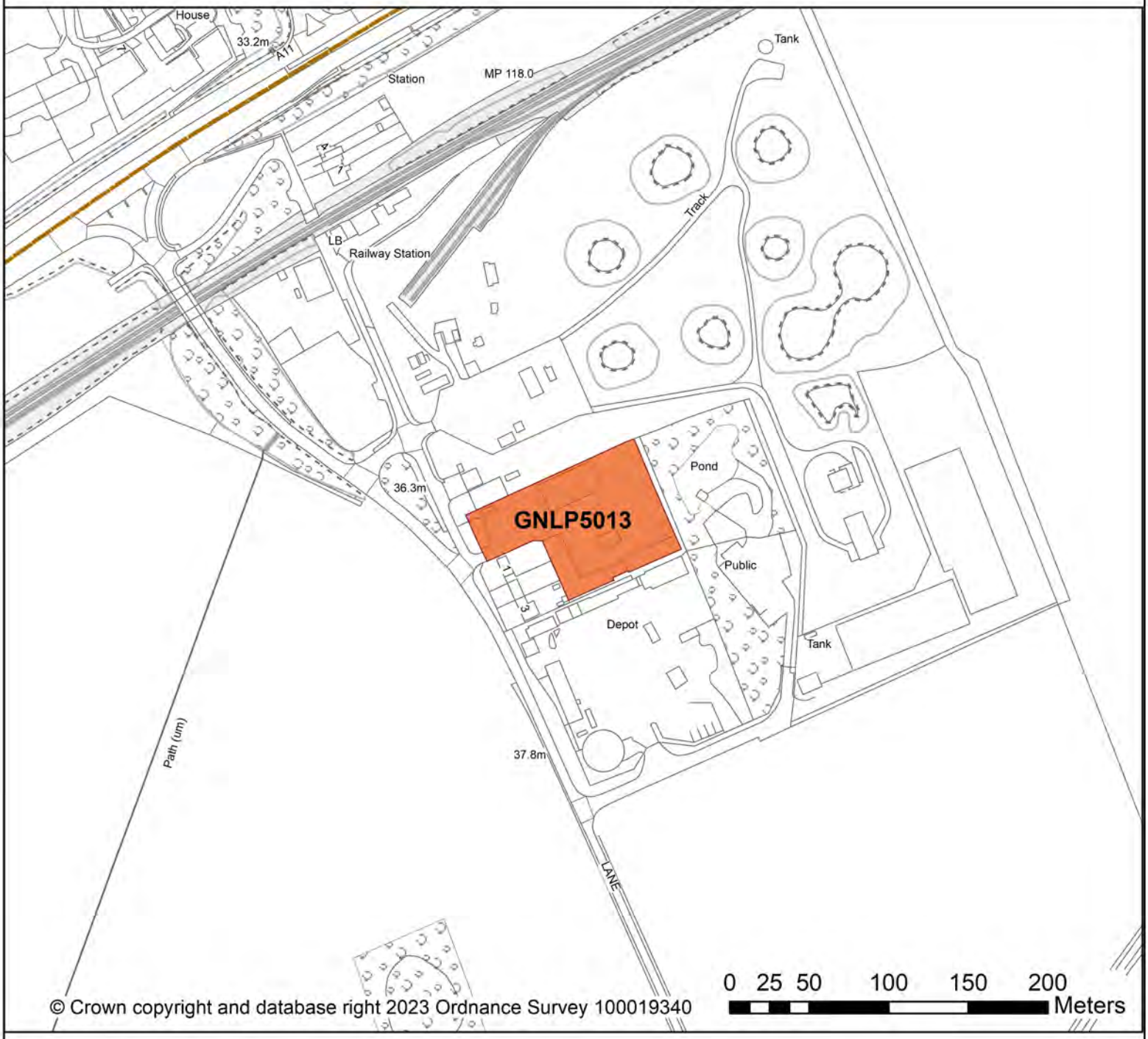
Gypsy and Traveller Site

Date: 02/05/2023

KETTERINGHAM

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference: GNLP5013
Location: Land at Ketteringham Depot
Description: 10 residential pitches for Gypsies and Travellers
Site Area: 0.7 ha



Gypsy and Traveller Site

Parish Boundary

Scale at A4:
1:3,500

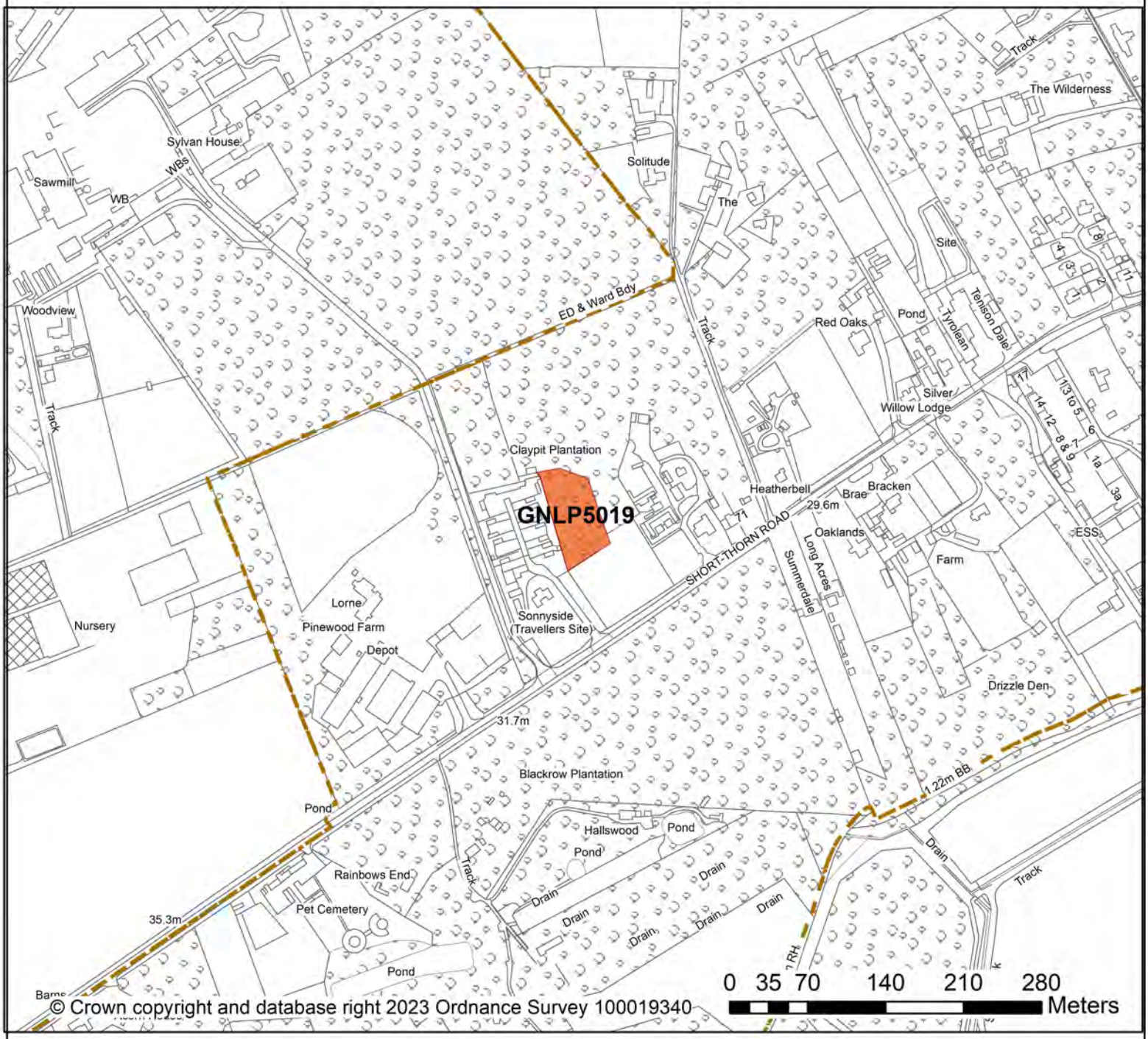
N

Date: 28/04/2023

STRATTON STRAWLESS

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference: GNLP5019
Location: Land at Woodland Stable, Shortthorn Road, Stratton Strawless
Description: 8 additional residential pitches for Gypsies and Travellers
Site Area: 0.33 ha



Gypsy and Traveller Site

Parish Boundary

Scale at A4:
1:5,000

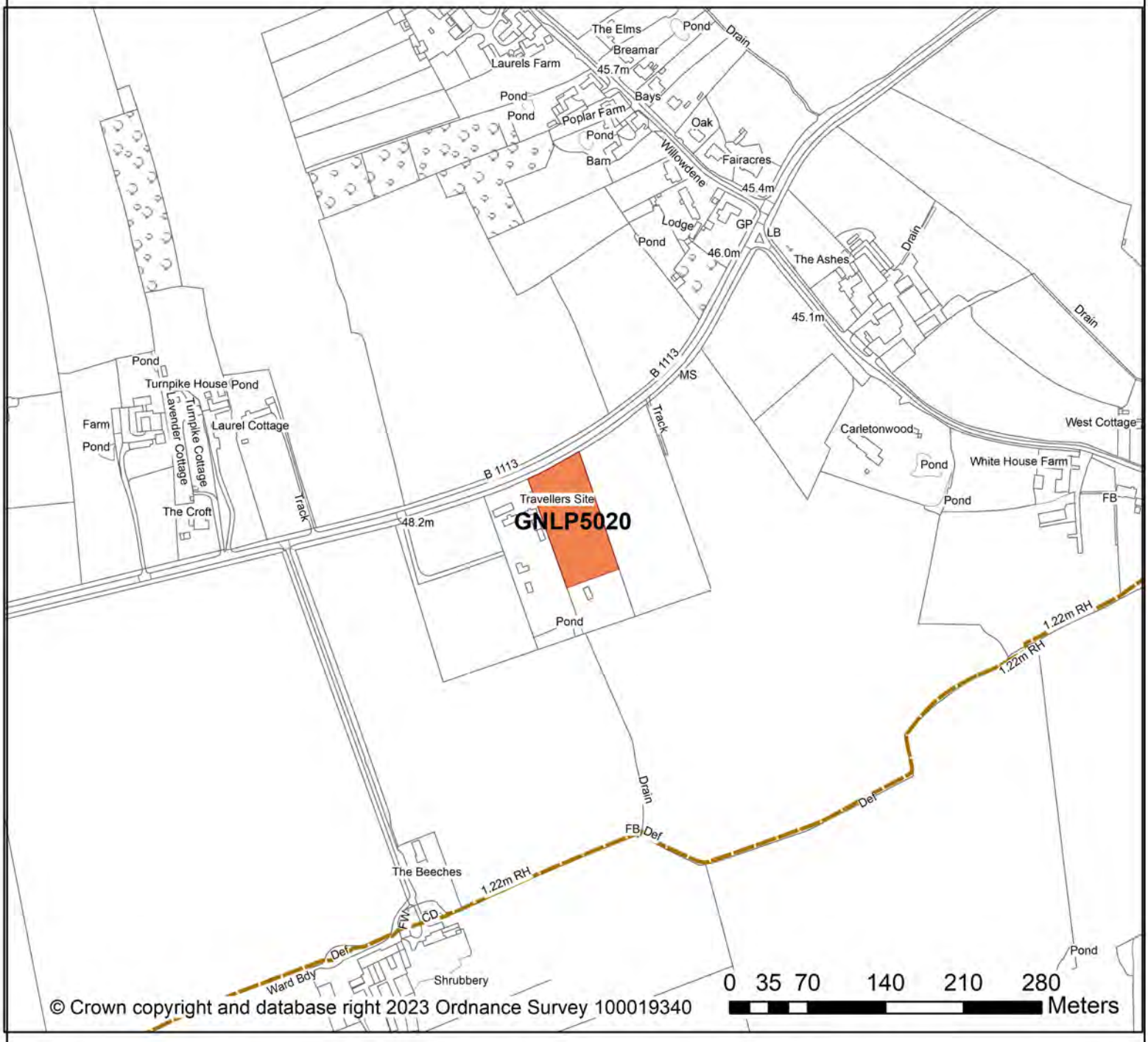
N

Date: 28/04/2023

CARLETON RODE

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference: GNLP5020
Location: Land at Romany Meadow, The Turnpike, Carleton Rode
Description: 6 additional residential pitches for Gypsies and Travellers
Site Area: 0.54 ha



Gypsy and Traveller Site

Parish Boundary

Scale at A4:
1:5,000

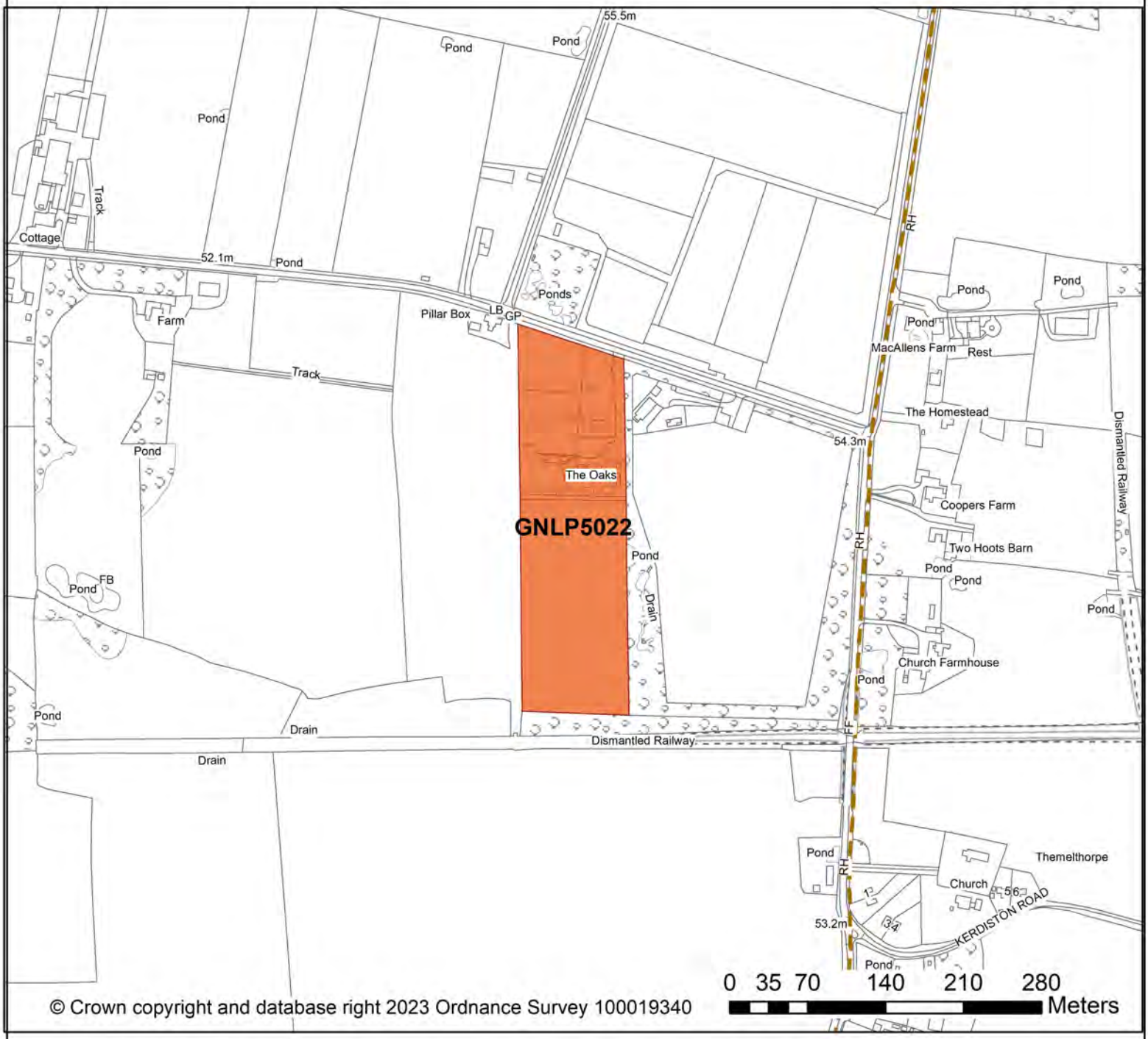
N

Date: 28/04/2023

FOULSHAM

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference:	GNLP5022
Location:	Land at The Oaks, Foulsham
Description:	5 additional residential pitches for Gypsies and Travellers
Site Area:	3.1 ha



Gypsy and Traveller Site

Parish Boundary

Scale at A4:
1:5,000

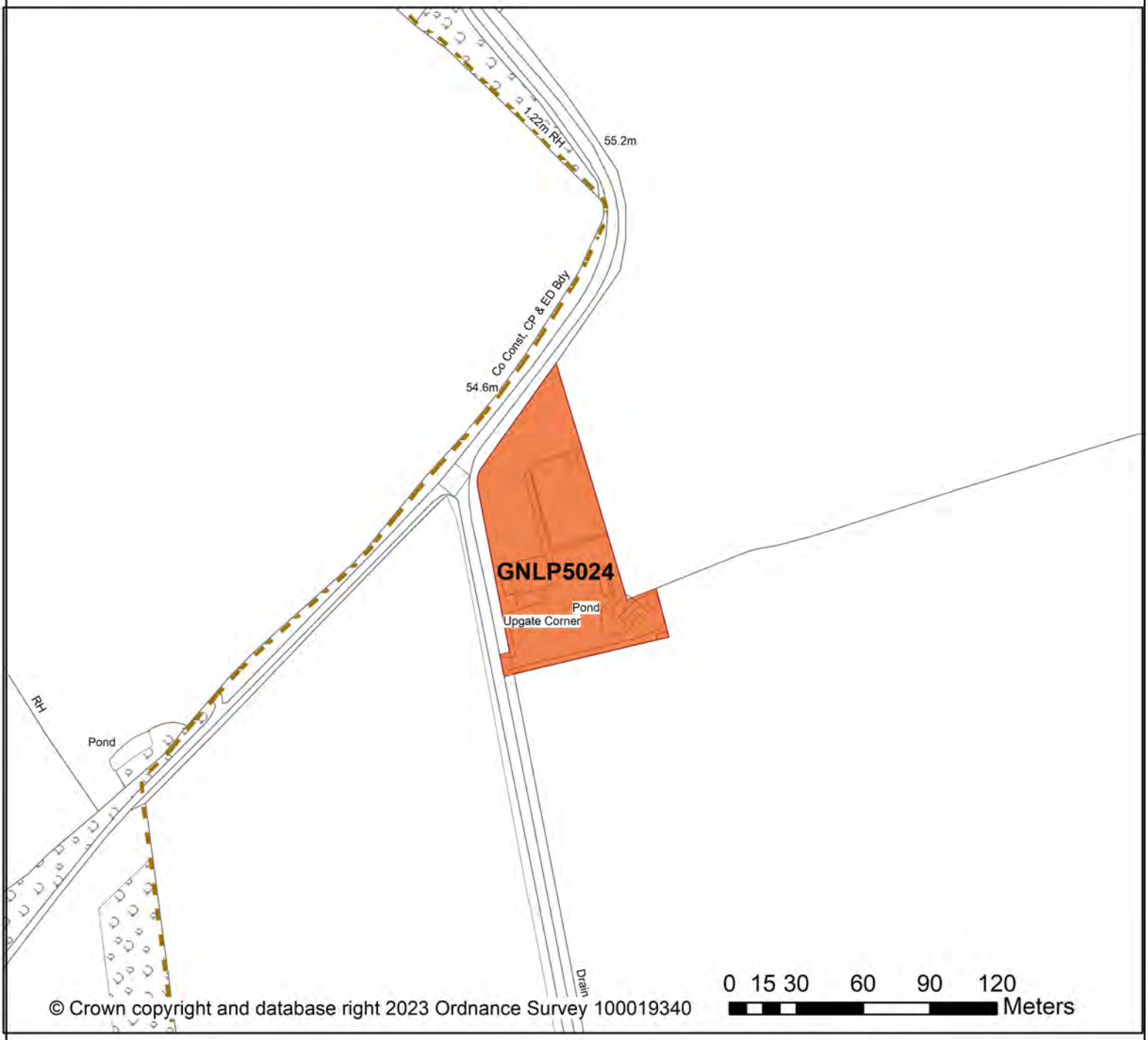
N

Date: 28/04/2023

CARLETON RODE

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference:	GNLP5024
Location:	Land at Upgate Street, Carleton Rode
Description:	4 additional residential pitches for Gypsies and Travellers
Site Area:	0.62 ha



Gypsy and Traveller Site

Parish Boundary

Scale at A4:
1:2,500

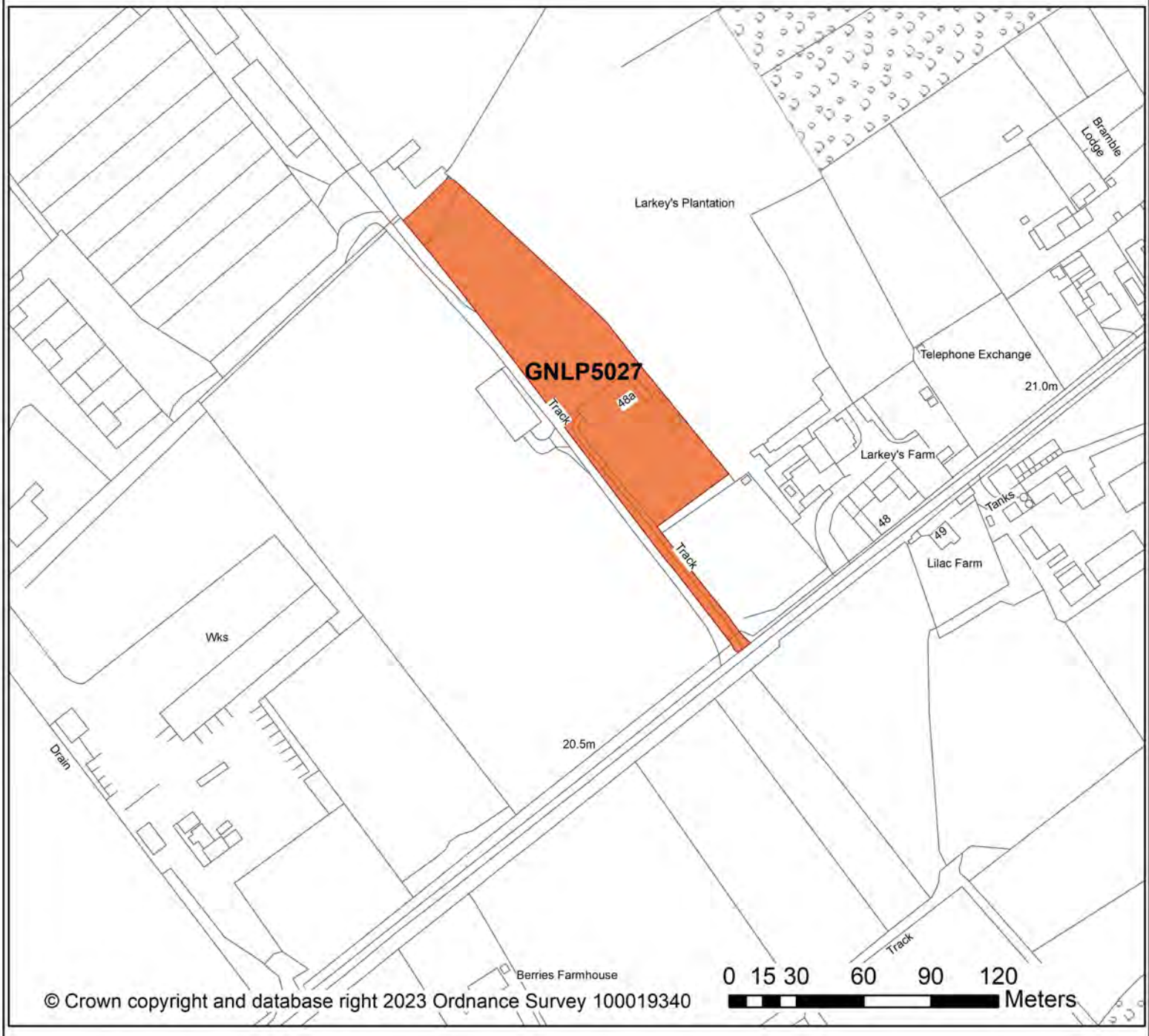
N

Date: 28/04/2023

HEVINGHAM

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference:	GNLP5027
Location:	Land Adjacent to Larkeys Farm, Brick Kiln Road, Hevingham
Description:	5 additional residential pitches for Gypsies and Travellers
Site Area:	0.75 ha



