North Cadbury and Yarlington Neighbourhood Plan

Habitats Regulations Assessment

North Cadbury and Yarlington Parish Council

August 2021

Quality information

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1. Introduction

Project Scope

1.1 AECOM has been commissioned by North Cadbury and Yarlington Parish Council to undertake a Habitats Regulations Assessment of the emerging North Cadbury and Yarlington Neighbourhood Plan (NCYNP), which covers the vision for the parishes over the forthcoming planning period. Neighbourhood planning was introduced through the Localism Act 2011 to give communities the opportunity to help shape local development, taking specific account of the views of local residents. The NCYNP allocates physical development in the NP area that seeks to meet the needs of a growing population, while looking out for the environment. It sets out planning policies that will be used to review planning applications, alongside the adopted policies in the overarching South Somerset Local Plan. Neighbourhood Plans are obliged to support the delivery of strategic policies set out in Local Plans and need to be in conformity with such strategic policies.

1.2 The NCYNP covers an area of approx. 15km^2 in South Somerset District, predominantly of a rural nature. There are several settlements in the NP area, including North Cadbury (the largest village with approx. 210 households), Galhampton, Woolston and Yarlington. Census 2011 data show that approx. 1,000 residents live in the two parishes. The area's main employment centre is the North Cadbury Business Park on the A359. A review of the NCYNP indicates that the overall new housing need in the two parishes over the planning period is modest, with the majority of dwellings to be delivered in North Cadbury. Of the 61 dwellings to be delivered in the NP area, 27 dwellings have existing planning consent and only 34 dwellings require HRA assessment.

1.3 The NP area's rural character is dominated by agricultural and pastoral fields, set amidst broad ridges and steep scarps. The area also supports thick hedgerows, mature and veteran trees. Furthermore, the NP area is penetrated by the River Cam and supports several priority habitats, including deciduous woodland, calcareous grassland and good quality semi-improved grassland.

1.4 Generally, an HRA of development plans is required under the terms of the Conservation of Habitats & Species Regulations 2017 (as amended) to assess whether any policies may have Likely Significant Effects (LSEs) and, ultimately, the potential to cause adverse effects on the integrity of the National Site Network and its constituent European Sites (Special Areas of Conservation, SACs, Special Protection Areas, SPAs, and Ramsar sites designated under the Ramsar convention), either in isolation or in combination with other plans and projects. If this is the case, the HRA process determines whether site-specific or policy mitigation measures are required. However, a review of mapping on MAGIC indicates that there are no European Sites within the NP boundary or within 10km outside its boundary, the typical screening distance for impact pathways linked to development. The closest European Site is the Mendip Woodlands SAC, lying approx. 14.8km to the north-east of the two parishes. Notwithstanding this, the HRA assesses potential implications of NCYNP policies, because the NP area lies within the wider hydrological catchment of the Somerset Levels & Moors Ramsar.

Legislation

1.5 The UK left the EU on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 ("the Withdrawal Act"). This established a transition period, which ended on 31 December 2020. The Withdrawal Act retains the body of existing EU-derived law within our domestic law, meaning that legislation relating to nature conservation continues to apply to and in the UK.

1.6 The need for Appropriate Assessment is set out by the Conservation of Habitats and Species Regulations 2017 (as amended) and is retained in the EU Exit Regulations 2019. The Regulations apply the precautionary principle[1] to assessments of European Sites, which form

[1] The Precautionary Principle, which is referenced in Article 191 of the Treaty on the Functioning of the European Union, has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as:

part of the newly coined National Site Network. Consent should only be granted for plans and projects once the relevant competent authority has ascertained that there will either be no likelihood of significant effects, or that a mechanism is in place to ensure that no adverse effect on the integrity of the European Site(s) in question arises. Where an Appropriate Assessment has been carried out and results in a negative assessment, or if uncertainty remains over the significant effect, consent can only be granted if there are no alternative solutions and there are Imperative Reasons of Over-Riding Public Interest (IROPI) for the development and compensatory measures have been secured.

1.7 To ascertain whether site integrity will be affected, an Appropriate Assessment should be undertaken of the plan or project in question. Figure 1 provides the legislative basis for an Appropriate Assessment.