Scale at A4:
1:2,500

N

Gypsy and Traveller Site

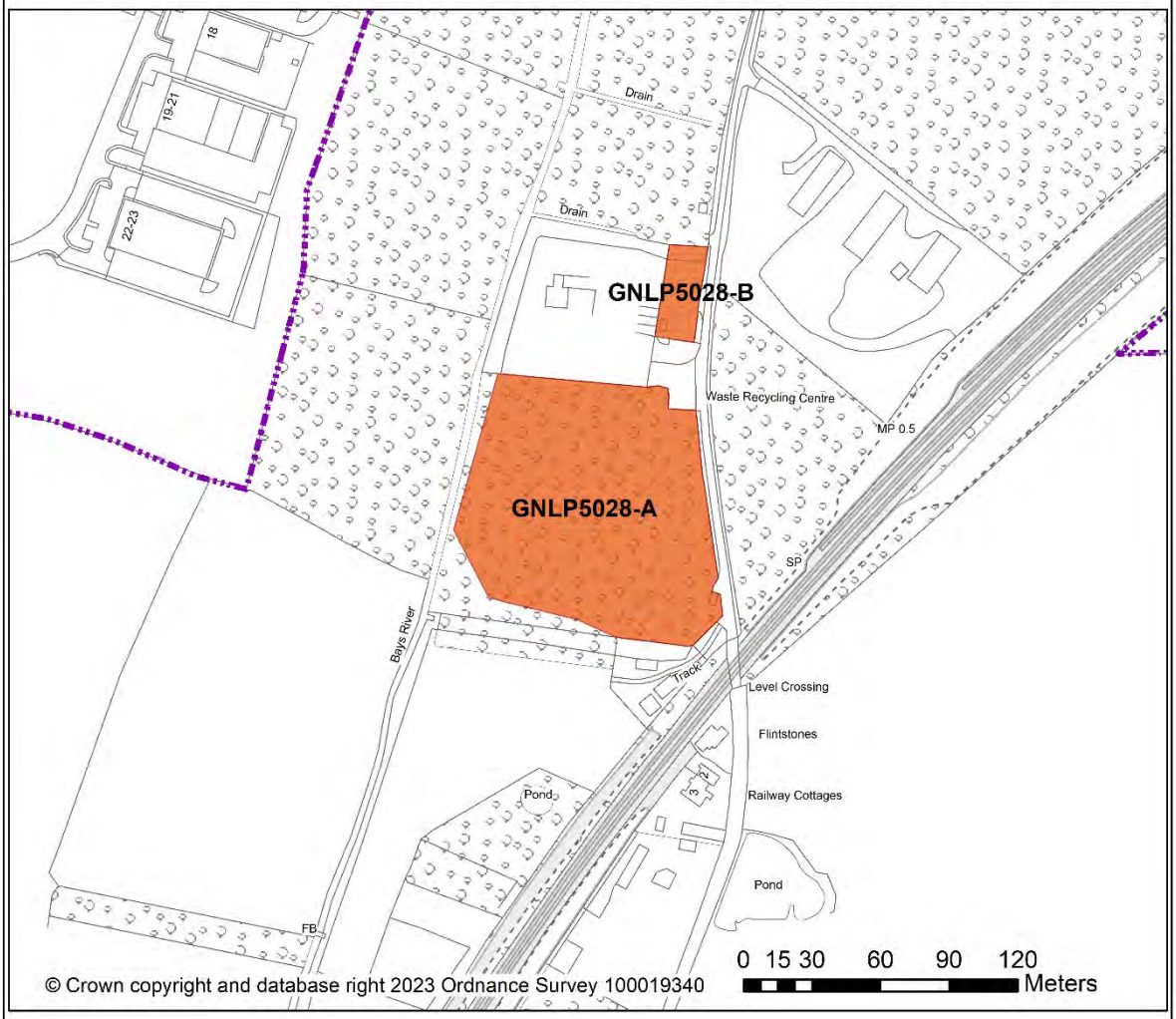
Date: 28/04/2023

WYMONDHAM

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference: GNLP5028 - A & B
Location: Site at Strayground Lane, Wymondham
Description: 12 residential pitches for Gypsies and Travellers

Site Areas: Part A: 1.1 ha
Part B: 0.07ha



Gypsy and Traveller Site

Settlement Boundary

Scale at A4:
1:2,500

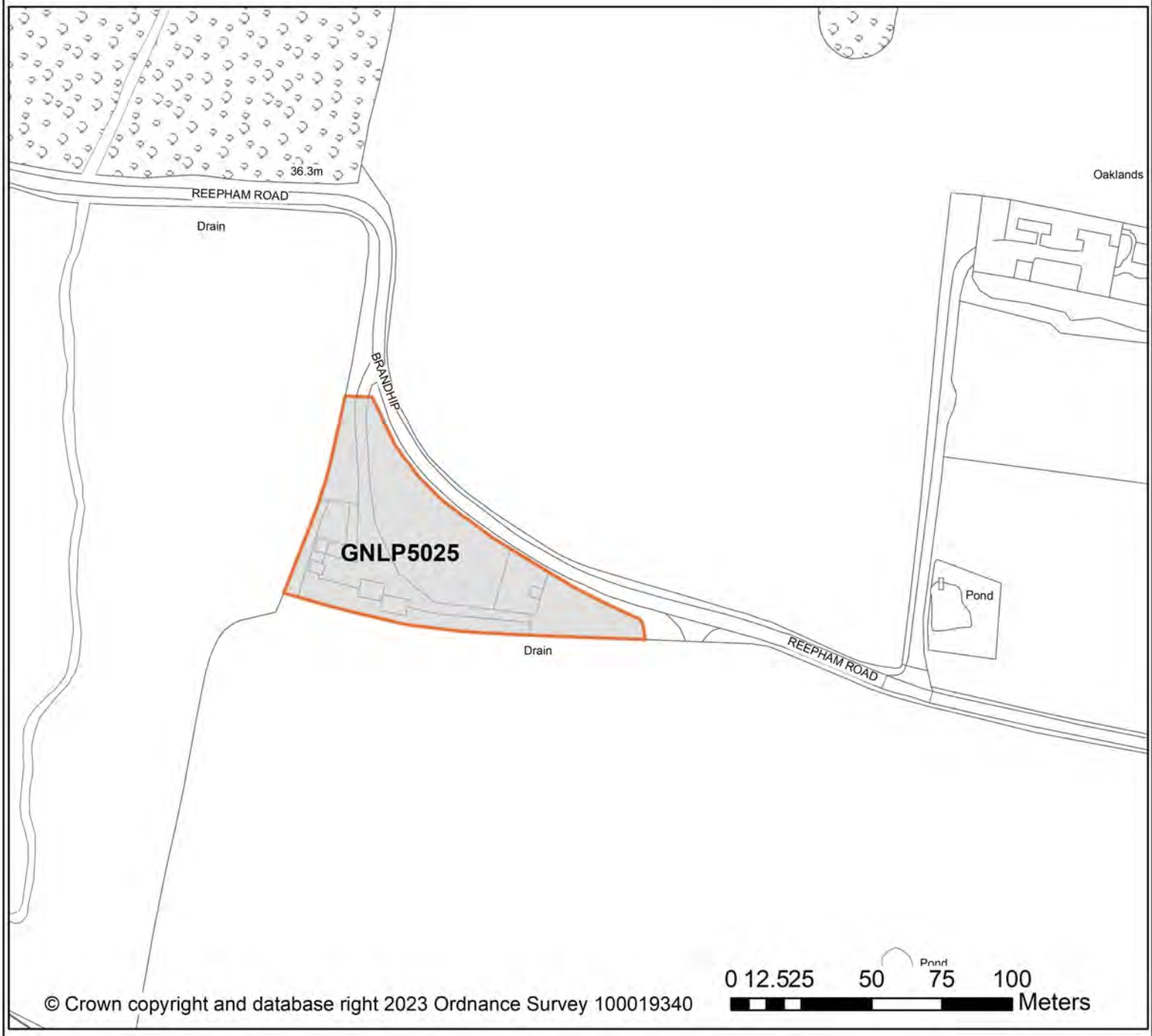
N

Date: 23/05/2023

FOULSHAM

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference: GNLP5025
Location: Woodyard, Reepham Road, Foulsham
Description: Unreasonable Alternative Site
Site Area: 0.47 ha



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N

Gypsy and Traveller Site (Unreasonable Alternative)

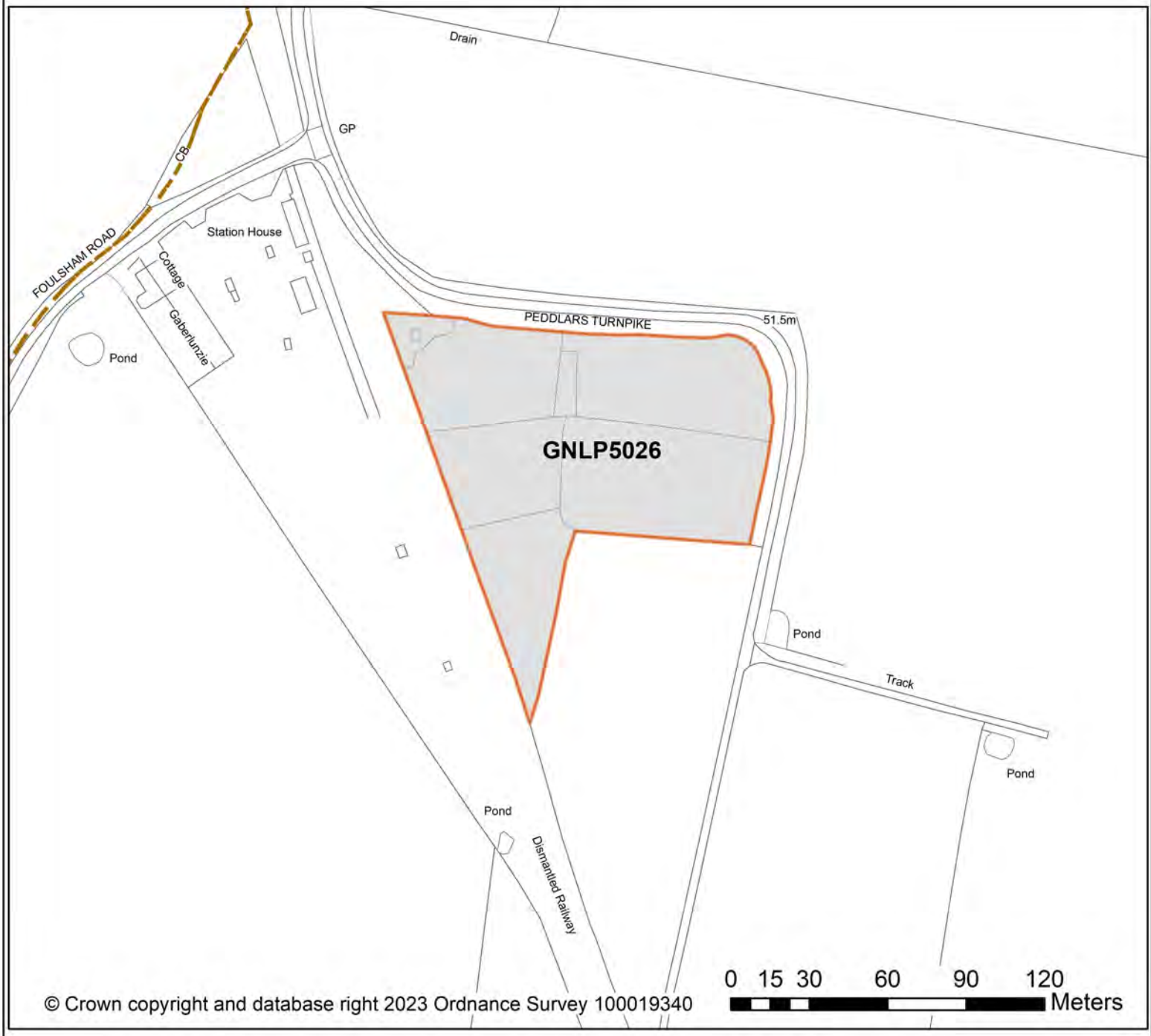
Settlement Boundary

Date: 28/04/2023

GUESTWICK

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference: GNLP5026
Location: Peddlars Turnpike, Guestwick
Description: Unreasonable Alternative Site
Site Area: 1.17 ha



Scale at A4:
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N

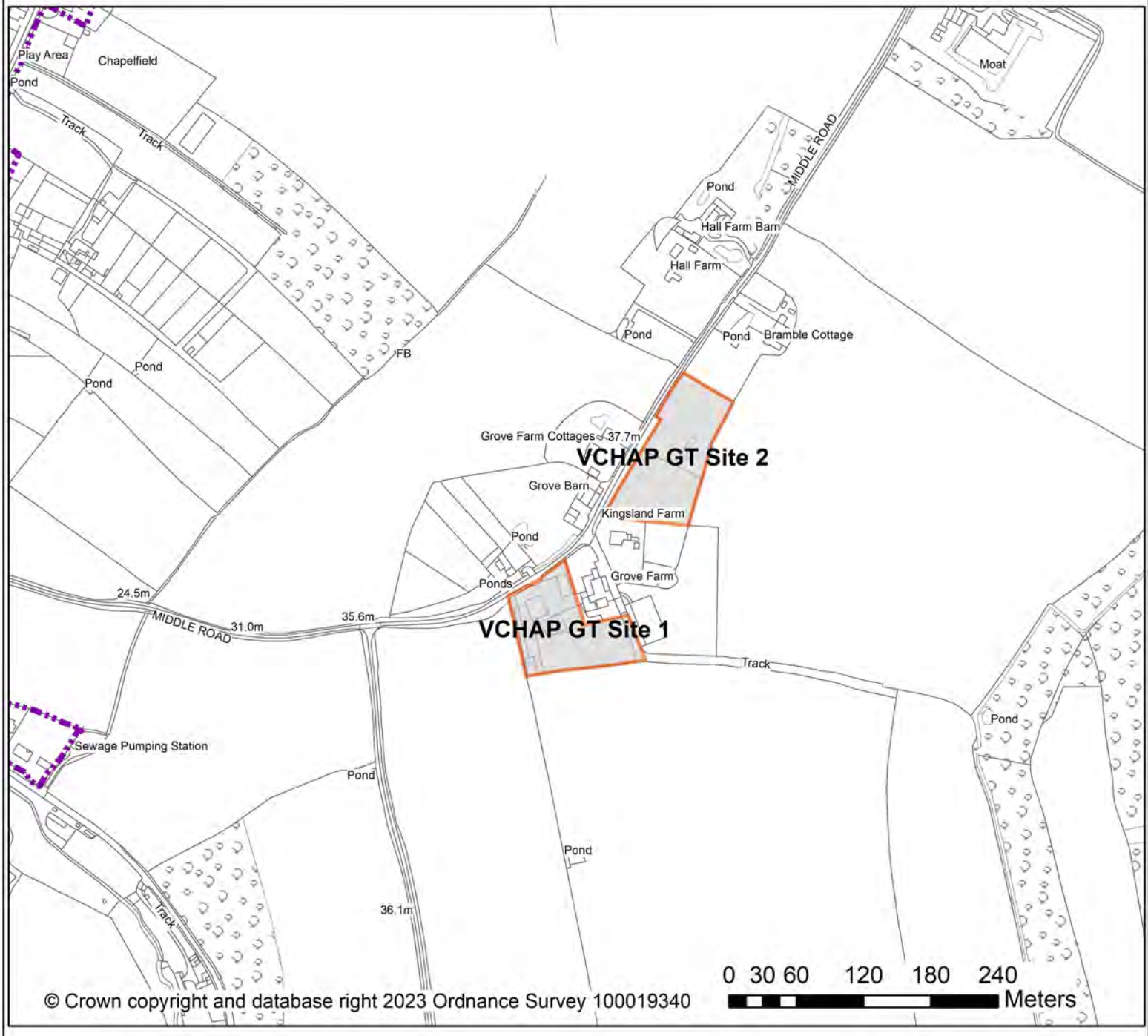
Gypsy and Traveller Site (Unreasonable Alternative)

Date: 28/04/2023

DENTON

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference:	VCHAP GT Site 1 and VCHAP GT Site 2
Location:	Grove Farm, Middle Road, Denton
Description:	Unreasonable Alternative Sites
Site Area:	0.68ha and 0.78 ha



Gypsy and Traveller Site (Unreasonable Alternative)

Settlement Boundary

Scale at A4:
1:5,000

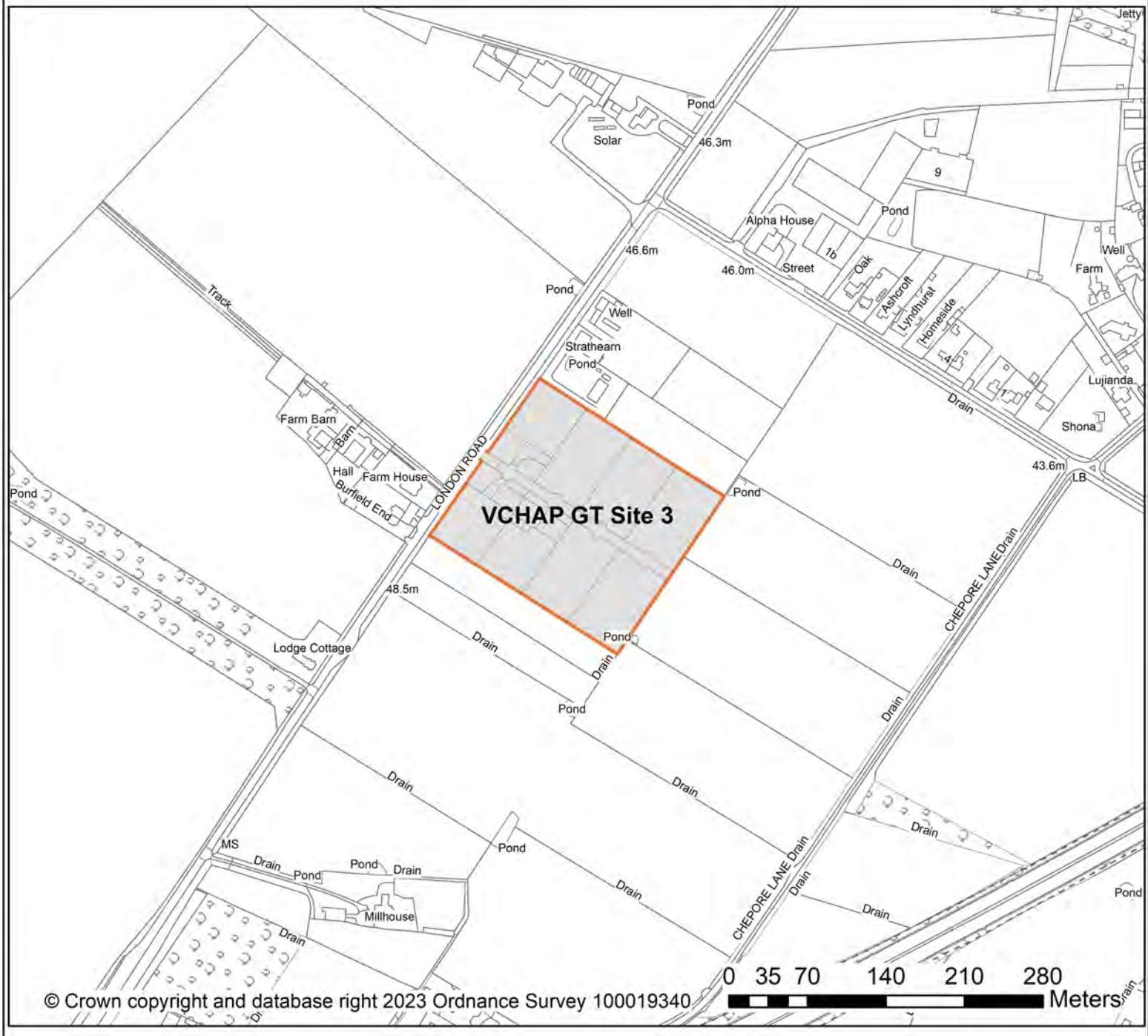
N

Date: 28/04/2023

WYMONDHAM

GREATER NORWICH LOCAL PLAN
GYPSY AND TRAVELLER SITES

Site Reference: VCHAP GT Site 3
Location: East Side of London Road, Suton, Wymondham
Description: Unreasonable Alternative Sites
Site Area: 3.35ha



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Gypsy and Traveller Site (Unreasonable Alternative)

Parish Boundary

Date: 28/04/2023

Appendix 3

European protected sites requiring nutrient neutrality strategic solutions

Scale: 1:330,000

Component SSSIs of The Broads SAC

Local Authorities

SSSI subject to nutrient neutrality strategy

Nutrient neutrality SSSI catchment

NATURAL ENGLAND

Nutrient Budget Calculator Guidance Document

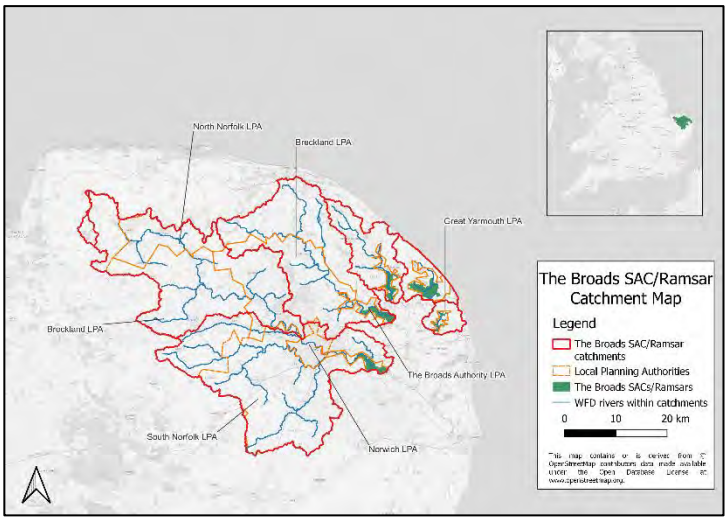
Guidance for completion of a nutrient budget using the nutrient budget calculator tool

Prepared by Ricardo Energy and Environment on behalf of Natural England

Issue 1

The Broads Special Area of Conservation (SAC) and Broadland Ramsar

The Broads SAC and Broadland Ramsar site are Habitats sites with water pollution and eutrophication considered a threat to its condition.



The fens of the Broads, located in East Anglia, contain several examples of naturally nutrient-rich lakes. Although artificial, having been created by peat digging in medieval times, these lakes and the ditches in areas of fen and drained marshlands support relict vegetation of the original Fenland flora, and collectively this site contains one of the richest assemblages of rare and local aquatic species in the UK.

The SAC and Ramsar are designated for several different significant habitats, including habitats made up of a range of important aquatic plant species from groups including stoneworts, pondweeds, water-milfoils and water-lillys. The sites are also a stronghold of little whirlpool ram's-horn snail and Desmoulin's whorl snail in East Anglia. The range of wetlands and associated habitats also provides suitable conditions for otters.

Increased levels of nitrogen and phosphorus entering aquatic environments via surface water and groundwater can severely threaten these sensitive habitats and species within the sites. The elevated levels of nutrients can cause eutrophication, leading to algal blooms which disrupt normal ecosystem function and cause major changes in the aquatic community. These algal blooms can result in reduced levels of oxygen within the water, which in turn can lead to the death of many aquatic organisms including invertebrates and fish.

The habitats and species within the site that result in designation as a SAC and Ramsar site are referred to as 'qualifying features.' Not all of these qualifying features will be sensitive to changes in nutrients within the sites. When completing an HRA involving nutrient neutrality, the Competent Authority (normally Local Planning Authority for developments) must identify and screen out qualifying features that are not sensitive to nutrients via a Habitats Regulations Assessment. Developers will be asked to submit information to support this process.

More detailed information on the qualifying features of the SAC and Ramsar and details of water quality data highlighting the current nutrient problems in the site are available in the Natural England The Broads SAC and Broadland Ramsar site evidence summary.

The requirement for Nutrient Neutrality

Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Ramsar sites are some of the most important areas for wildlife in the United Kingdom. They are internationally important for their habitats and wildlife and are protected under the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations). At some of these sites, there are high levels of nitrogen and phosphorus input to the protected water environment with sound evidence that these nutrients are causing eutrophication at these designated sites. These nutrient inputs currently mostly come either from agricultural sources or from wastewater from existing housing and other development. The resulting effects on ecology from an excessive presence of nutrients are impacting on protected habitats and species.

There is uncertainty as to whether new growth will further deteriorate designated sites, and/or make them appreciably more difficult to restore. The potential for future housing developments to exacerbate these impacts creates a risk to their potential future conservation status.

One way to address this uncertainty is for new development to achieve nutrient neutrality. Nutrient neutrality is a means of ensuring that development does not add to existing nutrient burdens and this provides certainty that the whole of the scheme is deliverable in line with the requirements of the Habitats Regulations.

Key Principles

The principles underpinning Habitats Regulations Assessments are well established[1]. At the screening stage, plans and projects should only be granted consent where it is possible to exclude, on the basis of objective information, that the plan or project will have significant effects on the sites concerned[2]. Where it is not possible to rule out likely significant effects, plans and projects should be subject to an appropriate assessment. That appropriate assessment must contain complete, precise and definitive findings which are capable of removing all reasonable scientific doubt as to the absence of adverse effects on the integrity of the site[3].

Natural England has been reviewing the available evidence on Habitats sites which are in unfavourable condition due to elevated nutrient levels. Where plans or projects will contribute additional nutrients to Habitats sites which are close to or already in unfavourable condition for nutrients, then a robust approach to the Habitats Regulations Assessment (HRA) of the effects of plans and projects is required.

Where sites are close to or already in unfavourable condition for nutrients, it may be difficult to grant consent for new plans and projects that will increase nutrient levels at the Habitats site. Nutrient neutrality provides a means of effectively mitigating the adverse effects associated with increased nutrients from new plans and projects, by counter-balancing any additional nutrient inputs to ensure that there is no net change in the amount of nutrients reaching the features which led to a Habitats site being designated.

Where new residential development is proposed, the additional nutrient load from the increase in wastewater and/or the change in the land use of the development land created by a new residential development can create an impact pathway for potential adverse effects on Habitats sites that are already suffering from problems related to nutrient loading. This impact pathway is shown diagrammatically in Figure 1. HRAs of new residential developments therefore need to consider whether nutrient loading will result in 'Likely Significant Effects' (LSE) on a Habitats site. If an HRA cannot exclude a LSE due to nutrient loading, the Appropriate Assessment (AA) will need to consider whether this nutrient load needs to be mitigated in order to remove adverse effects on the Habitats site.

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[1] See, amongst others Case C-127/02 *Waddenvereniging and Vogelsbeschermingvereniging* (Waddenzee); *R (Champion) v North Norfolk DC* [2015] EKSC 52 (Champion); C-323/17 *People Over Wind, Peter Sweetman v Coillte Teoranta* (People Over Wind); C-461/17 *Brian Holohan and Others v An Bord Pleanála* (Holohan); Joined Cases C-293/17 and C-294/17 *Coöperatie Mobilisation for the Environment UA and Others v College van gedeputeerde staten van Limburg and Other* (the Dutch Nitrogen cases);

[2] Case C-127/02 Waddenvereniging and Vogelsbeschermingvereniging (Waddenzee)

[3] Case 164/17 Grace & Sweetman v An Bord Pleanála (Grace & Sweetman)

For those developments that wish to pursue neutrality, Natural England advises that a nutrient budget is calculated for new developments that have the potential to result in increases of nitrogen/phosphorus entering the international sites. A nutrient budget calculated according to this methodology and demonstrating nutrient neutrality is, in our view, able to provide sufficient and reasonable certainty that the development does not adversely affect the integrity, by means of impacts from nutrients, on the relevant internationally designated sites. This approach must be tested through the AA stage of the HRA. The information provided by the applicant on the nutrient budget and any mitigation proposed will be used by the local planning authority, as competent authority, to make an AA of the implications of the plan or project on the Habitats sites in question.

The nutrient neutrality calculation includes key inputs and assumptions that are based on the best available scientific evidence and research. It has been developed as a pragmatic tool. However, for each input there is a degree of uncertainty. For example, there is uncertainty associated with predicting occupancy levels and water use for each household in perpetuity. Also, identifying current land / farm types and the associated nutrient inputs is based on best available evidence, research and professional judgement and is again subject to a degree of uncertainty.

It is our advice to local planning authorities to take a precautionary approach in line with existing legislation and case law when addressing uncertainty and calculating nutrient budgets. This should be achieved by ensuring nutrient budget calculations apply precautionary rates to variables and adding a buffer to the Total Nitrogen/Total Phosphorus figure calculated for developments. A precautionary approach to the calculations and solutions helps the local planning authority and applicants to demonstrate the certainty needed for their assessments.

By applying the nutrient neutrality methodology, with the buffer, to new development, the competent authority may be satisfied that, while margins of error will inevitably vary for each development, this approach will ensure that new development in combination will avoid significant increases of nitrogen load from entering the internationally designated sites.[4]

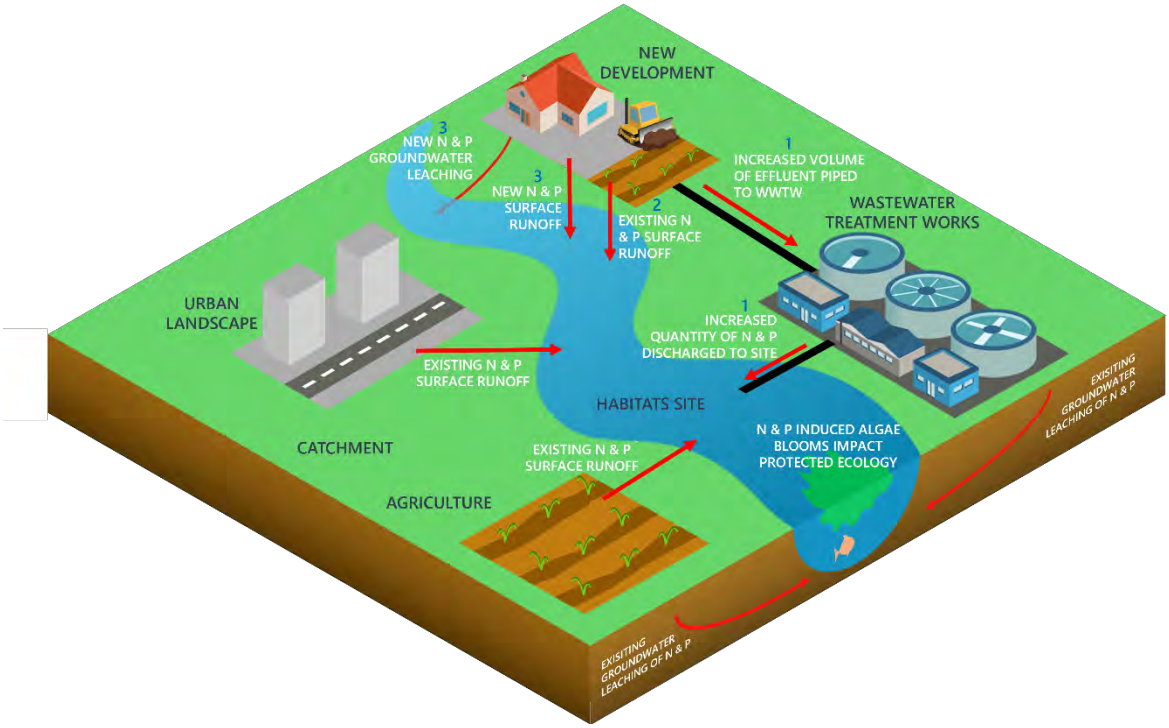
A HRA must be capable of removing all reasonable scientific doubt as to the absence of adverse effects on a Habitats site. Absolute certainty is not required, but the methodology used to evaluate potential adverse effects (and the measures intended to mitigate them) must effectively address any reasonable scientific doubt to achieve the required degree of certainty.

The first step in an AA that is applying nutrient neutrality is to understand whether a development will cause additional nutrient inputs to the Broads SAC and Broadland Ramsar site. This requires calculation of the amount of nutrients a new residential development will create, otherwise known as a nutrient budget.

If a nutrient budget shows that a new development will increase the nutrient input to the Broads SAC and Broadland Ramsar site and it is not possible to conclude no adverse effect on site integrity alone or in combination, then this is the amount of nutrients that require mitigating on an annual basis to achieve nutrient neutrality and therefore enable a conclusion of no adverse effect on site integrity to be reached.

[4] This approach was expressly endorsed in *R (Wyatt) v Fareham BC* [2021] EWHC 1434 (Admin)

Figure 1: Diagram demonstrating the potential nutrient impact pathways from a new development to a Habitats site. An increase in nitrogen and phosphorus availability in aquatic ecosystems can lead to various problems, such as algae blooms, which can have detrimental impacts on the ecology of a Habitats site.



What is this guidance for?

This guidance document accompanies the Broads SAC and Broadland Ramsar site nutrient budget calculator. The nutrient budget calculator is used to calculate the change in nutrient input from a new residential development to the Broads SAC and Broadland Ramsar site. The calculator can be used to inform an AA which is looking to apply nutrient neutrality to show whether a new development will require nutrient mitigation and if so, the amount of nitrogen and phosphorus loading that requires counterbalancing through mitigation measures to enable a conclusion of no adverse effect on site integrity, alone or in combination.

The guidance document contains the following:

- Step-by-step instructions on how to collect the specific data required as inputs to the tool.
- Instructions on how to use the tool.

Who is the guidance for?

This guidance is for anyone who needs to complete a nutrient budget calculation to support an AA of residential development in the Broads SAC and Broadland Ramsar site catchment. The tool is primarily aimed at developers who need to complete a nutrient budget calculation to support a planning application and Local Planning Authorities who need to understand the mitigation requirements for future development or assess planning applications. It could also be used by communities or environmental groups wanting to understand the impacts of a local development on the nutrient inputs to the Broads SAC and Broadland Ramsar site.

Summary of how the calculator works.

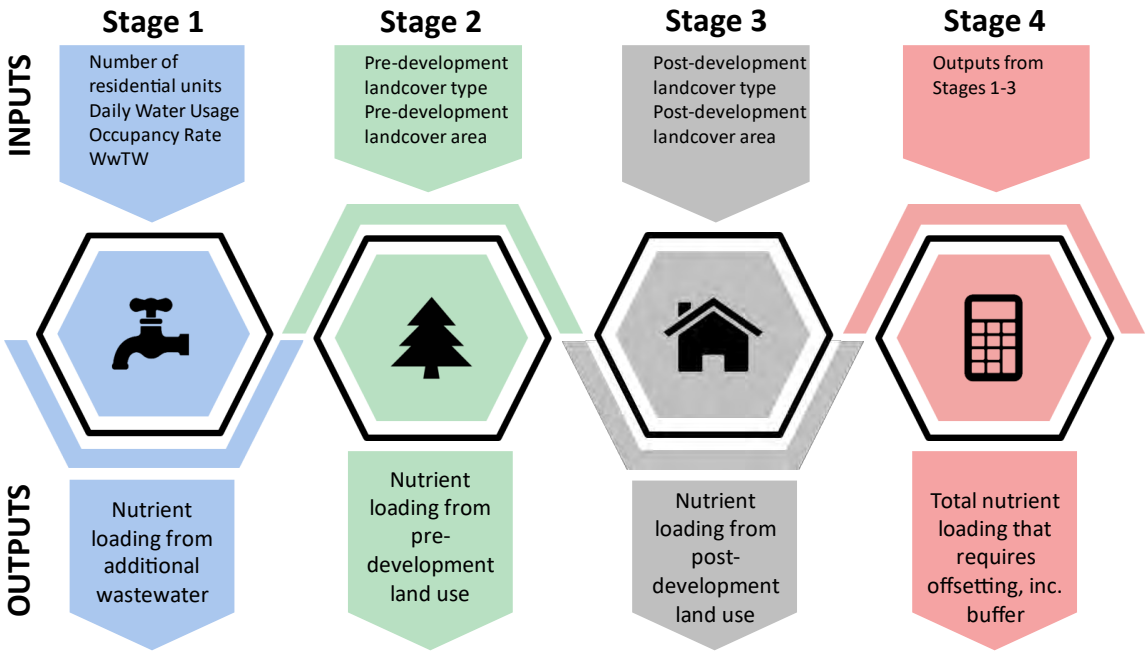
Overview

The nutrient budget calculator requires a set of inputs in order to calculate a new development's nutrient budget. The calculations are completed in four stages:

1. Calculate the increase in nutrient loading that comes from a development's wastewater.
2. Calculate the pre-existing nutrient load from current land use on the development site.
3. Calculate the future nutrient load from land use on the development site post-development.
4. Calculate the net change in nutrient loading from the development to the Broads SAC and Broadland Ramsar site with the addition of a buffer. The net change in nutrient loading + the buffer is the nutrient budget.

These key inputs and outputs for each stage can are shown schematically in Figure 2.

Figure 2: Schematic showing the key inputs and outputs associated with each stage of the nutrient budget calculation methodology



Note: the values that come pre-entered in this tool have been chosen based on research to select inputs that meet the HRA tests of beyond reasonable scientific doubt, best available evidence, in perpetuity and were chosen in accordance with the precautionary principle. It is highly unadvisable to edit the values in this tool without a sufficient evidence base to justify any changes.

Data Collection and preparation

The nutrient budget calculator requires a set of inputs as shown in Figure 2. This section does not provide instructions on how to gather development specific information, such as the number of properties being constructed, as this should be known by the developer and should be detailed in the planning application. The subsections below provide guidance on how to identify certain inputs that are needed to complete the calculations for each stage of the nutrient budget calculations. The information required is available from free to access data sources[5]. Most of the required inputs are for factors that are specific to the location of a development site or the hydrological catchment of the Broads SAC and Broadland Ramsar site.

The instructions below are divided by the stage where the data will be required. We advise that you collect and note down this data before starting to input information into each stage of the nutrient budget calculator.

Stage 2 & 3: Instructions for finding the Operational Catchment that the development is located within

- Go to this link: http://environment.data.gov.uk/catchment-planning/
- Search the location by place name, postcode etc. This will give a high-level view of the area. Use the zoom feature to find the exact location of the development.
- Click on the light blue area on the map in which the development is located. This will bring the user to the Operational Catchment page
- Make a note of the name of the Operational Catchment and select it from the dropdown list in the 'Catchment' cell when you get to this part of the calculator tool.

Stage 2: Instructions for finding the soil drainage type associated with the predominant soil type within the development site

- Go to this link: http://www.landis.org.uk/soilscapes/#
- Find your development site location on the map by using the search bar on the right side of the map in the 'Search' tab. Searching a location should generate a pop-up window in which you can view the soil information by clicking 'View soil information'. If this is not an option then click on the relevant soil type on the map and click on the 'Soil information' tab on the right-hand side of the map, below the 'Search' tab.
- The 'Soil drainage type' value can be found in the 'Soil information' under the title 'Drainage:'
- Make a note of this soil type and select the relevant soil drainage type from the drop-down list in the 'Soil drainage type' cell when you get to this part of the calculator tool.

Stage 2: Instructions for finding the annual average rainfall that the development site will receive

- Go to this link: https://nrfa.ceh.ac.uk/data/station/spatial/34002
- This link will bring the user to the Tas at Shotesham flow gauge catchment information page.
- Click on the dropdown list next to the title 'Select spatial data type to view:' on the left of the map and select 'Rainfall'.
- Select the Legend tab.
- Zoom in on the map to find the location of the development and find the corresponding rainfall range from the Legend. Note that you cannot search this map using location information and will need to 'surf' around the map to find your development site location.
- Make a note of the relevant rainfall band for your site and use it to select this rainfall band from the drop-down list in the 'Average annual rainfall' cell when you get to this part of the calculator tool.

[5] Correct at the time of writing. These data sources are available from websites that currently have government funding but it should be noted that these datasets may become unavailable if funding is removed.

Stage 2: Instructions for finding out whether the development is in a Nitrate Vulnerable Zone (NVZ)

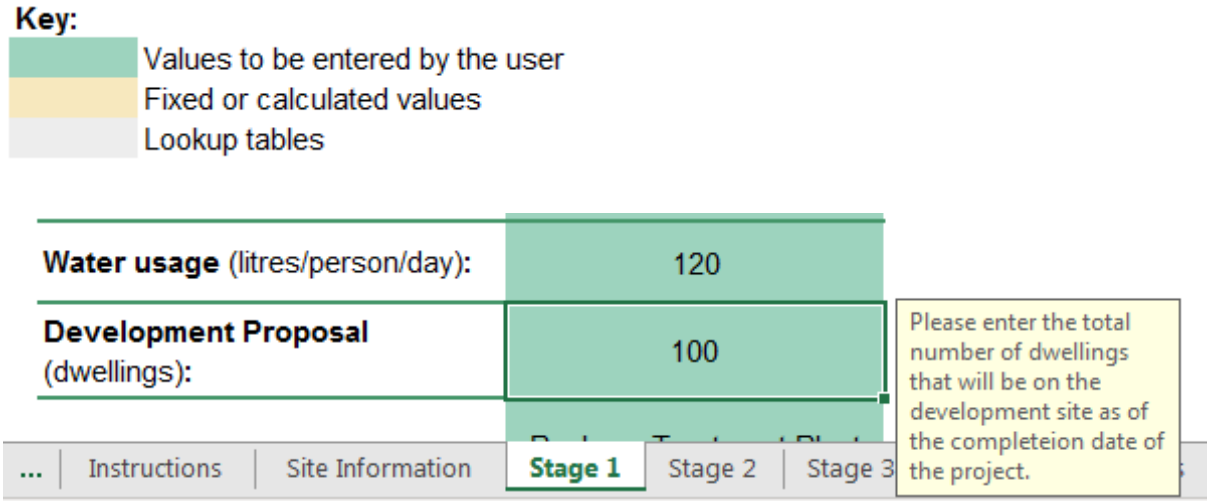
- Go to this link http://mapapps2.bgs.ac.uk/ukso/home.html?layers=NVZEng
- Enter the location of the development site in the search bar.
- Once the area has been located, click on the map where the development is located to find out if it is within an NVZ.
- Make a note of this information. It will be needed to select 'Yes' or 'No' from the 'Within Nitrate Vulnerable Zone (NVZ)' cell when you get to this part of the calculator tool.

Note: some of the values you select above will also be used in the Stage 3 calculations, however you only need to add the above details to the table in Stage 2 of the calculator and the required values for stage 3 will be carried through automatically.

How to use the calculator:

General tips

- The key below shows the colour coding used to highlight which cells need to be completed.
- When a cell is selected, instructions on how to fill out the cell that is selected are shown.
- Some cells will have values pre-populated, like the 'Water usage' input. The instructions for each cell will detail if an alternative value can be used.
- It is advisable to retain a default copy of this calculator tool workbook which has not had any development details added. "Save as" a new copy each time you calculate a budget for a new development in case any of the default values in the in the workbook get overwritten and are needed again.



Stage 1: calculate the new nutrient load associated with the additional wastewater

In this section the user will need to enter:

- The date of first occupancy. *This is because some wastewater treatment works may be due an upgrade in 2025 that will change the nitrogen or phosphorus output from this works, which will in turn change the output from this stage of the calculations. If this is the case, it will be apparent in the calculated values if there is an upgrade to a treatment works that affects the nutrient budget.*

- The average occupancy rate of the development will need to be entered in people per dwelling for residential dwellings or units for other types of overnight accommodation which would result in an increase in overnight accommodation. The default setting for residential dwellings is the national occupancy rate of 2.4 people per dwelling. **Only change this value if there is sufficient evidence that a different occupancy rate is appropriate** (see Occupancy Rate Guidance section below for when a local or regional occupancy rate is acceptable).

- The number of dwellings / units[6] that will be within the development at the time of completion.

- The wastewater treatment works that the development will connect to. If required this information can be obtained from the sewerage undertaker for the development site. If it is not feasible to connect to mains sewerage and a septic tank (ST) or package treatment plant (PTP) is being used, please select this option. Please be aware that if the total nitrogen (TN) or total phosphorus (TP) final effluent concentrations (in mg/l) are specified by the manufacturer, please select 'Septic Tank user defined' or 'Package Treatment Plant user defined' and enter the specified value in the cell where prompted. If you do not have a TP or TN value provided by the manufacturer, select the 'Septic Tank default' or 'Package Treatment Plant default' option and a value will be provided automatically.

Occupancy Rate Guidance:

As set out in the guidance below, the Local Planning Authority/Competent Authority will need to ensure that the occupancy rate is appropriate to development within their Authority area. **It is therefore recommended that the occupancy rate is agreed with the Local Planning Authority before completing the nutrient budget calculation.**

Competent authorities must satisfy themselves that the residents per dwelling/unit value used in this step of the calculation reflects local conditions in their area. The residents per dwelling value can be derived from national data providing it reflects local conditions. However, if national data does not yield a residents per dwelling/unit value that reflects local occupancy levels then locally relevant data should be used instead. Whichever figure is used, it is important to ensure it is sufficiently robust and appropriate for the project being assessed. **It is therefore recommended that project level Appropriate Assessments specifically include justification for why the competent authority has decided upon the occupancy rate that has been used.**

Further guidance is provided below.

National occupancy data

When using national occupancy data, the Office of National Statistics (ONS) national average value for the number of residents per dwelling of 2.4 is recommended. This value is derived from 2011 census data and is subject to change when the 2021 Census becomes available. This value can be used if the Local Planning Authority is satisfied that:

- It is appropriate for the level and type of housing development that is expected to come forward in the Local Planning Authority's area (a strategic assessment should be made of the development anticipated to come forward over the Local Plan period to ensure the use of average figures will not under/overestimate the level of impact)

- It corresponds to the local average in the area (it is not likely to overestimate or underestimate occupancy)

[6] The term 'dwellings' has a specific legal meaning derived from the use classes order. To ensure that all relevant forms of development which would result in an increase in overnight accommodation such as hotel rooms, short term holiday lets etc are considered in the HRA process the term units is used

- It is based on data that is robust and doesn't underestimate the level of impact over time.

It may not be appropriate to use the national average occupancy rate for development types which are not included in the ONS data, such as student accommodation or houses in multiple occupation. For such developments, the Local Planning Authority should specify an appropriate occupancy rate in the project level Appropriate Assessment and explain how this figure was derived.

Locally relevant occupancy data

If the national average occupancy rate does not correspond with local conditions, then a locally relevant average residents per dwelling value may be more appropriate. If a Local Planning Authority decides to use a locally relevant value, that value needs to be supported by robust and sufficient evidence which should be included in the project level Appropriate Assessment. Key sources of evidence include:

- The average occupancy rate from the census for the relevant local administrative area, e.g. the county.

- The average occupation figures used by the Local Planning Authority to calculate population growth due to Local Plan development.

- The average occupation figures used by the local water company to plan for population growth and the impact on water resources and sewage treatment.

A local / regional average occupancy rate can be used provided that it is from a robust source which can show trends over a protracted period of time– such as from ONS derived data or from the annual English Housing Survey. Figures derived from data collected over short periods of time will not be acceptable as short-term data is unlikely to provide the required degree of certainty. The Local Planning Authority should ensure that any trend in occupancy rates or estimates of the average number of persons per household used will continue for perpetuity and would not underestimate the level of impact over time. A local / regional average occupancy rate would therefore need to be based on figures over at least a 5-year period[7].

Local Planning Authorities will also need to satisfy themselves that a locally derived occupancy figure is appropriate for the level and type of housing development that is expected (a strategic assessment should be made of the development anticipated to come forward over the Local Plan period to ensure the use of average figures will not under/overestimate the level of impact).

Occupancy rates based on dwelling type

Should the nature or scale of development associated with a particular project proposal suggest that the use of an average occupancy rate is not appropriate, then the Local Planning Authority may decide to adopt an occupancy rate based on the dwelling types proposed for that particular project, provided it meets the criteria outlined above. This may be appropriate where a project proposer seeks consent for a development comprising certain dwelling types (e.g. flats and small 1 and 2 bed dwellings). If the Local Planning Authority decides to adopt a local approach based on determining occupancy rate by dwelling type, that approach should be used for all planning applications, rather than reverting back to the use of an average occupancy rate. This will ensure that the Local Planning Authority doesn't inadvertently underestimate total occupancy levels (and consequently water quality impacts) across its area by applying a lower residents per dwelling/unit value for developments comprising smaller units but failing to adopt a higher residents per dwelling/unit value for developments comprising larger units or a mix of units.

[7] The figure of 5 years has been chosen as the minimum period of time over which occupancy rates can be calculated from as local plans and WRMPs are reviewed every 5 years, so represents a long enough period of time to capture any trends or changes.

Consistency in applying occupancy rates

The same occupancy rate should be used where there are several different impacts on Habitat sites which require strategic mitigation. The strategic approaches developed with local planning authorities to deal with in combination impacts on international sites elsewhere typically calculate mitigation requirements and contribution requirements based on current national average occupancy rates. Local Planning Authorities may decide to use a locally derived average occupancy rate instead, but this local occupancy rate must be used consistently across each type of impact and each Habitats site affected. Local Planning Authorities should not use different occupancy rates in their HRAs for the same dwelling types / size of units. Whilst the impacts will be different, occupancy rates will have been used to estimate the scale of impact and subsequently the scale of mitigation required on the protected sites. The types of impact will typically last in perpetuity. Care is therefore needed to ensure the adoption of an alternative occupancy rate based on an assessment of net population additions to a locality for nutrient budgeting does not undermine other existing strategic approaches, particularly where there are overlapping impacts within the locality.

Note: When 2021 Census data is available, the 2.4 value will be updated.

Note: if an ST or PTP is being used then a comprehensive maintenance regime is required as part of the application process. Please consult your Local Planning Authority for further advice on how to specify this maintenance regime and demonstrate that it is appropriately secured. If the ST or PTP which is being used has phosphate stripping capabilities, chemical dosing may be required. If chemical dosing is required, a robust management plan that details how chemicals are stored, the dilution rates, dosing frequencies, that any chemicals used will not have an environmental impact etc. must also accompany the planning application. PTPs with chemical dosing may not be appropriate in all cases.

Stage 2 - calculate the annual nutrient load from existing (pre-development) land use on the development site

In this section some environmental information about the development will need to be entered as well as the type and area of landcover that is being developed. The environmental information required is described above.

Only the types and areas of land that are being altered by the development should be entered. For example, if two hectares of agricultural land within a ten-hectare development site are being retained in the same agricultural use, this area should not be included in the calculations.

In the 'Existing land use type(s)' column of the main table in Stage 2 of the calculator, each cell has drop-down list of land use types. This list contains seven agricultural land cover types to choose from and eight different non-agricultural land cover types that may be present on a pre-development site. Please find out what land use types are within the development before completing this tool. If there is a land use within the development area that is not in the list, please select the most similar land use type. Table 1 provides a description of the different land use types available within the calculator tool.

Table 1: Table of land use types included within the tool and their descriptions.

Land use types used in the calculator tool	Description
Cereals	Agricultural areas on which cereals, combinable crops and set aside are farmed.
General	Agricultural areas on which arable crops (including field scale vegetables) are farmed.
Horticulture	Agricultural areas on which fruit (including vineyards), hardy nursery stock, glasshouse flowers and vegetables, market garden scale vegetables, outdoor bulbs and flowers, and mushrooms are farmed.
Pig	Agricultural areas on which pigs farmed.
Poultry	Agricultural areas on which poultry are farmed.
Dairy	Agricultural areas on which dairy cows are farmed.
LFA	Agricultural areas on which cattle, sheep and other grazing livestock are farmed in locations where agricultural production is difficult. An area is classified as a Less Favoured Area (LFA) holding if 50 per cent or more of its total area is classed as LFA.
Lowland	Agricultural areas on which cattle, sheep and other grazing livestock are farmed. A holding is classified as lowland if less than 50 per cent of its total area is classed as a lowland grazing area.
Mixed	Agricultural areas in which none of the above categories are farmed or where it is too difficult to select a single category to describe the farm type.
Greenspace	Natural and semi-natural outdoor spaces provided for recreational use where fertilisers will not be applied and dog waste is managed, e.g. semi-natural parks. This does not include green infrastructure within the built urban environment, such as sports fields, gardens, or grass verges, as these are included in the residential urban land category.
Woodland	Natural and semi-natural outdoor wooded areas.
Shrub	Natural and semi-natural outdoor shrubland area.
Water	Areas of surface water, including rivers, ponds and lakes.
Residential urban land	Areas of houses and associated infrastructure. This is inclusive of roads, driveways, grass verges and gardens.
Commercial/industrial urban land	Areas that are used for industry. These are businesses that typically manufacture, process or otherwise generate products. Included in the definition of industrial land are factories and storage facilities as well as mining and shipping operations.
Open urban land	Area of land in urban areas used for various purposes, e.g. leisure and recreation - may include open land, e.g. sports fields, playgrounds, public squares or built facilities such as sports centres.
Community food growing	Areas that are used for local food production, such as allotments.

Stage 3: calculate the annual nutrient load from new (post-development) land use on the development site

In this section the user will need to select the type and area of the landcover present on the development site after the development has been completed.

In the ‘New land use type(s)’ column of the main table in Stage 3 of the calculator, each cell has a drop-down list of land use types containing eight non-agricultural land use types that may be present on the post-development site. Please find out what land use types are within the development before completing this part of the tool. If there is a land use within the development area that is not in the list (see Table 1 for land use type descriptions), please select the most similar land use type.

Stage 4: calculate the net change in nutrient loading for the site and the final annual nutrient budget for the development site:

This final stage automatically uses the results from Stages 1-3 and calculates the nutrient budget using the equation shown in Figure 3.

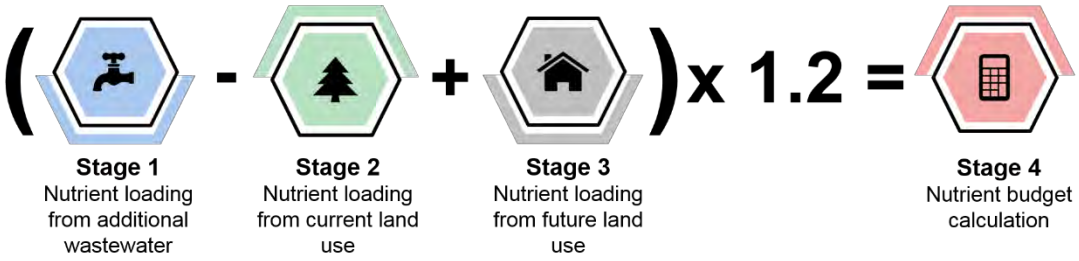
As Figure 3 shows, the output from Stage 4 of nutrient budget calculations is the balance of new sources of nitrogen and phosphorus from a development minus the existing sources of nitrogen and phosphorus from the pre-development site. To ensure the final figure is robust and suitably precautionary this balance is multiplied by 1.2, i.e. increased by a 20%, buffer'.

The 20% buffer is applied to account for the uncertainties that underlie the inputs to Stages 1-3 of the nutrient budget calculations, as well as accounting for some potential nutrient sources associated with new development that cannot be readily quantified. To cover all possible inputs to a nutrient budget with a high enough certainty to remove the need for the buffer would require extensive site-specific investigations. The 20% buffer is a means of accounting for the uncertainties within the nutrient budget calculations and providing confidence that mitigation of the nutrient budget will remove the risk of adverse effects on site integrity in the Broads SAC and Broadland Ramsar site.

The output in Stage 4 shows how much nutrient mitigation is required in kilograms per year to achieve nutrient neutrality.

If there are two values due to an upgrade occurring at the wastewater treatment works the development is connecting to, the calculator will show the total amount of nutrient mitigation that is needed before and after the upgrade.

Figure 3: The equation used to calculate the nutrient budget.



Designated Site Name:	The Broads SAC / Broadland Ramsar

Site Details:

From The Broads SAC citation:

The Broads in East Anglia contain several examples of naturally nutrient-rich lakes. Although artificial, having been created by peat digging in medieval times, these lakes and the ditches in areas of fen and drained marshlands support relict vegetation of the original Fenland flora, and collectively this site contains one of the richest assemblages of rare and local aquatic species in the UK.

The stonewort – pondweed – water-milfoil – water-lily (*Characeae –Potamogeton – Myriophyllum – Nuphar*) associations are well-represented, as are club-rush – common reed *Scirpo – Phragmitetum* associations. The dyke (ditch) systems support vegetation characterised by water-soldier *Stratiotes aloides*, whorled water-milfoil *Myriophyllum verticillatum* and broad-leaved pondweed *Potamogeton natans* as well as being a stronghold of little whirlpool ram's-horn snail *Anisus vorticulus* and Desmoulin's whorl snail *Vertigo moulinsiana* in East Anglia. The range of wetlands and associated habitats also provides suitable conditions for otters *Lutra lutra*.

The Broads is the richest area for stoneworts (charophytes) in Britain. The core of this interest is the Thurne Broads and particularly Hickling Broad, a large shallow brackish lake. Within the Broads examples of Chara vegetation are also found within fen pools (turf ponds) and fen and marsh ditch systems. The Broads supports a number of rare and local charophyte species, including *Chara aspera, C. baltica, C. connivens, C. contraria, C. curta, C. intermedia, C. pedunculata, Nitella mucronata, Nitellopsis obtusa, Tolypella glomerata* and *T. intricata*.

The complex of sites contains the largest blocks of alder *Alnus glutinosa* wood in England. Within the complex complete successional sequences occur from open water through reedswamp to alder woodland, which has developed on fen peat. There is a correspondingly wide range of flora, including uncommon species such as marsh fern *Thelypteris palustris*.

This site contains the largest example of calcareous fens in the UK. The great fen-sedge *Cladium mariscus* habitat occurs in a diverse set of conditions that maintain its species richness, including small sedge mires, and areas where great fen-sedge occurs at the limits of its ecological range. The habitat type forms large-scale mosaics with other fen types, fen meadows (with purple moor-grass *Moilinia caerulea*), open water and woodland, and contains important associated plants such as fen orchid *Liparis loeselii*, marsh helleborine *Epipactis palustris*, lesser tussock-sedge *Carex diandra*, slender sedge *C. lasiocarpa* and fibrous tussock-sedge *C. appropinquata*.

There are also areas of short sedge fen (both black bog-rush – blunt-flowered rush *Schoenus nigricans – Juncus subnodulosus* mire and bottle sedge – moss *Carex rostrata – Calliergon cuspidatum/giganteum mire*), which in places form a mosaic with common reed – milk-parsley *Phragmites australis – Peucedanum palustris* fen. The Broads also contain examples of transition mire, that are relatively small, having developed in re-vegetated peat-cuttings as part of the complex habitat mosaic of fen, carr and open water.

Reason for European Site Designation:

The Broads Special Area of Conservation is designated for the following features :

- H3140 Hard oligo-mesotrophic waters with benthic veg of *Chara* spp.
- H3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*
- H6410 Molinia meadows on calcareous, peat or clay-silt soil
- H7140 Transition mires and quaking bogs
- H7210 Calcareous fens with *C. mariscus* and species of *C. davallianae*
- H7230 Alkaline fens
- H91E0 Alluvial woods with *A. glutinosa, F. excelsior*
- S1016 Desmoulin's whorl snail, *Vertigo moulinsiana*
- S1355 Otter, *Lutra lutra*
- S1903 Fen orchid, *Liparis loeselii*
- S4056 Little ram's-horn whirlpool snail, *Anisus vorticulus*

The Broadland Ramsar is designated for the following features:

- Bewick's swan, *Cygnus columbianus bewickii* - Wintering
- Floodplain alder woodland
- Floodplain fen
- Gadwall, *Anas strepera* - Wintering
- Shoveler, *Anas clypeata* - Wintering
- Wetland invertebrate assemblage
- Wetland plant assemblage
- Wigeon, *Mareca penelope* – Wintering

Links to Conservation Advice:
Conservation Objectives
Conservation Objectives Supplementary Advice
JNCC Ramsar Information Sheet

Nutrient Pressure(s) for which the site is unfavourable:

Nitrogen
Phosphorus

Water Quality Evidence:

In the Conservation Objectives Supporting Advice for the Broads SAC it states for phosphorus to 'maintain and, where necessary, restore stable nutrient levels appropriate for lake type' and for nitrogen it states to 'maintain and restore a stable nitrogen concentration'.

Water Quality data is reported against the relevant SSSI units within the SAC for the five SSSIs within the Broads SAC where there is currently good evidence that they are unfavourable due to nutrients.

Ant Broads and Marshes

Unit name	SSSI Unit	Monitoring point ID	WQ Target		WQ Monitoring Data[1]		Compliance with target – Pass/Fail and % reduction needed to achieve the WQ Target	
			TP (ug/l)	TN (mg/l)	TP (ug/l)	TN (mg/l)	TP	TN
Barton Broad	33	BARTON BROAD (R.ANT) AN-ANT160	30	1.07	64	1.9	FAIL 53% reduction needed	FAIL 44% reduction needed
Instead Holmes	34	No monitoring	30	1.07			Unknown	Unknown
Catfield broad	35	No monitoring	30	1.07			Unknown	Unknown
Cromes Broad	36	CROMES BROAD EDGE SAMPLE FROM SHORE AN-ANT170E	30	1.07	44	1.7	FAIL 30% reduction needed	FAIL 58% reduction needed
Reedham Water	37	No monitoring	30	1.07			Unknown	Unknown

[1] Water Quality Monitoring data from EA WIMS database. Nutrient concentrations reported are the 2019 annual mean for Total Phosphorus (TP) and Total Nitrogen (TN).

Bure Broads and Marshes

Unit name	SSSI Unit	Monitoring point ID	WQ Target		WQ Monitoring Data[2]		Compliance with target – Pass/Fail and % reduction needed to achieve the WQ Target	
			TP (ug/l)	TN (mg/l)	TP (ug/l)	TN (mg/l)	TP	TN
Decoy Broad	4	DECOY BROAD R.BURE AN-BUR158	30	1.07	74	3.04	FAIL 60% reduction needed	FAIL 65% reduction needed
Hoveton Great Broad	10	HOVETON GREAT BROAD AN-BUR158	30	1.07	70	2.5	FAIL 57% reduction needed	FAIL 57% reduction needed
Hudson's Bay	11	HUDSON'S BAY, HOVETON GREAT BROAD, R.BURE AN-BUR158HB	30	1.07	104	1.79	FAIL 72% reduction needed	FAIL 40% reduction needed
Ranworth Broad	12	RANWORTH BROAD AN-BUR170A	30	1.07	94	2.99	FAIL 68% reduction needed	FAIL 64% reduction needed
Cockshoot Broad	13	COCKSHOOT BROAD AN-BUR160A	30	1.46	49	1.37	FAIL 39% reduction needed	PASS
Ranworth Flood	14	Ranworth Flood AN-BUR170RF	30	1.07	1017*	3.16*	FAIL 97% reduction needed	FAIL 68% reduction needed

[2] Water Quality Monitoring data from EA WIMS database. Nutrient concentrations reported are the 2019 annual mean for Total Phosphorus (TP) and Total Nitrogen (TN).

*TP Data for Ranworth Flood is a mean of 7 samples for TP and 4 samples for TN taken in 2017

Trinity Broads SSSI

Unit name	SSSI Unit	Monitoring point ID	WQ Target		WQ Monitoring Data[3]		Compliance with target – Pass/Fail and % reduction needed to achieve the WQ Target	
			TP (ug/l)	TN (mg/l)	TP (ug/l)	TN (mg/l)	TP	TN
Filby Broad	20	FILBY BROAD AN-FIL010	30	1.07	42	0.89	FAIL 29% reduction needed	PASS
Lily Broad	21	Lily Broad AN-LIL010	30	1.07	78**	1.19**	FAIL 62% reduction needed	FAIL 10% reduction needed
Ormesby Broad	22	ORMESBY BROAD AN-ORM010	30	1.07	52	1.24	FAIL 42% reduction needed	FAIL 14% reduction needed
Ormesby Little Broad	23	ORMESBY LITTLE BROAD AN-ROL020	30	1.07	50	0.94	FAIL 40% reduction needed	PASS
Rollesby Broad Sailing Club	24	ROLLESBY BROAD SAILING CLUB AN-ROL010	30	1.07	39	1.01	FAIL 23% reduction needed	PASS

[3] Water Quality Monitoring data from EA WIMS database. Nutrient concentrations reported are the 2019 annual mean for Total Phosphorus (TP) and Total Nitrogen (TN).
** Data for Lily Broad is the mean of 5 (TN) and 8 (TP) samples from 2017.

Upper Thurne Broads and Marshes

Unit name	SSSI Unit	Monitoring point ID	WQ Target		WQ Monitoring Data[4]		Compliance with target – Pass/Fail and % reduction needed to achieve the WQ Target	
			TP (ug/l)	TN (mg/l)	TP (ug/l)	TN (mg/l)	TP	TN
Heigham Sound	15	HEIGHAM SOUND (R.THURNE) AN-THR040	30	1.07	54	1.97***	FAIL 44% reduction needed	FAIL 45% reduction needed
Hickling Broad	16	HICKLING BROAD (R.THURNE) AN-THR030A	30	1.07	52	1.6	FAIL 42% reduction needed	FAIL 33% reduction needed

Horsey Mere	17	HORSEY MERE (R.THURNE) AN-THR020	30	1.46	51	2.22	FAIL 41% reduction needed	FAIL 34% reduction needed
R. Thurne Martham Broad	18	R.THURNE MARTHAM BROAD AN-THR060	30	1.07	33	No data	FAIL 9% reduction needed	Unknown
Martham South Broad	19	MARTHAM SOUTH BROAD (R.THURNE) AN-THR061	30	1.07	33	1.11***	FAIL 9% reduction needed	FAIL 4% reduction needed

[4]Water Quality Monitoring data from EA WIMS database. Nutrient concentrations reported are the 2019 annual mean for Total Phosphorus (TP) and Total Nitrogen (TN).
*** TN data is the mean for May 2019- Mar 2020.

Yare Broads and Marshes

Unit name	SSSI Unit	Monitoring point ID	WQ Target		WQ Monitoring Data[5]		Compliance with target – Pass/Fail and % reduction needed to achieve the WQ Target	
			TP (ug/l)	TN (mg/l)	TP (ug/l)	TN (mg/l)	TP	TN
Surlingham Broad	11	No monitoring point					Unknown	Unknown
Rockland Broad	15	ROCKLAND BROAD OUTFLOW (SHORT DIKE) AN-YAR31010	30	1.07	217 (Jan – Dec 2019)	7.65 (Jan – Dec 2019)	FAIL 86% reduction needed	FAIL 86% reduction needed
Bargate broad	24	No monitoring point					Unknown	Unknown
Wheatfen Broad	25	WHEATFEN BROAD AN-YAR305	30	1.07	326 Feb – Dec 2017)	2.68 May – Dec 2017)	FAIL 91% reduction needed	FAIL 60% reduction needed
Strumpshaw Broad	26	STRUMPSHAW BROAD AN-YAR225	30	1.07	353 Feb – Dec 2017)	2.47 May – Dec 2017)	FAIL 92% reduction needed	FAIL 57% reduction needed
Buckingham Broad	27	No monitoring point					Unknown	Unknown
Hassingham Broad	28	No monitoring point					Unknown	Unknown

[5]Water Quality Monitoring data from EA WIMS database.

The condition of the waterbody and the habitats which support the designated features is in part dependent on the water quality within them.

The condition of the waterbody and the habitats which support the designated features is in part dependent on the water quality within them. Where excessive nutrients are present in a system this can lead to the occurrence of eutrophication, impacting on aquatic macrophyte flora and changes in water chemistry.

Recent Water Quality data shows Ant Broads and Marshes, Bure Broads and Marshes, Trinity Broads SSSI, Upper Thurne Broads and Marshes and Yare Broads and Marshes are exceeding (overall) the targets for Total Phosphorus and Total Nitrogen. Within these areas four units are achieving the target for TN: Cockshoot Broad, Filby Broad, Ormesby Little Broad and Rollesby Broad Sailing Club.

The water quality targets for the water bodies are also required for the water input into the wetland habitats and dyke features to avoid changes in species composition and the loss of characteristic and sensitive species.

Additional Information:

Habitat type impacted by nutrients – Standing Water

The Broads SAC and Broadland Ramsar are underpinned by multiple SSSIs. The component SSSIs being considered here include;

- Ant Broads and Marshes
- Bure Broads and Marshes
- Trinity Broads
- Upper Thurne
- Yare Broads and Marshes

SSSI interest features include:

<u>Ant Broads and Marshes SSSI</u>

- Assemblages of breeding birds - Lowland open waters and their margins
- Ditches
- Eutrophic lakes
- Floodplain fen (lowland)
- Invert. assemblage W211 open water on disturbed sediments
- Invert. assemblage W313 moss & tussock fen
- Invert. assemblage W314 reed-fen & pools
- Lowland mire grassland and rush pasture
- Ponds
- Population of Schedule 8 plant - *Liparis loeselii*, Fen Orchid
- Vascular plant assemblage
- Wet woodland

<u>Bure Broads and Marshes SSSI</u>

- Assemblages of breeding birds - Lowland fen without open water
- Eutrophic lakes
- Floodplain fen (lowland)
- Invert. assemblage W126 seepage
- Invert. assemblage W211 open water on disturbed sediments
- Invert. assemblage W313 moss & tussock fen
- Invert. assemblage W314 reed-fen & pools
- Lowland mire grassland and rush pasture
- Vascular plant assemblage
- Wet woodland

Trinity Broads SSSI

- Aggregations of breeding birds - Marsh harrier, *Circus aeruginosus*
- Aggregations of breeding birds - Pochard, *Aythya ferina*
- Aggregations of breeding birds - Shoveler, *Anas clypeata*
- Aggregations of breeding birds - Tufted duck, *Aythya fuligula*
- Aggregations of non-breeding birds - Bittern, *Botaurus stellaris*
- Aggregations of non-breeding birds - Pochard, *Aythya ferina*
- Aggregations of non-breeding birds - Shoveler, *Anas clypeata*
- Aggregations of non-breeding birds - Tufted duck, *Aythya fuligula*
- Assemblages of breeding birds - Lowland open waters and their margins
- Floodplain fen (lowland)
- Lowland wetland including basin fen, valley fen, floodplain fen, waterfringe fen, spring/flush fen and raised bog lagg
- Mesotrophic lakes
- Otter, *Lutra lutra*
- Vascular plant assemblage
- Wet woodland

Upper Thurne Broads and Marshes SSSI

- Aggregations of breeding birds - Avocet, *Recurvirostra avosetta*
- Aggregations of breeding birds - Bearded tit, *Panurus biarmicus*
- Aggregations of breeding birds - Bittern, *Botaurus stellaris*
- Aggregations of breeding birds - Marsh harrier, *Circus aeruginosus*
- Aggregations of breeding birds - Pochard, *Aythya ferina*
- Aggregations of non-breeding birds - Bewick's swan, *Cygnus columbianus bewickii*
- Aggregations of non-breeding birds - Gadwall, *Anas strepera*
- Aggregations of non-breeding birds - Shoveler, *Anas clypeata*
- Aggregations of non-breeding birds - Teal, *Anas crecca*
- Assemblages of breeding birds - variety of species
- Charophyte assemblage
- Ditches
- Floodplain fen (lowland)
- Invert. assemblage W314 reed-fen & pools
- Lowland mire grassland and rush pasture
- Mesotrophic lakes
- Nationally scarce plant - *Potamogeton coloratus*, Fen Pondweed
- Nationally scarce plant - *Thelypteris palustris*, Marsh Fern
- Nationally scarce plant - *Thyselium palustre*, Milk-parsley
- Vascular plant assemblage
- Wet woodland

Yare Broads and Marshes SSSI

- Aggregations of breeding birds - Cetti's warbler, *Cettia cetti*
- Aggregations of breeding birds - Gadwall, *Anas strepera*
- Aggregations of breeding birds - Marsh harrier, *Circus aeruginosus*
- Aggregations of non-breeding birds - Bean goose, *Anser fabalis*
- Aggregations of non-breeding birds - Hen harrier, *Circus cyaneus*
- Aggregations of non-breeding birds - Wigeon, *Anas penelope*
- Assemblages of breeding birds - Lowland open waters and their margins
- Ditches
- Eutrophic lakes
- Floodplain fen (lowland)
- Invert. assemblage W313 moss & tussock fen
- Invert. assemblage W314 reed-fen & pools

- Lowland mire grassland and rush pasture
- Vascular plant assemblage
- Wet woodland

Appendix 4

European protected sites requiring nutrient neutrality strategic solutions

Scale: 1:190,000

Component SSSIs of River Wensum SAC

- Local Authorities
- SSSI subject to nutrient neutrality strategy
- Nutrient neutrality SSSI catchment
- National Parks

NATURAL ENGLAND

Nutrient Budget Calculator Guidance Document

Guidance for completion of a nutrient budget using the nutrient budget calculator tool

Prepared by Ricardo Energy and Environment on behalf of Natural England

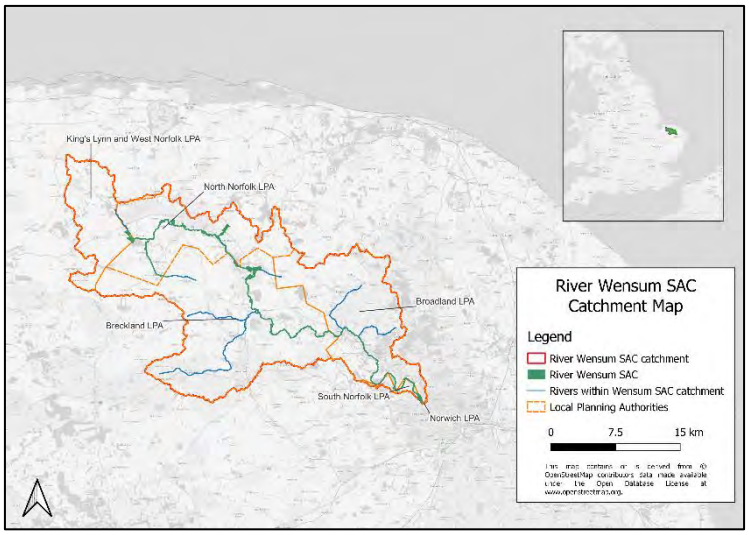
Issue 1

River Wensum Special Area of Conservation (SAC)

The River Wensum SAC is a Habitats site with water pollution and eutrophication considered a threat to its condition.

The Wensum is a low gradient, groundwater dominated river originating in northwest Norfolk, flowing southeast to Norwich where it joins the River Yare.

Intensive arable land-use dominates the landscape on the higher plateaus and valley sides, and grazing marsh, fen, reedbed, scrub and scattered woodland characterise the floodplain.



The current river channel is the product of a long history of modification and management. Anthropogenic influences have had a dramatic effect on the ecology and hydrology of the River Wensum, in particular at sites up and downstream of mill structures, sites affected by excessive silt deposition, sites that are heavily maintained and sites that lack natural riparian vegetation.

Regardless of this, the river supports over 100 species of plants, including three species of water-crowfoot. The river also supports white-clawed crayfish and populations of Desmoulin's whorl snail, Brook lamprey and Bullhead.

Increased levels of nitrogen and phosphorus entering aquatic environments via surface water and groundwater can severely threaten these sensitive habitats and species within the SAC. The elevated levels of nutrients can cause eutrophication, leading to algal blooms which disrupt normal ecosystem function and cause major changes in the aquatic community. These algal blooms can result in reduced levels of oxygen within the water, which in turn can lead to the death of many aquatic organisms including invertebrates and fish.

The habitats and species within the Wensum that result in designation as a SAC are referred to a 'qualifying features.' Not all of these qualifying features will be sensitive to changes in nutrients within the River Wensum. When completing an HRA involving nutrient neutrality, the Competent Authority (normally Local Planning Authority for developments) must identify and screen out qualifying features that are not sensitive to nutrients via a Habitats Regulations Assessment. Developers will be asked to submit information to support this process.

More detailed information on the qualifying features of the SAC and details of water quality data highlighting the current nutrient problems in the river are available in the Natural England River Wensum SAC evidence summary.

The requirement for Nutrient Neutrality

Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Ramsar sites are some of the most important areas for wildlife in the United Kingdom. They are internationally important for their habitats and wildlife and are protected under the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations). At some of these sites, there are high levels of nitrogen and phosphorus input to the protected water environment with sound evidence that these nutrients are causing eutrophication at these designated sites. These nutrient inputs currently mostly come either from agricultural sources or from wastewater from existing housing and other development. The resulting effects on ecology from an excessive presence of nutrients are impacting on protected habitats and species.

There is uncertainty as to whether new growth will further deteriorate designated sites, and/or make them appreciably more difficult to restore. The potential for future housing developments to exacerbate these impacts creates a risk to their potential future conservation status.

One way to address this uncertainty is for new development to achieve nutrient neutrality. Nutrient neutrality is a means of ensuring that development does not add to existing nutrient burdens and this provides certainty that the whole of the scheme is deliverable in line with the requirements of the Habitats Regulations.

Key Principles

The principles underpinning Habitats Regulations Assessments are well established[1]. At the screening stage, plans and projects should only be granted consent where it is possible to exclude, on the basis of objective information, that the plan or project will have significant effects on the sites concerned[2]. Where it is not possible to rule out likely significant effects, plans and projects should be subject to an appropriate assessment. That appropriate assessment must contain complete, precise and definitive findings which are capable of removing all reasonable scientific doubt as to the absence of adverse effects on the integrity of the site[3].

Natural England has been reviewing the available evidence on Habitats sites which are in unfavourable condition due to elevated nutrient levels. Where plans or projects will contribute additional nutrients to Habitats sites which are close to or already in unfavourable condition for nutrients, then a robust approach to the Habitats Regulations Assessment (HRA) of the effects of plans and projects is required.

Where sites are close to or already in unfavourable condition for nutrients, it may be difficult to grant consent for new plans and projects that will increase nutrient levels at the Habitats site. Nutrient neutrality provides a means of effectively mitigating the adverse effects associated with increased nutrients from new plans and projects, by counter-balancing any additional nutrient inputs to ensure that there is no net change in the amount of nutrients reaching the features which led to a Habitats site being designated.

Where new residential development is proposed, the additional nutrient load from the increase in wastewater and/or the change in the land use of the development land created by a new residential development can create an impact pathway for potential adverse effects on Habitats sites that are already suffering from problems related to nutrient loading. This impact pathway is shown diagrammatically in Figure 1. HRAs of new residential developments therefore need to consider whether nutrient loading will result in 'Likely Significant Effects' (LSE) on a Habitats site. If an HRA cannot exclude a LSE due to nutrient loading, the Appropriate Assessment (AA) will need to consider whether this nutrient load needs to be mitigated in order to remove adverse effects on the Habitats site.

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[1] See, amongst others Case C-127/02 *Waddenvereniging and Vogelsbeschermingvereniging* (Waddenzee); *R (Champion) v North Norfolk DC* [2015] EKSC 52 (Champion); C-323/17 *People Over Wind, Peter Sweetman v Coillte Teoranta* (People Over Wind); C-461/17 *Brian Holohan and Others v An Bord Pleanála* (Holohan); Joined Cases C-293/17 and C-294/17 *Coöperatie Mobilisation for the Environment UA and Others v College van gedeputeerde staten van Limburg and Other* (the Dutch Nitrogen cases);

[2] Case C-127/02 Waddenvereniging and Vogelsbeschermingvereniging (Waddenzee)

[3] Case 164/17 Grace & Sweetman v An Bord Pleanála (Grace & Sweetman)

For those developments that wish to pursue neutrality, Natural England advises that a nutrient budget is calculated for new developments that have the potential to result in increases of nitrogen/phosphorus entering the international sites. A nutrient budget calculated according to this methodology and demonstrating nutrient neutrality is, in our view, able to provide sufficient and reasonable certainty that the development does not adversely affect the integrity, by means of impacts from nutrients, on the relevant internationally designated sites. This approach must be tested through the AA stage of the HRA. The information provided by the applicant on the nutrient budget and any mitigation proposed will be used by the local planning authority, as competent authority, to make an AA of the implications of the plan or project on the Habitats sites in question.

The nutrient neutrality calculation includes key inputs and assumptions that are based on the best available scientific evidence and research. It has been developed as a pragmatic tool. However, for each input there is a degree of uncertainty. For example, there is uncertainty associated with predicting occupancy levels and water use for each household in perpetuity. Also, identifying current land / farm types and the associated nutrient inputs is based on best available evidence, research and professional judgement and is again subject to a degree of uncertainty.

It is our advice to local planning authorities to take a precautionary approach in line with existing legislation and case law when addressing uncertainty and calculating nutrient budgets. This should be achieved by ensuring nutrient budget calculations apply precautionary rates to variables and adding a buffer to the Total Nitrogen/Total Phosphorus figure calculated for developments. A precautionary approach to the calculations and solutions helps the local planning authority and applicants to demonstrate the certainty needed for their assessments.

By applying the nutrient neutrality methodology, with the buffer, to new development, the competent authority may be satisfied that, while margins of error will inevitably vary for each development, this approach will ensure that new development in combination will avoid significant increases of nitrogen load from entering the internationally designated sites.[4]

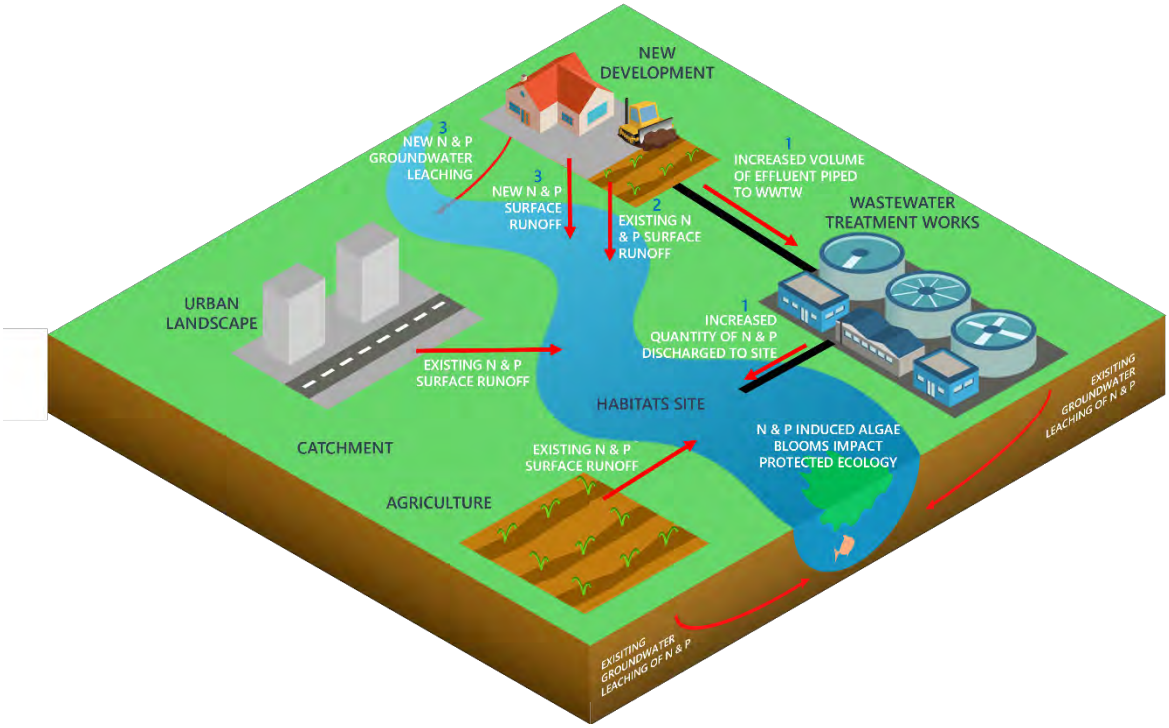
A HRA must be capable of removing all reasonable scientific doubt as to the absence of adverse effects on a Habitats site. Absolute certainty is not required, but the methodology used to evaluate potential adverse effects (and the measures intended to mitigate them) must effectively address any reasonable scientific doubt to achieve the required degree of certainty.

The first step in an AA that is applying nutrient neutrality is to understand whether a development will cause additional nutrient inputs to the River Wensum SAC. This requires calculation of the amount of nutrients a new residential development will create, otherwise known as a nutrient budget.

If a nutrient budget shows that a new development will increase the nutrient input to the River Wensum SAC and it is not possible to conclude no adverse effect on site integrity alone or in combination, then this is the amount of nutrients that require mitigating on an annual basis to achieve nutrient neutrality and therefore enable a conclusion of no adverse effect on site integrity to be reached.

[4] This approach was expressly endorsed in *R (Wyatt) v Fareham BC* [2021] EWHC 1434 (Admin)

Figure 1: Diagram demonstrating the potential nutrient impact pathways from a new development to a Habitats site. An increase in nitrogen and phosphorus availability in aquatic ecosystems can lead to various problems, such as algae blooms, which can have detrimental impacts on the ecology of a Habitats site.



What is this guidance for?

This guidance document accompanies the River Wensum SAC nutrient budget calculator. The nutrient budget calculator is used to calculate the change in nutrient input from a new residential development to the River Wensum SAC. The calculator can be used to inform an AA which is looking to apply nutrient neutrality to show whether a new development will require nutrient mitigation and if so, the amount of phosphorus loading that requires counterbalancing through mitigation measures to enable a conclusion of no adverse effect on site integrity, alone or in combination.

The guidance document contains the following:

- Step-by-step instructions on how to collect the specific data required as inputs to the tool.
- Instructions on how to use the tool.

Who is the guidance for?

This guidance is for anyone who needs to complete a nutrient budget calculation to support an AA of residential development in the River Wensum SAC catchment. The tool is primarily aimed at developers who need to complete a nutrient budget calculation to support a planning application and Local Planning Authorities who need to understand the mitigation requirements for future development or assess planning applications. It could also be used by communities or environmental groups wanting to understand the impacts of a local development on the nutrient inputs to the River Wensum SAC.

Summary of how the calculator works.

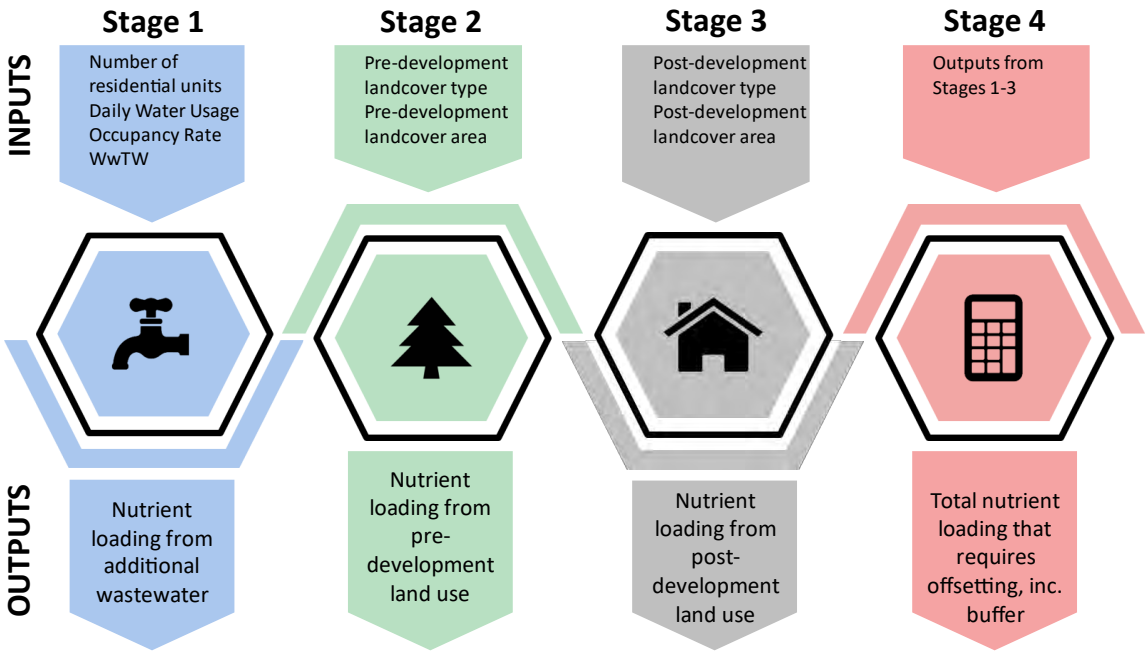
Overview

The nutrient budget calculator requires a set of inputs in order to calculate a new development's nutrient budget. The calculations are completed in four stages:

1. Calculate the increase in nutrient loading that comes from a development's wastewater.
2. Calculate the pre-existing nutrient load from current land use on the development site.
3. Calculate the future nutrient load from land use on the development site post-development.
4. Calculate the net change in nutrient loading from the development to the River Wensum SAC with the addition of a buffer. The net change in nutrient loading + the buffer is the nutrient budget.

These key inputs and outputs for each stage can are shown schematically in Figure 2.

Figure 2: Schematic showing the key inputs and outputs associated with each stage of the nutrient budget calculation methodology



Note: the values that come pre-entered in this tool have been chosen based on research to select inputs that meet the HRA tests of beyond reasonable scientific doubt, best available evidence, in perpetuity and were chosen in accordance with the precautionary principle. It is highly unadvisable to edit the values in this tool without a sufficient evidence base to justify any changes.

Data Collection and preparation

The nutrient budget calculator requires a set of inputs as shown in Figure 2. This section does not provide instructions on how to gather development specific information, such as the number of properties being constructed, as this should be known by the developer and should be detailed in the planning application. The subsections below provide guidance on how to identify certain inputs that are needed to complete the calculations for each stage of the nutrient budget calculations. The information required is available from free to access data sources[5]. Most of the required inputs are for factors that are specific to the location of a development site or the hydrological catchment of the River Wensum SAC.

The instructions below are divided by the stage where the data will be required. We advise that you collect and note down this data before starting to input information into each stage of the nutrient budget calculator.

Stage 2 & 3: Instructions for finding the Operational Catchment that the development is located within

- Go to this link: http://environment.data.gov.uk/catchment-planning/
- Search the location by place name, postcode etc. This will give a high-level view of the area. Use the zoom feature to find the exact location of the development.
- Click on the light blue area on the map in which the development is located. This will bring the user to the Operational Catchment page
- Make a note of the name of the Operational Catchment and select it from the dropdown list in the 'Catchment' cell when you get to this part of the calculator tool.

Note: the River Wensum SAC catchment is within a single Operational Catchment and so there is only one option that is pre-selected in the 'Catchment' cell of the calculator.

Stage 2: Instructions for finding the soil drainage type associated with the predominant soil type within the development site

- Go to this link: http://www.landis.org.uk/soilscapes/#
- Find your development site location on the map by using the search bar on the right side of the map in the 'Search' tab. Searching a location should generate a pop-up window in which you can view the soil information by clicking 'View soil information'. If this is not an option then click on the relevant soil type on the map and click on the 'Soil information' tab on the right-hand side of the map, below the 'Search' tab.
- The 'Soil drainage type' value can be found in the 'Soil information' under the title 'Drainage:'
- Make a note of this soil type and select the relevant soil drainage type from the drop-down list in the 'Soil drainage type' cell when you get to this part of the calculator tool.

Stage 2: Instructions for finding the annual average rainfall that the development site will receive

- Go to this link: https://nrfa.ceh.ac.uk/data/station/spatial/34004
- This link will bring the user to the Wensum at Costessey Mill flow gauge catchment information page.
- Click on the dropdown list next to the title 'Select spatial data type to view:' on the left of the map and select 'Rainfall'.
- Select the Legend tab.
- Zoom in on the map to find the location of the development and find the corresponding rainfall range from the Legend. Note that you cannot search this map using location information and will need to 'surf' around the map to find your development site location.

[5] Correct at the time of writing. These data sources are available from websites that currently have government funding but it should be noted that these datasets may become unavailable if funding is removed.

- Make a note of the relevant rainfall band for your site and use it to select this rainfall band from the drop-down list in the 'Average annual rainfall' cell when you get to this part of the calculator tool.

Stage 2: Instructions for finding out whether the development is in a Nitrate Vulnerable Zone (NVZ)

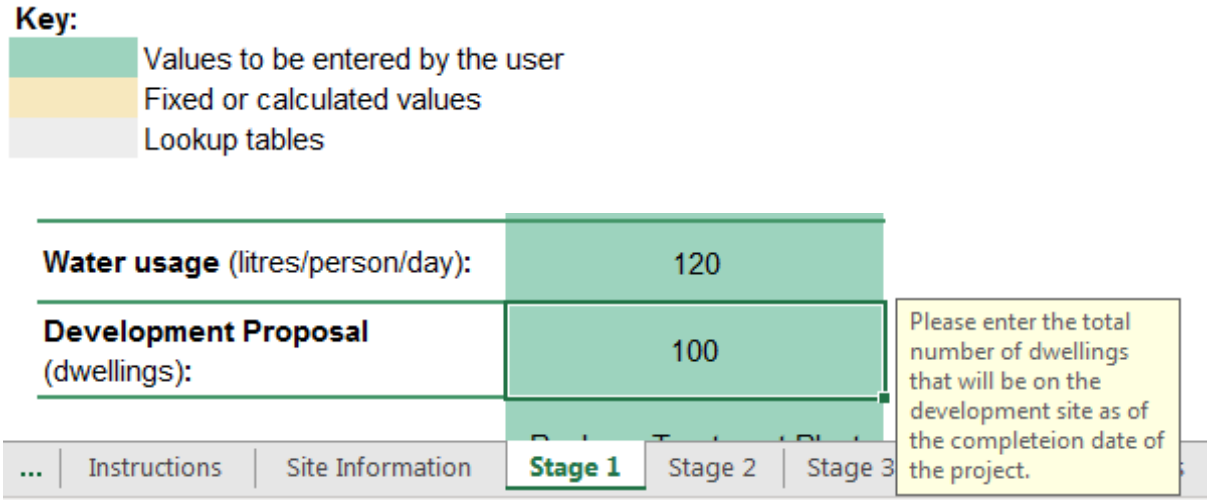
- Go to this link http://mapapps2.bgs.ac.uk/ukso/home.html?layers=NVZEng
- Enter the location of the development site in the search bar.
- Once the area has been located, click on the map where the development is located to find out if it is within an NVZ.
- Make a note of this information. It will be needed to select 'Yes' or 'No' from the 'Within Nitrate Vulnerable Zone (NVZ)' cell when you get to this part of the calculator tool.

Note: some of the values you select above will also be used in the Stage 3 calculations, however you only need to add the above details to the table in Stage 2 of the calculator and the required values for stage 3 will be carried through automatically.

How to use the calculator:

General tips

- The key below shows the colour coding used to highlight which cells need to be completed.
- When a cell is selected, instructions on how to fill out the cell that is selected are shown.
- Some cells will have values pre-populated, like the 'Water usage' input. The instructions for each cell will detail if an alternative value can be used.
- It is advisable to retain a default copy of this calculator tool workbook which has not had any development details added. "Save as" a new copy each time you calculate a budget for a new development in case any of the default values in the in the workbook get overwritten and are needed again.



Stage 1: calculate the new nutrient load associated with the additional wastewater

In this section the user will need to enter:

- The date of first occupancy. *This is because some wastewater treatment works may be due an upgrade in 2025 that will change the nitrogen or phosphorus output from this works, which will in turn change the output from this stage of the calculations. If this is the case, it will be apparent*

in the calculated values if there is an upgrade to a treatment works that affects the nutrient budget.

- The average occupancy rate of the development will need to be entered in people per dwelling for residential dwellings or units for other types of overnight accommodation which would result in an increase in overnight accommodation. The default setting for residential dwellings is the national occupancy rate of 2.4 people per dwelling. **Only change this value if there is sufficient evidence that a different occupancy rate is appropriate** (see Occupancy Rate Guidance section below for when a local or regional occupancy rate is acceptable).

- The number of dwellings / units[6] that will be within the development at the time of completion.

- The wastewater treatment works that the development will connect to. If required this information can be obtained from the sewerage undertaker for the development site. If it is not feasible to connect to mains sewerage and a septic tank (ST) or package treatment plant (PTP) is being used, please select this option. Please be aware that if the total nitrogen (TN) or total phosphorus (TP) final effluent concentrations (in mg/l) are specified by the manufacturer, please select 'Septic Tank user defined' or 'Package Treatment Plant user defined' and enter the specified value in the cell where prompted. If you do not have a TP or TN value provided by the manufacturer, select the 'Septic Tank default' or 'Package Treatment Plant default' option and a value will be provided automatically.

Occupancy Rate Guidance:

As set out in the guidance below, the Local Planning Authority/Competent Authority will need to ensure that the occupancy rate is appropriate to development within their Authority area. **It is therefore recommended that the occupancy rate is agreed with the Local Planning Authority before completing the nutrient budget calculation.**

Competent authorities must satisfy themselves that the residents per dwelling/unit value used in this step of the calculation reflects local conditions in their area. The residents per dwelling value can be derived from national data providing it reflects local conditions. However, if national data does not yield a residents per dwelling/unit value that reflects local occupancy levels then locally relevant data should be used instead. Whichever figure is used, it is important to ensure it is sufficiently robust and appropriate for the project being assessed. **It is therefore recommended that project level Appropriate Assessments specifically include justification for why the competent authority has decided upon the occupancy rate that has been used.**

Further guidance is provided below.

National occupancy data

When using national occupancy data, the Office of National Statistics (ONS) national average value for the number of residents per dwelling of 2.4 is recommended. This value is derived from 2011 census data and is subject to change when the 2021 Census becomes available. This value can be used if the Local Planning Authority is satisfied that:

- It is appropriate for the level and type of housing development that is expected to come forward in the Local Planning Authority's area (a strategic assessment should be made of the development anticipated to come forward over the Local Plan period to ensure the use of average figures will not under/overestimate the level of impact)

[6] The term 'dwellings' has a specific legal meaning derived from the use classes order. To ensure that all relevant forms of development which would result in an increase in overnight accommodation such as hotel rooms, short term holiday lets etc are considered in the HRA process the term units is used

- It corresponds to the local average in the area (it is not likely to overestimate or underestimate occupancy)
- It is based on data that is robust and doesn't underestimate the level of impact over time.

It may not be appropriate to use the national average occupancy rate for development types which are not included in the ONS data, such as student accommodation or houses in multiple occupation. For such developments, the Local Planning Authority should specify an appropriate occupancy rate in the project level Appropriate Assessment and explain how this figure was derived.

Locally relevant occupancy data

If the national average occupancy rate does not correspond with local conditions, then a locally relevant average residents per dwelling value may be more appropriate. If a Local Planning Authority decides to use a locally relevant value, that value needs to be supported by robust and sufficient evidence which should be included in the project level Appropriate Assessment. Key sources of evidence include:

- The average occupancy rate from the census for the relevant local administrative area, e.g. the county.
- The average occupation figures used by the Local Planning Authority to calculate population growth due to Local Plan development.
- The average occupation figures used by the local water company to plan for population growth and the impact on water resources and sewage treatment.

A local / regional average occupancy rate can be used provided that it is from a robust source which can show trends over a protracted period of time– such as from ONS derived data or from the annual English Housing Survey. Figures derived from data collected over short periods of time will not be acceptable as short-term data is unlikely to provide the required degree of certainty. The Local Planning Authority should ensure that any trend in occupancy rates or estimates of the average number of persons per household used will continue for perpetuity and would not underestimate the level of impact over time. A local / regional average occupancy rate would therefore need to be based on figures over at least a 5-year period[7].

Local Planning Authorities will also need to satisfy themselves that a locally derived occupancy figure is appropriate for the level and type of housing development that is expected (a strategic assessment should be made of the development anticipated to come forward over the Local Plan period to ensure the use of average figures will not under/overestimate the level of impact).

Occupancy rates based on dwelling type

Should the nature or scale of development associated with a particular project proposal suggest that the use of an average occupancy rate is not appropriate, then the Local Planning Authority may decide to adopt an occupancy rate based on the dwelling types proposed for that particular project, provided it meets the criteria outlined above. This may be appropriate where a project proposer seeks consent for a development comprising certain dwelling types (e.g. flats and small 1 and 2 bed dwellings). If the Local Planning Authority decides to adopt a local approach based on determining occupancy rate by dwelling type, that approach should be used for all planning applications, rather than reverting back to the use of an average occupancy rate. This will ensure that the Local Planning Authority doesn't inadvertently underestimate total occupancy levels (and consequently water quality impacts) across its area by applying a lower residents per dwelling/unit value for developments comprising smaller units but failing to adopt a higher residents per dwelling/unit value for developments comprising larger units or a mix of units.

[7] The figure of 5 years has been chosen as the minimum period of time over which occupancy rates can be calculated from as local plans and WRMPs are reviewed every 5 years, so represents a long enough period of time to capture any trends or changes.

Consistency in applying occupancy rates

The same occupancy rate should be used where there are several different impacts on Habitat sites which require strategic mitigation. The strategic approaches developed with local planning authorities to deal with in combination impacts on international sites elsewhere typically calculate mitigation requirements and contribution requirements based on current national average occupancy rates. Local Planning Authorities may decide to use a locally derived average occupancy rate instead, but this local occupancy rate must be used consistently across each type of impact and each Habitats site affected. Local Planning Authorities should not use different occupancy rates in their HRAs for the same dwelling types / size of units. Whilst the impacts will be different, occupancy rates will have been used to estimate the scale of impact and subsequently the scale of mitigation required on the protected sites. The types of impact will typically last in perpetuity. Care is therefore needed to ensure the adoption of an alternative occupancy rate based on an assessment of net population additions to a locality for nutrient budgeting does not undermine other existing strategic approaches, particularly where there are overlapping impacts within the locality.

Note: When 2021 Census data is available, the 2.4 value will be updated.

Note: if an ST or PTP is being used then a comprehensive maintenance regime is required as part of the application process. Please consult your Local Planning Authority for further advice on how to specify this maintenance regime and demonstrate that it is appropriately secured. If the ST or PTP which is being used has phosphate stripping capabilities, chemical dosing may be required. If chemical dosing is required, a robust management plan that details how chemicals are stored, the dilution rates, dosing frequencies, that any chemicals used will not have an environmental impact etc. must also accompany the planning application. PTPs with chemical dosing may not be appropriate in all cases.

Stage 2 - calculate the annual nutrient load from existing (pre-development) land use on the development site

In this section some environmental information about the development will need to be entered as well as the type and area of landcover that is being developed. The environmental information required is described above.

Only the types and areas of land that are being altered by the development should be entered. For example, if two hectares of agricultural land within a ten-hectare development site are being retained in the same agricultural use, this area should not be included in the calculations.

In the 'Existing land use type(s)' column of the main table in Stage 2 of the calculator, each cell has drop-down list of land use types. This list contains seven agricultural land cover types to choose from and eight different non-agricultural land cover types that may be present on a pre-development site. Please find out what land use types are within the development before completing this tool. If there is a land use within the development area that is not in the list, please select the most similar land use type. Table 1 provides a description of the different land use types available within the calculator tool.

Table 1: Table of land use types included within the tool and their descriptions.

Land use types used in the calculator tool	Description
Cereals	Agricultural areas on which cereals, combinable crops and set aside are farmed.
General	Agricultural areas on which arable crops (including field scale vegetables) are farmed.
Horticulture	Agricultural areas on which fruit (including vineyards), hardy nursery stock, glasshouse flowers and vegetables, market garden scale vegetables, outdoor bulbs and flowers, and mushrooms are farmed.
Pig	Agricultural areas on which pigs farmed.
Poultry	Agricultural areas on which poultry are farmed.
Dairy	Agricultural areas on which dairy cows are farmed.
LFA	Agricultural areas on which cattle, sheep and other grazing livestock are farmed in locations where agricultural production is difficult. An area is classified as a Less Favoured Area (LFA) holding if 50 per cent or more of its total area is classed as LFA.
Lowland	Agricultural areas on which cattle, sheep and other grazing livestock are farmed. A holding is classified as lowland if less than 50 per cent of its total area is classed as a lowland grazing area.
Mixed	Agricultural areas in which none of the above categories are farmed or where it is too difficult to select a single category to describe the farm type.
Greenspace	Natural and semi-natural outdoor spaces provided for recreational use where fertilisers will not be applied and dog waste is managed, e.g. semi-natural parks. This does not include green infrastructure within the built urban environment, such as sports fields, gardens, or grass verges, as these are included in the residential urban land category.
Woodland	Natural and semi-natural outdoor wooded areas.
Shrub	Natural and semi-natural outdoor shrubland area.
Water	Areas of surface water, including rivers, ponds and lakes.
Residential urban land	Areas of houses and associated infrastructure. This is inclusive of roads, driveways, grass verges and gardens.
Commercial/industrial urban land	Areas that are used for industry. These are businesses that typically manufacture, process or otherwise generate products. Included in the definition of industrial land are factories and storage facilities as well as mining and shipping operations.
Open urban land	Area of land in urban areas used for various purposes, e.g. leisure and recreation - may include open land, e.g. sports fields, playgrounds, public squares or built facilities such as sports centres.
Community food growing	Areas that are used for local food production, such as allotments.

Stage 3: calculate the annual nutrient load from new (post-development) land use on the development site

In this section the user will need to select the type and area of the landcover present on the development site after the development has been completed.

In the ‘New land use type(s)’ column of the main table in Stage 3 of the calculator, each cell has a drop-down list of land use types containing eight non-agricultural land use types that may be present on the post-development site. Please find out what land use types are within the development before completing this part of the tool. If there is a land use within the development area that is not in the list (see Table 1 for land use type descriptions), please select the most similar land use type.

Stage 4: calculate the net change in nutrient loading for the site and the final annual nutrient budget for the development site:

This final stage automatically uses the results from Stages 1-3 and calculates the nutrient budget using the equation shown in Figure 3.

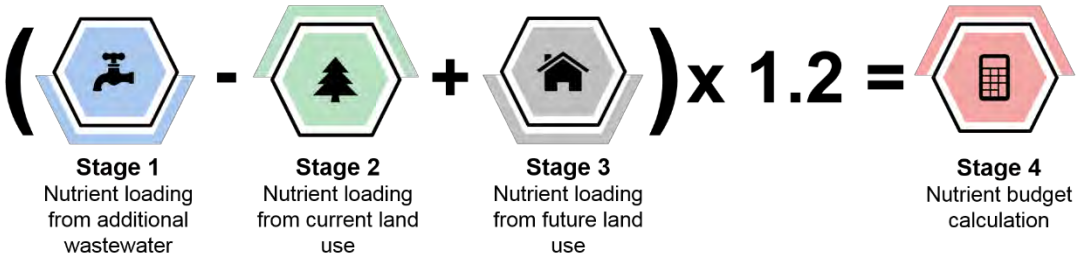
As Figure 3 shows, the output from Stage 4 of nutrient budget calculations is the balance of new sources of phosphorus from a development minus the existing sources of phosphorus from the pre-development site. To ensure the final figure is robust and suitably precautionary this balance is multiplied by 1.2, i.e. increased by a 20%, buffer'.

The 20% buffer is applied to account for the uncertainties that underlie the inputs to Stages 1-3 of the nutrient budget calculations, as well as accounting for some potential nutrient sources associated with new development that cannot be readily quantified. To cover all possible inputs to a nutrient budget with a high enough certainty to remove the need for the buffer would require extensive site-specific investigations. The 20% buffer is a means of accounting for the uncertainties within the nutrient budget calculations and providing confidence that mitigation of the nutrient budget will remove the risk of adverse effects on site integrity in the River Wensum SAC.

The output in Stage 4 shows how much nutrient mitigation is required in kilograms per year to achieve nutrient neutrality.

If there are two values due to an upgrade occurring at the wastewater treatment works the development is connecting to, the calculator will show the total amount of nutrient mitigation that is needed before and after the upgrade.

Figure 3: The equation used to calculate the nutrient budget.



Designated Site Name:	River Wensum SAC

Site Details:

From the River Wensum SAC citation:

The Wensum is a naturally enriched, calcareous lowland river. The upper reaches are fed by springs that rise from the chalk and by run-off from calcareous soils rich in plant nutrients. This gives rise to beds of submerged and emergent vegetation characteristic of a chalk stream. Lower down, the chalk is overlain with boulder clay and river gravels, resulting in aquatic plant communities more typical of a slow-flowing river on mixed substrate.

Much of the adjacent land is managed for hay crops and by grazing, and the resulting mosaic of meadow and marsh habitats, provides niches for a wide variety of specialised plants and animals. *Ranunculus* vegetation occurs throughout much of the river's length.

Stream water-crowfoot *R. penicillatus* ssp. *pseudofluitans* is the dominant *Ranunculus* species but thread-leaved *watercrowfoot R. trichophyllus* and fan-leaved water-crowfoot *R. circinatus* also occur in association with the wide range of aquatic and emergent species that contribute to this vegetation type.

The river should support an abundant and rich invertebrate fauna including the native freshwater crayfish *Austropotamobius pallipes* as well as a diverse fish community, including bullhead *Cottus gobio* and brook lamprey *Lampetra planeri*. The site has an abundant and diverse mollusc fauna which includes Desmoulin's whorl-snail *Vertigo moulinsiana*, which is associated with aquatic vegetation at the river edge and adjacent fens.

Reason for European Site Designation:

The River Wensum Special Area for Conservation is designated for the following features:

- H3260 Water courses of plain to montane levels with *R. fluitantis*
- S1016 Desmoulin's whorl snail, *Vertigo moulinsiana*
- S1092 Freshwater crayfish, *Austropotamobius pallipes*
- S1096 Brook lamprey, *Lampetra planeri*
- S1163 Bullhead, *Cottus gobio*

Links to Conservation Advice:
Conservation Objectives
Conservation Objectives Supplementary Advice

Nutrient Pressure(s) for which the site is unfavourable:

Phosphorus

Water Quality Evidence:

In the Conservation Objectives Supplementary Advice for the River Wensum SAC it states 'restore the natural nutrient regime of the river, with any anthropogenic enrichment above natural/background concentrations limited to levels at which adverse effects on characteristic biodiversity are unlikely'

Water Quality data is reported against the respective SSSI units within the SAC. The data reported here are from the same monitoring points as those used in the River Wensum Diffuse Water Pollution Plan.

Unit name	SSSI Unit	Monitoring point ID	WQ Target	WQ Monitoring Data[1]	Compliance with target – Pass/Fail and % reduction needed to achieve the WQ Target
			Soluble Reactive Phosphorus (ug/l), annual mean	Orthophosphate, reactive as P (ug/l), mean	Compliance with target – Pass/Fail and % reduction needed to achieve the WQ Target
Wensum Above Confluence with Tat	45	R.Wensum Helhoughton Bridge An-Wen020	20	39.3 (Feb 2019 – Jan 2022)	FAIL 49% reduction needed
Tat Above Confluence with Wensum	46	R.Tat Tatterford Common (R.Wensum) An-Wen010	20	80.9 (Feb 2019 – Jan 2022)	FAIL 75% reduction needed
Confluence - Fakenham Mill	47	R.Wensum Sculthorpe Mill An-Wen040	30	45.2 (Feb 2019 – Jan 2022)	FAIL 34% reduction needed
		R. Wensum Goggs Mill Rd. Br. Hempton An-Wen045	30	46.1 (Jan 2019 – Dec 2021)	FAIL 35% reduction needed
Fakenham Mill - Great Ryburgh Mill	48	R.Wensum Great Ryburgh Bridge An-Wen070	30	59 (Oct 2011 – Sept 2014)	FAIL – older data 49% reduction needed
Great Ryburgh Mill - Bintree Mill	49	No Monitoring Point	30	-	Unknown
Bintree Mill - North Elmham Mill	50	R.Wensum County School Bridge An-Wen102	30	71.6 (May 2019 – Dec 2021)	58% reduction needed
North Elmham Mill - Elsing Mill	51	R.Wensum Swanton Morley Bridge An-Wen180	30	57.6 (Feb 2019 – Jan 2022)	FAIL 48% reduction needed
Elsing Mill - Lenwade Mill	52	R. Wensum Lyng Road Bridge An-Wen1905	30	64.9 (Jan 2019 – Dec 2021)	FAIL 54% reduction needed
Lenwade Mill - Taverham Mill	53	R.Wensum Great Witchingham Bridge An-Wen200	30	59.7 (Feb 2019 – Jan 2022)	FAIL 50% reduction needed
Taverham Mill - Hellesdon Mill	54	R.Wensum Taverham Bridge An-Wen235	30	63.8 April 2017 – March 2020)	FAIL 53% reduction needed

Langor Drain Above Conf. with Wensum	55	Kettlestone Str. Langer Br. (R.Wensum) An-Wen060	30	75 (Aug 2014 – Jul 2017)	FAIL 60% reduction needed

[1]Water Quality Monitoring data from EA WIMS database, the date range is in brackets. Any sample results below the level of detection (LOD) were taken at face values in the calculation of the mean. Following the rivers common standards monitoring guidance the mean of 3 years of data used where available.
The condition of the waterbody and the habitats which support the designated features is in part dependent on the water quality within them.

The occurrence of elevated nutrients in the waterbody can impact on the competitive interactions between high plant species and between higher plant species and algae, which can result in a loss of characteristic plant species. Changes in plant growth and community composition and structure can have implications for the wider food web, and the species present. Increased nutrients and the occurrence of eutrophication can also impact on the dissolved oxygen levels in the waterbody and substrate condition, also impacting on biota within the river.

Recent water quality measurements for the River Wensum within the SAC show phosphorus concentrations to be exceeding the targets for all unit where there is monitoring data. Any nutrients entering the catchment upstream of the locations which are exceeding their nutrient targets, will make their way downstream and have the potential to further add to the current exceedance. Therefore, for the River Wensum, the whole upstream catchment is included within the catchment map.

Additional Information:

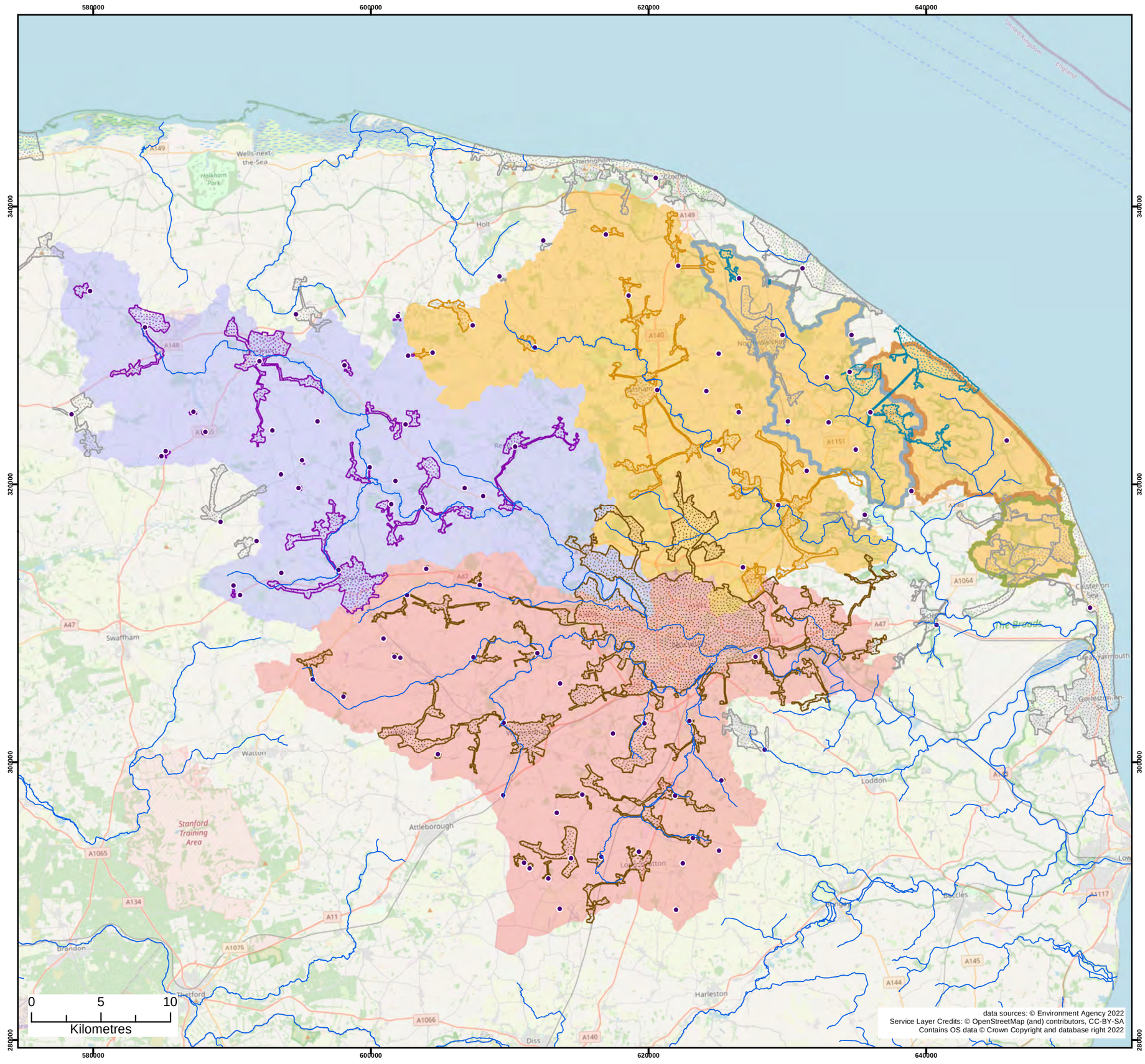
Habitat type impacted by nutrients - Riverine

The Special Area for Conservation is legally underpinned by the River Wensum SSSI

SSSI interest features include:

- River supporting habitat
- Rivers and Streams

Appendix 5



Legend:

- Wastewater Treatment Works
- Main Rivers
- WwTWs that do not drain into the catchment

WwTWs within the catchment

- River Bure
- River Bure - Ant Broads
- River Bure - Hickling Broad
- River Wensum
- River Yare

Surface Water Catchments

- River Wensum
- River Yare
- River Bure
- River Bure - Hickling Broad
- River Bure - Filby Broad
- River Bure - Ant Broads

Client:	Project:
Norfolk Council	Norfolk Nutrients Project

Title: Nutrient Catchment Map (overview)

Figure:	Drawing No:
2	PC3719-RHD-ZZ-XX-DR-Z-0002

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	29/09/2022	GC	LB	A3	1:275,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

REPORT

Norfolk Nutrient Budget Calculator

Technical Reference Report

Client: Norfolk Combined Authorities

Reference: PC3719-RHD-ZZ-XX-RP-Z-0001
Status: S0/P01.01
Date: 22 September 2022

Royal HaskoningDHV
Enhancing Society Together

Project related

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Document title: Norfolk Nutrient Budget Calculator

Subtitle: Technical Reference Report
Reference: PC3719-RHD-ZZ-XX-RP-Z-0001
Status: P01.01/S0
Date: 22 September 2022
Project name: Norfolk Nutrient Strategy
Project number: PC3719
Author(s): Oliver Bowers & Ian Dennis

Drafted by: Oliver Bowers

Checked by: Oliver Bowers

Date: 21/09/2022

Approved by: Ian Dennis

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Classification

Project related

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1.1 Introduction

1.1.1 Evidence-based approach

The Norfolk nutrient budget calculator is a regional specific tool designed to rapidly calculate the nutrient loading from new residential development in the catchments of the River Wensum SAC and the Broads SAC. This report presents the methods, principles and key assumptions on which the calculator is based.

The Norfolk nutrient budget calculator utilises the best available scientific evidence and research alongside the latest nutrient neutrality guidance from Natural England (2022). The calculator adopts a regional specific and accurate approach. As a result, some of the calculator inputs and assumptions deviate from those advised in the published guidance. The evidence to support these deviations is presented within this report.

Whilst the best available evidence and research was used, some inputs are based on professional judgement and the values used are subject to a degree of uncertainty. As such, a precautionary approach was applied in line with existing legislation and case law. Furthermore, a precautionary buffer is added to the total nutrient loading values for developments. Applying a precautionary approach provides reasonable certainty to the local planning authority that the development, in combination with other developments, will avoid significant increases in nutrient loading to the designated sites.

Under the requirements of the Conservation of Habitats and Species Regulations 2017 (as amended) (herein referred to as the Habitats Regulations), a Habitats Regulations assessment must remove all reasonable scientific doubt as to the absence of adverse effects on a habitats site. However, absolute certainty is not required. In order to meet the requirements, scientific evidence was used instead of generic assumptions where possible.

1.1.2 Use of the calculator

The calculator is only applicable to developments that impact the River Wensum SAC and/or Broads SAC site or any water body that subsequently discharges into these sites. **Figure 1** presents the surface water catchment area that will impact nutrient contributions to the designated sites. **Appendix 1** provides a full list of the Water Recycling Centres (WRCs) that discharge into the surface drainage network upstream of the designated sites and could therefore supply nutrients to them. For any development proposals that would be located outside of the defined surface water catchment area, but would discharge effluent to a WRC within the surface water catchment, stages 2 and 3 do not apply. No assessment is necessary for any development proposals that would drain to a WRC that discharges outside of the surface water catchment.

The methodology applies to all developments that could result in a net increase in population, such as new homes, student accommodation, tourist attractions and tourist accommodation as these developments would have wastewater implications. Commercial developments are not typically included, as it is assumed that people working in a commercial building will live within the same catchment and the wastewater implications of the individuals are considered when assessing housing. Assessing both housing and commercial developments could therefore lead to ‘double-counting’.

Figure 2 presents a flow diagram for the application of the methodology used in the Norfolk nutrient budget calculator. Details of each stage are presented below.

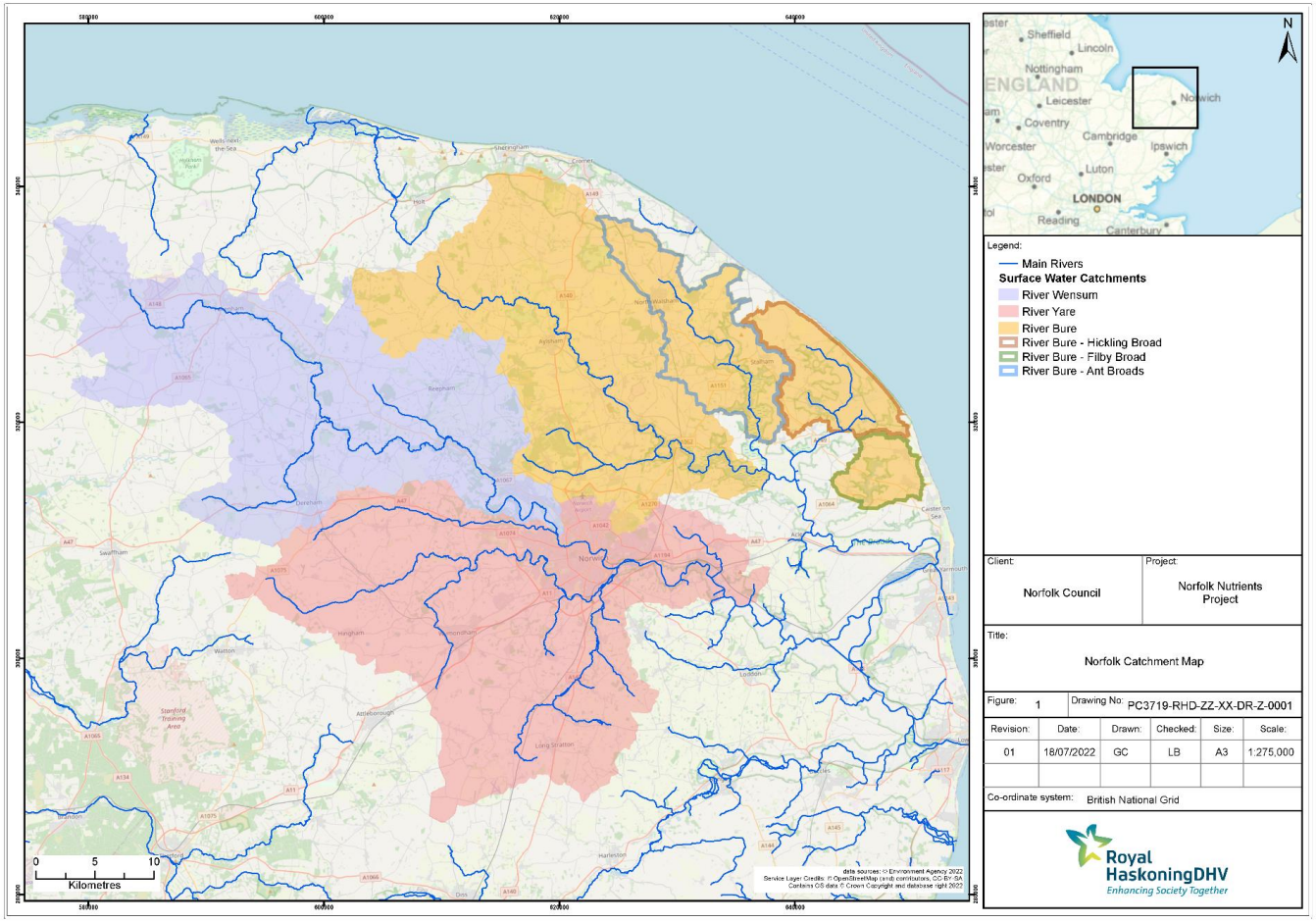

Figure 1: *Surface water catchment map*

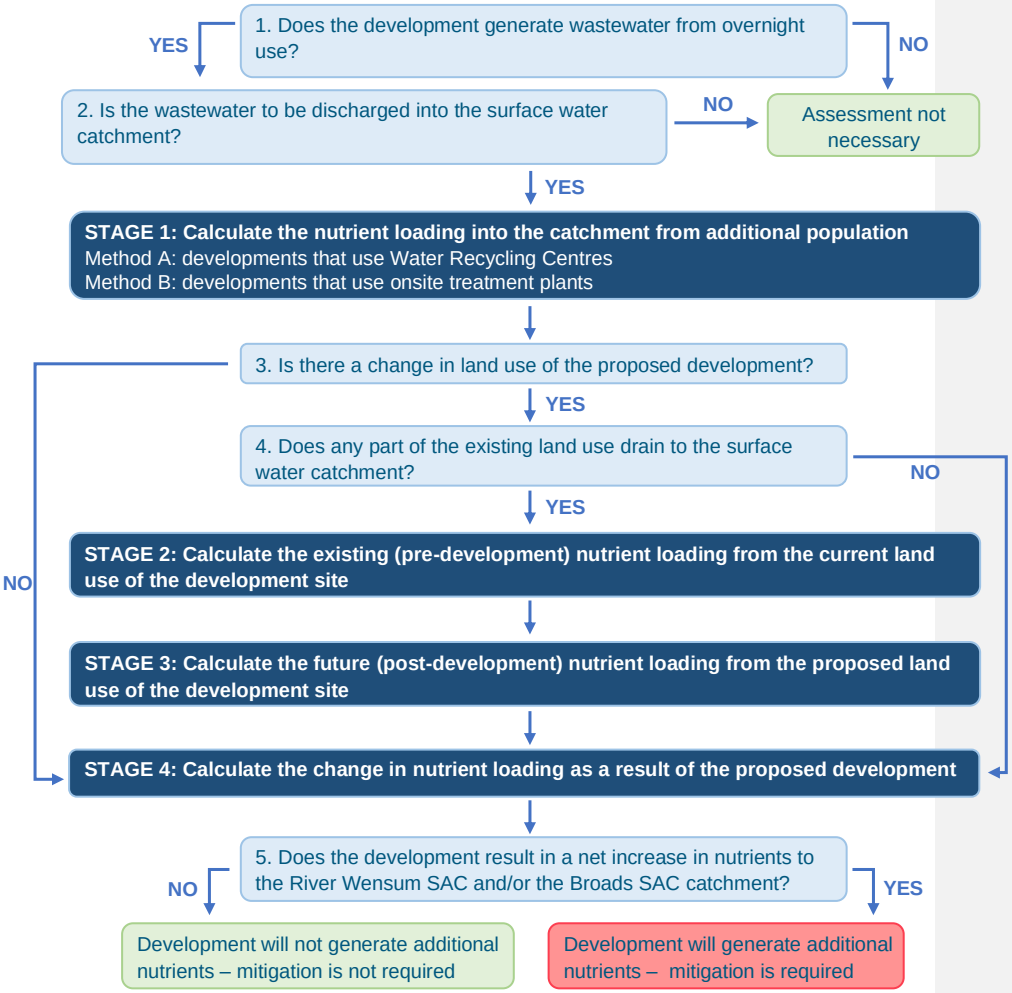

Figure 2: *Nutrient neutrality flow diagram*

1.2 Stage 1: Calculate nutrient loading from additional wastewater

1.2.1 Stage 1 methodology

Nutrient loading is calculated by multiplying the number of proposed dwellings by the assumed occupancy rate (persons/dwelling) to calculate the population increase from the development. This is then multiplied by the water usage (l/person/day) and the effluent discharge concentration (mg/l) to calculate the nutrient loading, which is converted into kg/yr.

$$\boldsymbol{No.of\ dwellings \times Occupancy\ rate\ = P_i} \qquad \textit{Eq. 1}$$

Where $\boldsymbol{P_i}$ represents the population increase.

$$\boldsymbol{P_i \times Water\ usage = W\ (Litres\ per\ day)} \qquad \textit{Eq. 2}$$

Where $\boldsymbol{W}$ the wastewater volume generated.

$$\boldsymbol{W \times (WRC\ discharge\ level) = L_w\ (mg\ per\ day)} \qquad \textit{Eq. 3}$$

$$\boldsymbol{\frac{Nutrient\ load}{1000000} \times 365\ = L_w(kg\ per\ year)} \qquad \textit{Eq. 4}$$

Where L_w represents the loading from wastewater.

1.2.2 Average occupancy rates

The current Natural England nutrient neutrality guidance (2022) derives average housing occupancy rates by considering the total population within a catchment against the total number of dwellings. This housing rate is then applied to all new developments within the catchment. This approach assumes that all new dwellings will result in an increase in the population within the catchment and ignores the fact that new dwellings will often by occupied by people who are already living within the catchment (and therefore already contributing to wastewater).

A more robust method of calculating the actual population change from new developments was used and a Norfolk specific occupancy rate of 1.89 persons/dwelling was derived (ORS, 2022). This value accounts for people moving within catchments and the impact of second homes / holiday homes.

Commented [ID1]: Can we provide any more detail regarding how this was derived? Otherwise it might be worth including this report as an appendix

Commented [OB2R1]: Trevor – Can we include the report as an appendix?

This Norfolk average occupancy rate is applied to all residential dwellings within the catchment, regardless of the number of bedrooms. This consistent approach reduces the risk of underestimating or overestimating the total occupancy levels across the catchment. However, the Norfolk average occupancy rate is not appropriate for development types such as student accommodation or houses in multiple occupation, which are not included in the ONS data. In this case, an average occupancy of 1.65 persons/dwelling, derived from the Dorset Heathlands SPD (Dorset Council, 2020), is applied to additional rooms above 6 residents. The Dorset Heathlands SPD provides the best alternative estimate and is considered to be appropriate for use outside of Dorset.

In the case of hotels or guest houses, an average occupancy of 1.65 persons/dwelling is also assumed, alongside estimations on the number of weeks open per year (1-52) and typical occupancy (1-100%) which are applied as multipliers. Accounting for the number of weeks open and typical occupancy allows for the most accurate determination of the wastewater volume that will be produced by the development.

In the case of single bedroom student halls, bespoke occupancy rates should be agreed with the relevant Local Planning Authority.

1.2.3 Water usage per person

The optional higher Building Regulations standard for water use per person of 110 litres/person/day is used within the calculator by default. When developments are built to 110 l/person/day, this value should be secured by the Local Planning Authority through a planning condition. However, the cells remains open and the user can choose to apply the Building Regulations legal maximum water use per person standard of 125 litres/person/day or a water use per person standard that is even greater than the optional higher standard.

Natural England nutrient neutrality guidance (2022) indicates that an additional 10 litres per person per day should be applied to the chosen water usage standard to account for potential changes to less water efficient fittings throughout the lifetime of the development. However, there is evidence in the literature to suggest that water usage per person per day does not increase over time. As such, this assumption was not adopted in the Norfolk nutrient budget calculator. For example, a recent report by Waterwise (2018) indicates that customer perception on water efficient fittings is positive, with 42% feeling that efficient showerheads and taps would perform the same and 39% thinking that they perform better than less efficient products. Furthermore, a recent Ofwat study found that it is possible to achieve average household consumptions of 50-70 litres per person per day in 50 years, without a reduction in the level of utility or quality of water use. Andrewartha and Scott (2018) found that the average water usage in properties built to a standard of 125 litres/person/day is actually 113.7 litres/person/day.

The Norfolk Nutrient budget calculator uses a default value of 110 l/person/day within the calculator and does not apply an additional 10 l/person/day as per Natural England guidance.

1.2.4 Wastewater discharge concentrations

1.2.4.1 Water Recycling Centre

In order to calculate the nutrient contribution from wastewater, an estimate is made on the nutrient concentrations in the treated wastewater generated by the new development. Wastewater from a new development is preferably treated at a mains water recycling centre (WRC), where nutrients are removed by treatment processes. Some WRCs have dedicated nutrient removal processes and the final effluent concentrations will comply with permitted concentrations. Other WRCs, usually more rural, will not have a permitted limit on the concentration of final effluent discharges.

Permitted WRCs are operated so that they have some headroom between the final effluent concentrations and the level that has to be met for compliance with the permit. This is to ensure that WRCs will remain compliant with their permits as well as to provide water quality benefits. Where a permit limit is set to decrease, water companies will sometimes operate at this lower concentration in advance of the permit changes. Natural England's guidance assumes that WRC discharge at 90% of their permit limit, and as such apply a multiplier of 0.9 to the permit limit. This makes a general assumption on the average discharge concentrations, which is likely to vary between each WRC, and typically represents an overestimation on the actual discharge concentrations in the final effluent from the WRCs.

A more catchment specific and evidence-based approach is to use measured discharge concentrations from the WRC within the catchment that operate under permit limits. However, due to potential future changes (either increases or decreases) in the discharge concentration, a precautionary approach was adopted which assumes that the WRCs discharge at one standard deviation[1] from the mean.

[1] *Standard deviation is a statistic that measures the dispersion of a dataset relative to its mean. This is calculated as the square root of the variance using the formula* $\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(X_i - \mu)^2}$ Where σ is the standard deviation, μ is the mean average, N is the sample size and X the observed values. A low standard deviation indicates the values tend to be close to the mean, while a high standard deviation indicates the values are spread out over a wider range. Under a normal distribution (i.e. bell-shaped curve), one standard deviation away from the mean in either direction account for 68.2% of the values.

The suitability of the standard deviation approach as a precautionary buffer was assessed by considering the % increase in flow (m^3/day) as a result of projected growth at each permitted WRC. Where a WRC will see a flow increase of greater than 10%, it was assumed that this was significant growth and a further buffer was required on top of the standard deviation. The WRCs in this case were therefore assumed to operate at 90% of their permit. This approach ensures that future growth is considered without underestimating the wastewater loading. For the WRCs without sufficient data, the typical standard deviation discharge of 76% was applied to the permitted concentration.

The discharge concentration data was supplied by Anglian Water Services and ranges from January 2019 to June 2022. In order to ensure the calculator remains up to date with measured concentrations, a review of the measured data should be conducted at regular intervals and the calculator updated to reflect any changes. The calculator, at the time of completing the Habitats Regulations Assessment will represent the best available evidence at that time. Regularly reviewing the discharge concentration data ensures that is still the case going forward.

The calculator also incorporates post 2025 (Asset Management Plan (AMP) 7) and Post 2030 (AMP 8) discharge concentrations. Where the permit limit is not changing post 2025, the same discharge concentrations were assumed. Where the permit limit is changing (Aylsham, Southrepps and Swardeston) it was assumed that the WRC would operate at 90% of its updated permit limit. This will be reviewed once there is sufficient evidence regarding the post-2025 performance.

A statement from the Department for Levelling Up, Housing & Communities (21st July 2022) indicates that there will be a statutory obligation on Anglian Water to operate WRCs at the Technically Achievable Limit (TAL) within the catchment by 2030. The TAL is 0.25mg/l for Total Phosphorus (TP) and 10mg/l for Total Nitrogen (TN). The government will table an amendment to the Levelling Up and Regeneration Bill (LURB) which gives confidence that the upgrades will be in place by 2030 and enabling the use of the lower permit limits as part of a Habitats Regulations Assessment. The calculator adopts these new lower permit limits. However, due to a lack of data on performance at these significantly reduced limits, the calculator assumes the discharge concentrations would be at 90% of the permits.

Natural England guidance indicates that standard concentrations of 8 mg/l for TP and 27 mg/l for TN should be assumed for unpermitted WRCs. However, catchment specific default values are used within the Norfolk nutrient budget calculator of 6 mg/l TP and 25 mg/l TN.. These are the values used in Environment Agency WRC modelling of nutrient inputs from WRCs in Norfolk and represent the most locally relevant default values.

Table 1 presents the WRC concentrations used within the Norfolk nutrient budget calculator for the permitted sites. A full list of WRCs and their assumed discharge concentrations are provided in **Appendix A1**.

Table 1: *Measured discharge concentrations of permitted WRCs*

WRC	Permitted P limit (mg/l)	Assumed P concentration (mg/l)	Discharge %	Assumption applied
Aldborough	2	1.57	79	STDEV
Aylsham	1	0.9	72	Significant growth
Aylsham (post 2025)	0.6	0.54	76	90% of future permit
Belaugh	1	1.05	105	STDEV
Briston	1	0.69	69	STDEV
Bylaugh	2.5	1.89	76	STDEV
Coltishall	1	0.86	86	STDEV

WRC	Permitted P limit (mg/l)	Assumed P concentration (mg/l)	Discharge %	Assumption applied
Dereham	1	0.76	76	STDEV
Fakenham	1	0.9	69	Significant growth
Foulsham	1	0.89	89	STDEV
Long Stratton	1	0.74	74	STDEV
Ludham	1	0.67	67	STDEV
North Elham	1	0.62	62	STDEV
Rackheath	2	1.8	75	Significant growth
Reepham	1	0.83	83	STDEV
Roughton	2	1.34	67	STDEV
Sculthorpe	1	0.65	65	STDEV
Southrepps	3	2.28	76	Average discharge applied
Southrepps (post 2025)	0.5	0.45	76	90% of future permit
Stalham	1	0.86	86	STDEV
Swanton Morley	2	1.52	76	Average discharge applied
Swardeston (post 2025)	0.4	0.36	76	90% of future permit
Whitlingham	1	0.9	76	Significant growth
Wymondham	0.8	0.61	76	STDEV

1.2.5 On-site treatment plant

The Norfolk nutrient budget calculator adopts default discharge concentrations for TP and TN from Package Treatment Plants (PTPs) and Septic Tanks (STs) from the Natural England nutrient neutrality guidance (Natural England, 2022). Additionally, the Norfolk nutrient budget calculator also includes the option to select a ST serving multiple properties with a discharge concentration of 7mg/l TP (May and Woods, 2016). The default values used within the calculator are presented in **Table 2**.

Table 2: *Default onsite treatment plants effluent concentrations*

Treatment type	P removal (mg/l)	N removal (mg/l)
Default package treatment plant	9.7	72.9
Default multi-source septic tank	7	96.3
Default single-source septic tank	11.6	96.3

1.3 Stage 2 & 3: Calculate nutrient loading from land use

1.3.1 Stage 2 & 3 methodology

In order to calculate the net change in land use, the existing nutrient input from the current land within the proposed development footprint needs to be calculated. The nutrient input is calculated by multiplying the runoff coefficient for each specific land use type by the relevant area of each land use.

$$(\boldsymbol{A_1} \times \boldsymbol{C_1}) + (\boldsymbol{A_2} \times \boldsymbol{C_2}) \ldots + (\boldsymbol{A_n} \times \boldsymbol{C_n}) = \boldsymbol{L_{current}} \qquad Eq.\ 5$$

*Where **A** represents the Area in hectares, **C** the export coefficient and $L_{current}$ the nutrient load from the current land uses.*

Where land does not drain to the designated site surface water catchment it should be excluded from the calculation in Stages 2 and 3.

The nutrient load from the future land uses ($L_{proposed}$) utilises the same calculations as Equation 5.

1.3.2 Rainfall data

The rainfall data used within the Norfolk nutrient budget calculator differs from that used within the Natural England guidance. Rainfall data used within the Norfolk nutrient budget calculator for the catchment was derived from HadUK gridded which provided Standard Average Annual Rainfall (SAAR) for the period 2001-2021. This data provides the best available evidence for which to base the land use runoff coefficients. The HadUk data provides a more up to date dataset than the data proposed by Natural England which was collected between 1961 – 1990.

1.3.3 Agricultural runoff coefficients

The Norfolk nutrient budget calculator employs the same methodology for deriving agricultural runoff coefficients as the Natural England guidance. TP and TN runoff coefficients (in kg/ha/yr) were derived using Farmscoper V5 (ADAS, 2022). The Upscale tool was used which derived runoff coefficients specific to the operational catchments of the Wensum, Yare and Bure as well as the Broadland Rivers Management catchment. Operational catchment values were used where possible. In the absence of operational catchment values, management catchment data was used. The agricultural runoff coefficients were modified to account for pollution incidents and illegal operations. Agricultural runoff coefficients for each operational catchment are provided in **Appendix A2**.

The agricultural runoff rates are dependent on the following:

- Farm type
- Operational catchment
- Soil types
- Average annual rainfall
- Whether the development is in a Nitrate Vulnerable Zone (NVZ)

Soil types are derived from Soilscapes (Cranfield Soil and Agrifood Institute, 2022) and characterised into the following drainage categories to conform with the Farmscoper (**Table 3**). This is consistent with the approach outlined by Natural England (2022).

Table 3: *Soil types by drainage category*

Free draining			Impermeable - drained for arable			Impermeable - drained for arable and grassland		
Colour	ID	Name	Colour	ID	Name	Colour	ID	Name
	3	Shallow lime-rich soils over chalk or limestone		1	Saltmarsh soils		17	Slowly permeable seasonally wet acid loamy and clayey soils
	4	Sand dune soils		2	Shallow very acid peaty soils over rock		18	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
	5	Freely draining lime-rich loamy soils		8	Slightly acid loamy and clayey soils with impeded drainage		19	Slowly permeable wet very acid upland soils with a peaty surface
	6	Freely draining slightly acid loamy soils		9	Lime-rich loamy and clayey soils with impeded drainage			
	7	Freely draining slightly acid but base-rich soils		15	Naturally wet very acid sandy and loamy soils			
	10	Freely draining slightly acid sandy soils		16	Very acid loamy upland soils with a wet peaty surface			
	11	Freely draining sandy Breckland soils		20	Loamy and clayey floodplain soils with naturally high groundwater			
	12	Freely draining floodplain soils		21	Loamy and clayey soils of coastal flats with naturally high groundwater			
	13	Freely draining acid loamy soils over rock		22	Loamy soils with naturally high groundwater			
	14	Freely draining very acid sandy and loamy soils		23	Loamy and sandy soils with naturally high groundwater and a peaty surface			
				24	Restored soils mostly from quarry and opencast spoil			
				25	Blanket bog peat soils			
				26	Raised bog peat soils			
				27	Fen peat soils			

The Farmscoper Upscale tool uses existing data on operating farms within a catchment to predict the average runoff coefficients. The Farmscoper upscale tool does not contain data on farms within the catchment with a rainfall of less than 600 mm/yr. As a result, runoff coefficients derived for 600 – 700 mm/yr rainfall were also applied to the runoff coefficients between 500 – 600 mm/yr.

Allotments and community food growing land are derived using agricultural land export coefficients in line with the Natural England guidance (2022).

1.3.4 Non-agricultural land runoff coefficients

Non-agricultural land use coefficients were adopted from Natural England's nutrient neutrality guidance (2022) (**Table 4**). The Norfolk nutrient budget calculator also includes the option not select constructed wetlands as a land use. The Norfolk nutrient budget calculator uses default values for constructed wetlands that is intended to be used for guidance proposes only to provide the user with an indication of the likely area required. The default values were derived from expert opinion and literature (Land et al., 2016).

***Table 4**: Non-agricultural land runoff coefficients*

Land Use classification	P runoff coefficient (kg/ha/yr)	N runoff coefficient (kg/ha/yr)
Greenspace	0.02	3
Woodland	0.02	3
Shrub / heathland / bracken / bog	0.02	3
Water	0.00	0
Constructed wetland	-8.00	-930
Set aside Land	0.02	3

1.3.5 Urban land runoff coefficients

The derivation of urban land use runoff coefficients is primarily based on Natural England's nutrient neutrality guidance (2022) and does not deviate from the proposed method (HR Wallingford Modified Rational Method). The urban land is categorised into residential, open urban and commercial/industrial land. The Norfolk nutrient budget calculator further sub-divides residential land into high-density, medium-density and low-density.. This allows for more specific land use types to be selected, increasing the accuracy of the calculator and limits the potential for overestimations or underestimations. The following definitions are used:

- High density residential - applies to urban cores (e.g. city centres)
- Medium density residential - applies to development in larger towns where there is a high percentage of development, but outside of core cities.
- Low density residential – rural developments

The HR Wallingford Modified Rational Method was used to calculate the nutrient loading:

$$L = R \times P_r \qquad Eq.\ 6$$

Where L is the average runoff (mm/yr), R is the average rainfall (mm/yr) and P_r is the percentage runoff (%)

The percentage runoff was calculated using the following equation:

$$P_r = 0.829 \times PIMP + 0.078 \times U - 20.7 \qquad Eq.\ 7$$

Where $PIMP$ is the percentage of land that is impervious (%) and U is the catchment wetness index.

The catchment wetness index is calculated using the following equation:

$$U = -129.5 + (0.424 \times R) - (2.28 \times 10^{-4} \times R^2) - (4.56 \times 10^{-8} \times R^3) \qquad Eq.\ 8$$

Eq. 6 is combined with Event Mean Concentrations (EMCs) to calculate the urban runoff coefficients. The EMCs outlined in the Natural England nutrient neutrality guidance (2022) were adopted and are derived from Mitchel (2005). The EMCs used within calculations are presented in **Table 5**.

Table 5: *EMCs for urban land use*

Land use	P EMC (mg/l)	N EMC (mg/l)
Residential	2.85	0.41
Commercial / Industrial	1.52	0.30
Open urban land	1.68	0.22

The percentage of land that is impervious in selected urban land uses was derived from the available literature[2], and represents the average of reported mean values stated. Where a range of values was provided, the upper limits were taken in order to adopt a precautionary approach. To account for how nitrogen is more readily transported in the environment, an additional 20% was added to the TN impervious values. **Table 6** presents the impervious percentages used to derive urban land use runoff coefficients.

Table 6: *Impervious percentages used for the various land use types*

Land use	TP imperviousness (%)	TN imperviousness (%)
High density residential	61	81
Medium density residential	38	58
Low density residential	30	50
Commercial / Industrial	84	100
Open space urban	22	42

The literature values are further supported by measured data from ongoing projects within the catchment, which shows that land classified as either high density or medium density urban has a typical impervious cover of 45-50%.

Table 7 presents the urban runoff coefficients used with the calculator.

[2] *Exum et al., (2005); Cappiela & Brown (2001); Chormanski et al., (2008); Lu & Weng (2006); Yancey (2008); Yang & Liu (2005); Wu & Murray (2003); Xu et al., (2018); Ferguson (1998); Jiang & Fu (2015); Boyd et al., (1993); New York State Department of Environmental Conservation (2015); Tilley & Slonecker (2006); ENSR (2005); Shahtahmassebi et al., (2018); National Land Cover Data (1992)*

Table 7: *Urban runoff coefficients derived for the Norfolk nutrient budget calculator*

Rainfall band (mm/yr)	Midpoint (mm/yr)	Catchment wetness (U)	High density residential		Medium density residential		Low density residential		Commercial / Industrial		Urban open space	
			TP	TN	TP	TN	TP	TN	TP	TN	TP	TN
550-575	562.55	28.75	0.74	7.81	0.30	4.75	0.15	3.69	0.86	5.51	0.00	1.55
575-600	587.55	31.66	0.78	8.19	0.32	5.00	0.16	3.89	0.91	5.78	0.00	1.64
600-625	612.55	34.19	0.82	8.57	0.34	5.25	0.17	4.09	0.95	6.04	0.00	1.73
625-650	637.55	36.33	0.85	8.95	0.36	5.49	0.18	4.29	0.99	6.30	0.01	1.82
650-675	662.55	38.07	0.89	9.33	0.37	5.73	0.19	4.48	1.03	6.56	0.01	1.90
675-700	687.55	39.42	0.93	9.70	0.39	5.97	0.20	4.67	1.07	6.82	0.01	1.99
700-750	725.05	40.68	0.98	10.25	0.42	6.31	0.22	4.94	1.13	7.20	0.01	2.11
750-800	775.05	41.00	1.05	10.97	0.44	6.75	0.23	5.29	1.21	7.70	0.01	2.25
800-850	825.05	41.00	1.12	11.67	0.47	7.19	0.25	5.63	1.29	8.20	0.01	2.40
850-900	875.05	41.00	1.19	12.38	0.50	7.63	0.26	5.97	1.37	8.70	0.01	2.55

1.4 Stage 4: Calculating the nutrient budget

1.4.1 Stage 4 methodology

Stage 4 calculates the net change in the nutrient loading to the catchment as a whole due to the proposed development. This is calculated by summing the additional nutrients from wastewater (stage 1) and the difference between the nutrient load for the future (stage 3) and current land uses (stage 2). A precautionary buffer is then applied.

$$\boldsymbol{Total\ nutrient\ loading} = \mathbf{1.2} \times (\boldsymbol{L_W} + (\boldsymbol{L_{Proposed}} - \boldsymbol{L_{Current}})) \qquad \textit{Eq. 9}$$

1.4.2 Precautionary buffer

Whilst the figures used throughout this model are based on scientific research and evidence and represent the best available evidence, there is some inherent uncertainty remaining. A precautionary buffer is used to recognise the uncertainty and provide, with reasonable certainty, that there will be no adverse effect on the integrity of the designated sites. As per Natural England guidance (2022), a 20% precautionary buffer is added to the total loading value.

1.5 Mitigation

The Norfolk nutrient budget calculator goes beyond the Natural England guidance and provides an indication of potential mitigation options. The mitigation tabs offer guidance on the change in land use that is required in order to achieve nutrient neutrality. The stages only apply to developments that will generate additional nutrients as outlined in Stage 4. The different tabs reflect the different mitigation requirements from reduction in permit limits. The mitigation tabs offer the option to implement either on-site or off-site.

1.5.1 Mitigation methodology

In the case of off-site mitigation, the excess nutrients as a result of the proposed development must equal the change in land use of the mitigation area.

$$\boldsymbol{Total\ nutrient\ loading} = (\boldsymbol{L_{Mitigationproposed}} - \boldsymbol{L_{mitigationCurrent}}) \qquad \textit{Eq. 10}$$

Where $\boldsymbol{L_{Mitigationproposed}}$ is the total nutrient loading from the proposed land use of the mitigation area and $\boldsymbol{L_{Mitigationcurrent}}$ is the total nutrient loading from the current land use of the mitigation area.

Only land that is currently within the surface water catchment and may affect the designated sites, either by draining directly and draining to upstream locations, can be selected for mitigation land.

1.6 Zero-value calculator

The zero-value calculator is an additional feature included within the Norfolk nutrient budget calculator. The zero-value calculator shows the number of developments that can be built and occupied as a result of taking the entire development site out of agricultural use and partly into low-input use (e.g. semi-natural grassland) and a small part of the future use. This allows part of the development to progress and prevents delays while mitigation solutions are implemented. The calculator generates the number of properties that can be built for both TP and TN. Unless the difference in short-term mitigation can be sourced off-site, the lower number of dwellings applies.

1.6.1 Zero-value calculator methodology

The development will be 'zero value' or nutrient neutral when the wastewater contribution from the development is equal to the nutrient load from the land use change. In this case the precautionary buffer is not required because the value is not above zero.

$$L_W = ((L_{Proposed} + L_{low-input}) - L_{Current}))$$ *Eq. 11*

In order to calculate the maximum number of dwellings that could be permitted whilst remaining nutrient neutral, the permitted nutrient loading from wastewater that is neutral follows the opposite calculations to those in Stage 1.

$$\frac{L_W}{365} \times 1000000 = L_w$$ *Eq. 12*

$$\frac{L_w}{WRC\ discharge\ level} = W$$ *Eq. 13*

$$\frac{W}{water\ usage} = P_i$$ *Eq. 14*

$$\frac{P_i}{occupancy\ rate} = No.\ of\ dwellings$$ *Eq. 15*

1.7 Summary

Table 8 below provides a summary of the key inputs and how these differ between the Natural England guidance and the Norfolk nutrient budget calculator.

Table 8: *Summary comparison of key inputs*

Calculator input	Natural England guidance	Norfolk nutrient budget calculator	Comment
Occupancy rate	2.4 persons/dwelling	1.89 persons/dwelling residential development	Use of regional specific value for Norfolk that accounts for movement of people already living within the catchment.
	Not included	1.65 persons/dwelling for houses in multiple occupation and hotels.	Provides more accurate estimation of wastewater volume from specific development types
Water usage	120 l/person/day	110 l/person/day	Use of 110/l/person/day as this is secured through policy
WRC P discharge concentrations	At 90% of permit limit for permitted sites 8 mg/l for unpermitted sites	Use of one standard deviation from the mean. WRC with significant growth use 90% of permit. 6 mg/l for unpermitted sites	Use of measured data rather than generalised assumptions for permitted sites. Use of regional specific default values used by Environment Agency.
WRC N discharge concentrations	27 mg/l	25 mg/l	Use of regional specific default values used by Environment Agency.
Onsite treatment plants	Default values used for PTP and ST from literature review	Default values used for PTP and ST from literature review. Addition of option to include STs serving multiple dwellings.	No difference in default values.
Rainfall	1961 – 1990 SAAR data	2001 – 2021 SAAR data	Use of more up to date data
Agricultural runoff rates	Derived using Farmscoper upscale model	Derived using Farmscoper upscale model	No difference in approach
Non-agricultural runoff rates	Default values derived from literature review	Default values derived from literature review	No difference in approach

Urban runoff coefficients	Derived using HR Wallingford Modified Rational Method. Default EMCs used from Mitchell (2005) and generic impervious values of 80% for P and 100% for N. Option of only residential land use.	Derived using HR Wallingford Modified Rational Method. Default EMCs used from Mitchell (2005) and impervious values derived from detailed literature review and catchment specific data. Option of high, medium and low density residential land use types.	Use of catchment specific data and adoption of values following detailed literature review, as opposed to generic assumptions. Use of more detailed land use types to improve accuracy of urban runoff coefficients.
Precautionary buffer	20%	20%	No difference in approach
Mitigation	Not included	Included	N/A
Zero-value calculator	Not included	Included	N/A

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A1 Appendix A1: Water Recycling Centre discharge concentrations

Water Recycling centres	Current TP discharge concentration (mg/l)	Post-2025 TP discharge concentration (mg/l)	Post-2030 TP discharge concentration (mg/l)	Current TN discharge concentration (mg/l)	Post-2030 TN permit limit (mg/l)
Aldborough Water Recycling Centre	1.57	1.57	0.23	25.0	9.00
Ashmanaugh	6.00	6.00	0.23	25.0	9.00
Ashwellthorpe Water Recycling Centre	6.00	6.00	0.23	25.0	9.00
Aylsham Water Recycling Centre	0.90	0.54	0.23	25.0	9.00
Barford Water Recycling Centre	6.00	6.00	0.23	25.0	9.00
Barnham Broom Water Recycling Centre	6.00	6.00	0.23	25.0	9.00
Barton Turf	6.00	6.00	0.23	25.0	9.00
Belaugh Water Recycling Centre	1.05	1.05	0.23	25.0	9.00
Billingford STW	6.00	6.00	0.23	25.0	9.00
Bircham Newton (Monks Close) WRC	6.00	6.00	0.23	25.0	9.00
Brisley	6.00	6.00	0.23	25.0	9.00
Briston Water Recycling Centre	0.69	0.69	0.23	25.0	9.00
Bunwell STW	6.00	6.00	0.23	25.0	9.00
Bylaugh Water Recycling Centre	1.89	1.89	0.23	25.0	9.00
Carleton Rode Church Road	6.00	6.00	0.23	25.0	9.00
Carleton Rode STW	6.00	6.00	0.23	25.0	9.00
Coltishall STW	0.86	0.86	0.23	25.0	9.00
Corpusty STW	6.00	6.00	0.23	25.0	9.00
Cranworth STW	6.00	6.00	0.23	25.0	9.00

Water Recycling centres	Current TP discharge concentration (mg/l)	Post-2025 TP discharge concentration (mg/l)	Post-2030 TP discharge concentration (mg/l)	Current TN discharge concentration (mg/l)	Post-2030 TN permit limit (mg/l)
Deopham STW	6.00	6.00	0.23	25.0	9.00
Dereham WRC	0.76	0.76	0.23	25.0	9.00
East Bilney STW	6.00	6.00	0.23	25.0	9.00
East Carleton - Wymondham Road STW	6.00	6.00	0.23	25.0	9.00
East Ruston STW	6.00	6.00	0.23	25.0	9.00
Fakenham (Old And New) WRC	0.90	0.90	0.23	25.0	9.00
Felmingham Water Recycling Centre	6.00	6.00	0.23	25.0	9.00
Forncett End STW	6.00	6.00	0.23	25.0	9.00
Forncett St. Peter STW	6.00	6.00	0.23	25.0	9.00
Foulsham Water Recycling Centre	0.89	0.89	0.23	25.0	9.00
Fritton School Lane STW	6.00	6.00	0.23	25.0	9.00
Fundenhall STW	6.00	6.00	0.23	25.0	9.00
Garvestone Reymerston Road STW	6.00	6.00	0.23	25.0	9.00
Garvestone, Dereham Road	6.00	6.00	0.23	25.0	9.00
Gateley STW	6.00	6.00	0.23	25.0	9.00
Great Melton STW	6.00	6.00	0.23	25.0	9.00
Gresham STW	6.00	6.00	0.23	25.0	9.00
Hardwick STW	6.00	6.00	0.23	25.0	9.00
Hempnall Water Recycling Centre	6.00	6.00	0.23	25.0	9.00
Hempnell - Silver Green STW	6.00	6.00	0.23	25.0	9.00
Hindolveston Church Lane	6.00	6.00	0.23	25.0	9.00

Water Recycling centres	Current TP discharge concentration (mg/l)	Post-2025 TP discharge concentration (mg/l)	Post-2030 TP discharge concentration (mg/l)	Current TN discharge concentration (mg/l)	Post-2030 TN permit limit (mg/l)
Hindolveston STW	6.00	6.00	0.23	25.0	9.00
Hockering STW	6.00	6.00	0.23	25.0	9.00
Horningtoft	6.00	6.00	0.23	25.0	9.00
Horsey - Bensleys Close STW	6.00	6.00	0.23	25.0	9.00
Honing STW	6.00	6.00	0.23	25.0	9.00
Little Fransham Crown Lane STW	6.00	6.00	0.23	25.0	9.00
Little Fransham Glebe STW	6.00	6.00	0.23	25.0	9.00
Long Stratton WRC	0.74	0.74	0.23	25.0	9.00
Mattishall STW	6.00	6.00	0.23	25.0	9.00
North Elmham STW	0.62	0.62	0.23	25.0	9.00
North Tuddenham STW	6.00	6.00	0.23	25.0	9.00
Rackheath Water Recycling Centre	1.80	1.80	0.23	25.0	9.00
Reepham Water Recycling Centre	0.83	0.83	0.23	25.0	9.00
Ridlington(Norfolk) STW	6.00	6.00	0.23	25.0	9.00
Roughton Water Recycling Centre	1.34	1.34	0.23	25.0	9.00
Saxlingham STW	6.00	6.00	0.23	25.0	9.00
Spooner Row School Lane STW	6.00	6.00	0.23	25.0	9.00
Sculthorpe STW	0.65	0.65	0.23	25.0	9.00
Shipdham STW	6.00	6.00	0.23	25.0	9.00
Shotesham The Grove STW	6.00	6.00	0.23	25.0	9.00
Skeyton STW	6.00	6.00	0.23	25.0	9.00

Water Recycling centres	Current TP discharge concentration (mg/l)	Post-2025 TP discharge concentration (mg/l)	Post-2030 TP discharge concentration (mg/l)	Current TN discharge concentration (mg/l)	Post-2030 TN permit limit (mg/l)
Sloley STW	6.00	6.00	0.23	25.0	9.00
Smallburgh STW	6.00	6.00	0.23	25.0	9.00
South Raynham	6.00	6.00	0.23	25.0	9.00
Southrepps STW	2.28	0.45	0.23	25.0	9.00
Sparham Norwich Road WRC	6.00	6.00	0.23	25.0	9.00
Sparham(Wells Close)	6.00	6.00	0.23	25.0	9.00
Stalham Water Recycling Centre	0.86	0.86	0.23	25.0	9.00
Stanfield STW	6.00	6.00	0.23	25.0	9.00
Stibbard Moor End STW	6.00	6.00	0.23	25.0	9.00
Stoke Holy Cross STW	6.00	6.00	0.23	25.0	9.00
Swanton Abbott STW	6.00	6.00	0.23	25.0	9.00
Swanton Morley Water Recycling Centre	1.52	1.52	0.23	25.0	9.00
Swanton Novers STW	6.00	6.00	0.23	25.0	9.00
Swardeston STW	6.00	0.36	0.23	25.0	9.00
Tibenham The Street STW	6.00	6.00	0.23	25.0	9.00
Weasenham All Saints STW	6.00	6.00	0.23	25.0	9.00
Weasenham St.Peter STW	6.00	6.00	0.23	25.0	9.00
Wendling STW	6.00	6.00	0.23	25.0	9.00
West Raynham STW	6.00	6.00	0.23	25.0	9.00
Whinburgh	6.00	6.00	0.23	25.0	9.00
Whitlingham Water Recycling Centre	6.00	6.00	0.23	25.0	9.00

Water Recycling centres	Current TP discharge concentration (mg/l)	Post-2025 TP discharge concentration (mg/l)	Post-2030 TP discharge concentration (mg/l)	Current TN discharge concentration (mg/l)	Post-2030 TN permit limit (mg/l)
Wymondham Water Recycling Centre	0.90	0.90	0.23	25.0	9.00

A2 Appendix A2: Agricultural runoff coefficients

Wensum – P runoff coefficients

	500-600 mm/yr						600-700 mm/yr						700-900 mm/yr					
Land Use	**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**		**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**		**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**	
Dairy	0.14	0.14	0.19	0.19	0.50	0.51	0.14	0.14	0.19	0.19	0.50	0.51	1.31	0.98	0.41	0.41	0.83	0.84
Lowland grazing	0.06	0.06	0.11	0.11	0.43	0.50	0.06	0.06	0.11	0.11	0.43	0.50	0.11	0.16	0.22	0.22	0.68	0.68
Mixed Livestock	0.06	0.06	0.28	0.29	0.55	0.60	0.06	0.06	0.28	0.29	0.55	0.60	0.14	0.18	0.60	0.60	0.94	0.95
Poultry	0.17	0.12	0.35	0.38	0.71	0.68	0.17	0.12	0.35	0.38	0.71	0.68	0.26	0.37	0.70	0.74	1.08	1.14
Pig	0.07	0.07	0.35	0.38	0.58	0.68	0.07	0.07	0.35	0.38	0.58	0.68	0.17	0.23	0.72	0.76	1.00	1.05
Horticulture	0.05	0.05	0.33	0.33	0.52	0.53	0.05	0.05	0.33	0.33	0.52	0.53	0.14	0.15	0.66	0.70	0.92	0.97
Cereals	0.05	0.05	0.34	0.34	0.56	0.56	0.05	0.05	0.34	0.34	0.56	0.56	0.15	0.15	0.73	0.73	0.98	0.98
General Arable	0.05	0.05	0.31	0.31	0.53	0.50	0.05	0.05	0.31	0.31	0.53	0.50	0.13	0.13	0.64	0.64	0.90	0.90
Allotment	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.13	0.13	0.13	0.13	0.13	0.13

Yare – P runoff coefficients

	500-600 mm/yr						600-700 mm/yr						700-900 mm/yr					
Land Use	**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**		**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**		**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**	
Dairy	0.14	0.14	0.27	0.28	0.83	0.85	0.14	0.14	0.27	0.28	0.83	0.85	1.31	0.98	1.31	0.98	1.31	1.31
Lowland grazing	0.09	0.09	0.15	0.15	0.51	0.51	0.09	0.09	0.15	0.15	0.51	0.51	0.16	0.16	0.26	0.25	0.80	0.78
Mixed Livestock	0.07	0.08	0.29	0.30	0.59	0.59	0.07	0.08	0.29	0.30	0.59	0.59	0.18	0.18	0.61	0.62	1.00	1.01
Poultry	0.16	0.18	0.39	0.43	0.60	0.65	0.16	0.18	0.39	0.43	0.60	0.65	0.37	0.37	0.80	0.85	1.06	1.26
Pig	0.08	0.10	0.35	0.38	0.58	0.62	0.08	0.10	0.35	0.38	0.58	0.62	0.23	0.23	0.77	0.82	1.00	1.12
Horticulture	0.05	0.05	0.31	0.31	0.52	0.52	0.05	0.05	0.31	0.31	0.52	0.52	0.15	0.15	0.64	0.66	0.92	0.92
Cereals	0.06	0.06	0.34	0.34	0.56	0.56	0.06	0.06	0.34	0.34	0.56	0.56	0.17	0.18	0.73	0.74	0.98	0.99
General Arable	0.05	0.05	0.29	0.29	0.49	0.49	0.05	0.05	0.29	0.29	0.49	0.49	0.15	0.15	0.61	0.62	0.85	0.86
Allotment	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.62	0.62	0.62	0.62	0.62	0.62

Bure – P runoff coefficients

Bure	500-600 mm/yr						600-700 mm/yr						700-900 mm/yr					
Land Use	Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)		Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)		Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)	
Dairy	0.14	0.14	0.28	0.28	0.88	0.90	0.14	0.14	0.28	0.28	0.88	0.90	1.31	0.98	1.31	0.98	1.31	1.31
Lowland grazing	0.10	0.10	0.16	0.16	0.50	0.50	0.10	0.10	0.16	0.16	0.50	0.50	0.17	0.16	0.28	0.25	0.85	0.78
Mixed Livestock	0.09	0.09	0.33	0.33	0.60	0.60	0.09	0.09	0.33	0.33	0.60	0.60	0.20	0.18	0.67	0.62	1.00	1.01
Poultry	0.16	0.16	0.41	0.44	0.71	0.75	0.16	0.16	0.41	0.44	0.71	0.75	0.34	0.37	0.80	0.85	1.20	1.26
Pig	0.08	0.08	0.38	0.42	0.62	0.68	0.08	0.08	0.38	0.42	0.62	0.68	0.21	0.23	0.77	0.82	1.06	1.12
Horticulture	0.05	0.05	0.33	0.33	0.53	0.53	0.05	0.05	0.33	0.33	0.53	0.53	0.16	0.15	0.66	0.66	0.96	0.92
Cereals	0.06	0.06	0.36	0.36	0.56	0.56	0.06	0.06	0.36	0.36	0.56	0.56	0.18	0.18	0.77	0.74	1.04	0.99
General Arable	0.05	0.05	0.32	0.32	0.50	0.50	0.05	0.05	0.32	0.32	0.50	0.50	0.15	0.15	0.65	0.62	0.91	0.86
Allotment	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.62	0.62	0.62	0.62	0.62	0.62

Wensum – N runoff coefficients

	500-600 mm/yr						600-700 mm/yr						700-900 mm/yr					
Land Use	**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**		**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**		**Free draining**		**Impermeable (Drained for Arable)**		**Impermeable (Drained for Arable + Grassland)**	
Dairy	35.87	35.87	12.05	12.15	11.17	11.30	35.87	35.87	12.05	12.15	11.17	11.30	22.54	18.10	17.17	17.32	12.96	13.11
Lowland grazing	12.94	13.02	8.87	8.93	7.97	9.68	12.94	13.02	8.87	8.93	7.97	9.68	17.55	22.39	13.66	13.75	9.62	9.65
Mixed Livestock	27.33	27.39	18.76	18.96	18.83	21.55	27.33	27.39	18.76	18.96	18.83	21.55	33.11	38.38	24.06	24.32	20.64	20.98
Poultry	244.30	231.58	144.04	149.96	138.11	140.47	244.30	231.58	144.04	149.96	138.11	140.47	273.57	287.23	177.92	185.52	141.39	152.82
Pig	93.57	93.25	59.54	61.69	56.34	79.38	93.57	93.25	59.54	61.69	56.34	79.38	109.91	147.90	73.20	75.97	60.56	64.79
Horticulture	22.09	22.39	15.49	15.52	15.97	16.00	22.09	22.39	15.49	15.52	15.97	16.00	26.42	26.19	19.08	19.09	17.12	17.02
Cereals	26.47	26.54	19.11	19.16	20.20	20.25	26.47	26.54	19.11	19.16	20.20	20.25	31.52	31.61	23.75	23.82	21.97	22.03
General Arable	25.28	25.35	17.62	17.67	18.23	19.17	25.28	25.35	17.62	17.67	18.23	19.17	29.97	30.05	21.72	21.77	19.48	19.52
Allotment	25.35	25.35	25.35	25.35	25.35	25.35	25.35	25.35	25.35	25.35	25.35	25.35	30.05	30.05	30.05	30.05	30.05	30.05

Yare – N runoff coefficients

Yare	500-600 mm/yr						600-700 mm/yr						700-900 mm/yr					
Land Use	Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)		Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)		Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)	
Dairy	35.87	35.87	22.72	24.35	18.31	18.64	35.87	35.87	22.72	24.35	18.31	18.64	22.54	18.10	22.54	18.10	22.54	22.54
Lowland grazing	16.52	16.42	11.24	11.32	9.85	9.87	16.52	16.42	11.24	11.32	9.85	9.87	22.39	22.39	17.62	17.59	11.91	11.76
Mixed Livestock	30.56	31.47	20.94	21.21	20.84	21.19	30.56	31.47	20.94	21.21	20.84	21.19	38.38	38.38	27.25	28.27	23.37	23.83
Poultry	257.38	243.03	158.74	165.42	146.43	156.49	257.38	243.03	158.74	165.42	146.43	156.49	287.23	287.23	187.03	195.03	157.06	160.54
Pig	101.74	125.44	64.59	67.00	60.94	64.61	101.74	125.44	64.59	67.00	60.94	64.61	147.90	147.90	97.81	101.80	65.71	86.47
Horticulture	21.86	22.15	15.39	15.50	15.96	15.99	21.86	22.15	15.39	15.50	15.96	15.99	26.19	26.19	19.05	19.13	17.12	17.15
Cereals	26.13	26.21	19.23	19.29	20.56	20.62	26.13	26.21	19.23	19.29	20.56	20.62	31.21	31.51	23.99	24.03	22.55	22.42
General Arable	24.70	24.77	17.41	17.46	18.16	18.20	24.70	24.77	17.41	17.46	18.16	18.20	31.17	31.25	21.56	22.76	19.53	20.53
Allotment	24.77	24.77	24.77	24.77	24.77	24.77	24.77	24.77	24.77	24.77	24.77	24.77	26.19	26.19	26.19	26.19	26.19	26.19

Bure – N runoff coefficients

Bure	500-600 mm/yr						600-700 mm/yr						700-900 mm/yr					
Land Use	Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)		Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)		Free draining		Impermeable (Drained for Arable)		Impermeable (Drained for Arable + Grassland)	
Dairy	35.87	35.80	24.09	24.35	19.06	19.43	35.87	35.80	24.09	24.35	19.06	19.43	22.54	18.10	22.54	18.10	22.54	22.54
Lowland grazing	18.15	18.29	12.39	12.48	9.65	9.68	18.15	18.29	12.39	12.48	9.65	9.68	25.00	22.39	19.50	17.59	13.14	11.76
Mixed Livestock	34.60	34.74	23.56	23.85	21.18	21.55	34.60	34.74	23.56	23.85	21.18	21.55	42.91	38.38	31.32	28.27	23.37	23.83
Poultry	228.65	227.66	141.90	147.63	138.11	147.41	228.65	227.66	141.90	147.63	138.11	147.41	268.72	287.23	175.37	195.03	148.53	160.54
Pig	89.80	89.51	57.34	82.66	74.68	79.38	89.80	89.51	57.34	82.66	74.68	79.38	105.49	147.90	97.81	101.80	80.36	86.47
Horticulture	22.63	22.69	15.78	15.82	15.97	16.00	22.63	22.69	15.78	15.82	15.97	16.00	26.79	26.19	19.08	19.13	17.34	17.15
Cereals	25.75	25.83	18.70	18.75	20.45	20.51	25.75	25.83	18.70	18.75	20.45	20.51	30.70	31.51	23.29	24.03	21.57	22.42
General Arable	27.73	2.80	19.36	19.40	19.12	19.17	27.73	2.80	19.36	19.40	19.12	19.17	32.90	31.25	23.83	22.76	21.38	20.53
Allotment	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	26.19	26.19	26.19	26.19	26.19	26.19

7 Oct 2022

Our ref: Norfolk Nutrient calculator response

Dragonfly House
2 Gilders Way
Norwich NR3 1UB

FAO: Heads Planning, Development Management and Planning Policy

By email only

Dear Sir/Madam

Consultation: Norfolk Nutrient Budget Calculator (Developed by Norfolk LPAs and Royal Haskoning)

Thank you for your email of 23 September from Trevor Wiggett, consulting Natural England on the nutrient budget calculator that the Norfolk Authorities have developed with support from Royal Haskoning, hereafter referred to as the 'Norfolk calculator'.

Natural England notes that the approach adopted in the Norfolk calculator is broadly consistent with that which underpins the Natural England nutrient budget calculator. This response therefore focusses on the elements of the Norfolk calculator for which a different approach, or different figures have been used.

Following a review of the information shared with Natural England, there are three elements of the Norfolk calculator where the approach differs from that in the Natural England calculator:

1. Occupancy rates
2. Water usage
3. WwTW discharge concentrations

Detailed comments and advice regarding the three aforementioned elements are set out below.

Occupancy rates:

As set out in the Natural England Nutrient Neutral Generic Methodology and the Natural England Calculator Guidance document; "Competent authorities must satisfy themselves that the residents per dwelling/unit value used in this step of the calculation reflects local conditions in their area. The residents per dwelling value can be derived from national data providing it reflects local conditions. However, if national data does not yield a residents per dwelling/unit value that reflects local occupancy levels then locally relevant data should be used instead. Whichever figure is used, it is important to ensure it is sufficiently robust and appropriate for the project being assessed."

The Norfolk calculator also includes a separate occupancy rate for houses with multiple occupancy (HMO) and for hotels/guest houses to be used when there is development with an additional number of rooms above six residents. For hotels/guesthouse developments, the calculator additionally allows for a bespoke

figure of number of weeks occupied per year and an average occupancy rate (0-100%). There is no information in the ORS report to explain how these figures have been derived, or to support using a different occupancy rate for HMOs/tourist accommodation. The Royal Haskoning report indicates that the average occupancy rate for hotels and HMOs comes from the Dorset Heaths SPD. This SPD specifies a 1.65 occupancy rate for 'flats' but with no detailed information as to how this has been derived.

Natural England would advise that suitable provisions should be put in place to ensure that should hotels/guesthouses revert to residential accommodation in the future, there is a mechanism to assess the potential for any resulting change in nutrient load. We would further advise that the number of weeks per year use, and average occupancy of hotels and tourism accommodation should be adequately evidenced to provide the necessary certainty required for Appropriate Assessment.

Natural England therefore support the use of locally relevant data to derive an appropriate occupancy figure for Norfolk. The Norfolk Authorities, as competent authority must be satisfied that the evidence underpinning the occupancy rate in the Norfolk calculator is sufficiently robust and appropriate. We would recommend that project level Appropriate Assessments which are informed by the Norfolk calculator specifically include justification for why the competent authority has decided upon the occupancy rate that has been used.

We would also recommend the Norfolk Authorities review the comments made by Justice Jay at the High Court in the Wyatt v Fareham Judicial Review, regarding the use of occupancy rates which are appropriate to the type of development being permitted.

Water Usage:

The Natural England methodology and calculator recommends the addition of 10 litres per person, per day to the Building Regulations standard being applied to the planning permission (e.g. 110 litres per person, per day). The Norfolk calculator has removed this additional 10 litres per person, per day and relies on the Building Regulations standard which is secured as part of the planning permission.

The Norfolk Authorities have referenced a study to support the removal of the additional 10 litres per person, per day. It is noted that this study is of homes built to the 125 litres per person, per day standard, rather than 110 litres. We would highlight that Natural England's methodology was informed by the analysis by Waterwise of homes in London built to a stricter 105 l/person/day under the Code for Sustainable Homes which showed that actual water usage ranged between 110 to 140.75 litres per person, per day, depending on the occupancy rates (https://www.waterwise.org.uk/knowledge-base/advice-on-water-efficient-new-homes-for-england-september-2018/).

Natural England advise that the removal of the additional 10 litres per person, per day makes the Norfolk calculator less precautionary than the approach set out in the Natural England methodology, and the Natural England calculator.

WwTW discharge concentrations:

The Norfolk calculator uses a hybrid approach of retaining the Natural England methodology for Waste-water Treatment Works (WwTW) with high levels of anticipated new connections, and current discharge concentrations with an additional precautionary uplift for WwTW with lower levels of anticipated new connections.

Water companies can increase the concentration of nutrients in the waste-water discharged from WwTW up to the level set in their Environment Agency permit without the requirement for any new consent or consultation. Therefore, the Norfolk Authorities must be satisfied that the figures used in the Norfolk calculator do not risk underestimating the nutrient load of new development connecting to WwTW with lower levels of anticipated growth. It is important to recognise that when undertaking an Appropriate Assessment, potential impacts need to be considered over the lifetime of the development proposal.

For WwTW which do not benefit from a discharge permit with a defined maximum nutrient concentration, the Norfolk calculator uses 6mg/litre for Total Phosphorus, and 25mg/litre for Total Nitrogen. We note that these are the national average values used by the Environment Agency for their planning purposes.

However, as these values represent the national average, there will be a variation in WwTW performance with some performing better, and others worse than this figure.

Natural England advise that the reduction (by 2mg/litre) in the values used in the Norfolk calculator for WwTW without a defined maximum nutrient concentration makes the Norfolk calculator less precautionary than the approach set out in the Natural England methodology, and the Natural England calculator.

The Norfolk calculator includes future discharge concentration values for WwTW which have upgrades planned as part of the Periodic Review (PR) process. This is consistent with the approach set out in the Natural England methodology, and the approach taken for the Natural England calculator. The Norfolk calculator also incorporates the Technically Achievable Limit (TAL) figure from 2030 (0.25mg/litre for Phosphorus and 10mg/litre for Nitrogen) which was announced as a requirement for water companies in nutrient neutrality areas by Defra Secretary of State in July 2022.

The announced requirement for water companies to achieve TAL will be legislated through the Levelling-up and Regeneration Bill. Natural England advise that until the Bill receives Royal Assent the requirement for TAL cannot be considered certain. We recommend that the pre-2030 figure is used to determine the mitigation requirement for new development until the legislation securing the requirement for water companies to achieve TAL is in place.

Summary of Natural England's Advice

As set out above, Natural England considers the Norfolk calculator to have reduced the level of precaution in the nutrient budget calculation in comparison to the methodology and calculator we have produced. A reduction in the level of precaution in the nutrient budget calculation will have a corresponding increase in the potential for the mitigation delivered to be insufficient to fully address the potential for adverse effect to the Broads SAC, and River Wensum SAC.

Natural England accepts that it is the decision of the Norfolk Authorities, as Competent Authority to determine the approach (and associated calculations) taken to Appropriate Assessment of new development proposals. We therefore recommend that the Authorities take legal advice to ensure the approach taken to inform Appropriate Assessment of new development proposals is robust and not open to legal challenge.

Natural England do not intend to raise objection to the Norfolk Authorities using the Norfolk calculator to inform their Appropriate Assessments, other than the specific inclusion of the TAL figure for WwTW from 2030 onwards. As highlighted, the 2030 upgrades are not yet in legislation and therefore cannot be considered sufficiently certain to form the basis of a nutrient budget for new development proposals. Therefore, any Appropriate Assessment which relies on these figures, in advance of the relevant legislation being in place, would lead to an objection by Natural England.

Consultation responses to Appropriate Assessments relating to nutrient neutrality, which do not rely on the TAL figure from 2030 will include the following advice from Natural England:

Natural England notes that the Authority's own calculator has been used to calculate the nutrient budget for this application. This calculator deviates from the Natural England nutrient neutral methodology. As set out in our letter dated 7 Oct 2022 your Authority must be satisfied that the calculator is based on robust evidence and takes a suitably precautionary approach.

I hope this information is helpful, please contact my colleague Helen Dixon in the first instance if you wish to discuss further helen.dixon@naturalengland.org.uk

Yours faithfully

Simon Thompson
Principle Adviser – Strategic Solutions
Strategy and Government Advice