Conservation of Habitats and Species Regulations 2017 (as amended)

The Regulations state that:

"*A competent authority, before deciding to … give any consent for a plan or project which is likely to have a significant effect on a European site … must make an appropriate assessment of the implications for the plan or project in view of that site's conservation objectives… The competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site."*

Figure 1. The legislative basis for Appropriate Assessment

1.8 Over the years, 'Habitats Regulations Assessment' (HRA) has come into wide currency to describe the overall process set out in the Habitats Regulations, from screening through to identification of IROPI. This has arisen in order to distinguish the overall process from the individual stage of "Appropriate Assessment". Throughout this report the term HRA is used for the overall process and restricts the use of Appropriate Assessment to the specific stage of that name.It is therefore important to note that this report has two purposes:

- To assist the Qualifying Body (North Cadbury and Yarlington Parish Council) in preparing their plan by recommending (where necessary) any adjustments required to protect European sites, thus ensuring that their plan will be deemed compliant with the Conservation of Habitats and Species Regulations 2017 (as amended); and
- On behalf of the Qualifying Body, to assist the overarching Local Planning Authority (South Somerset District Council) to discharge their duty under Regulation 105 (in their role as 'plan-making authority' within the meaning of that regulation) and Regulation 106 (in their role as 'competent authority').

1.9 As 'competent authority', the legal responsibility for ensuring that a decision of 'Likely Significant Effects' is made, for ensuring an 'Appropriate Assessment' (where required) is undertaken, and for ensuring Natural England are consulted, falls on the local planning authority. However, they are entitled to request from the Qualifying Body the necessary information on which to base their judgment and that is a key purpose of this report.

"*When human activities may lead to morally unacceptable harm [to the environment] that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement of plausibility should be grounded in scientific analysis*".

2. Methodology

Introduction

2.1 Figure 2 below outlines the stages of HRA according to current Ministry of Housing, Communities and Local Government guidance. The stages are essentially iterative, being revisited as necessary in response to more detailed information, recommendations and any relevant changes to the Plan until no significant adverse effects remain.

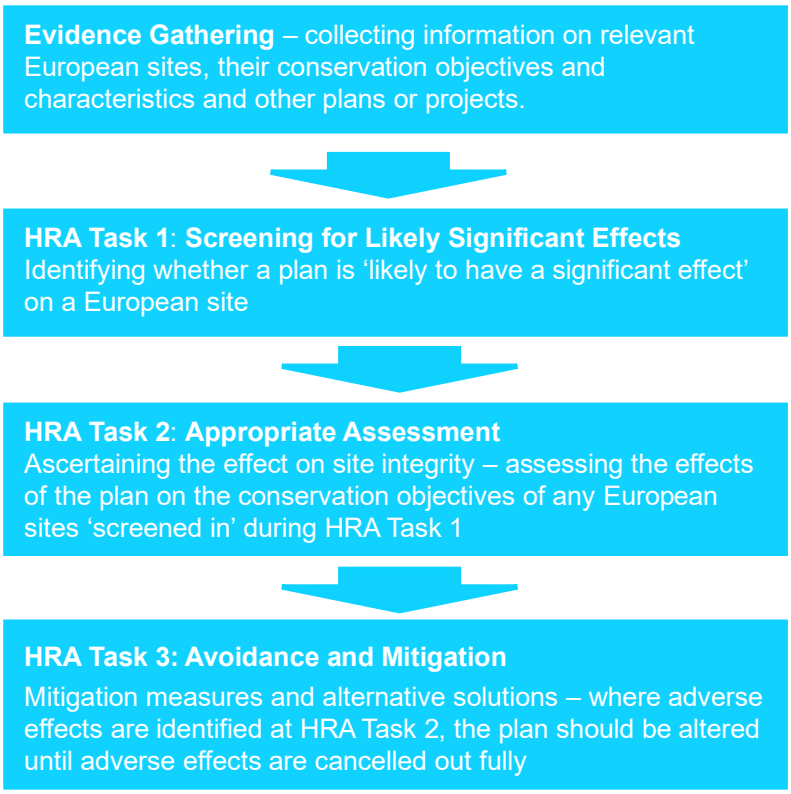


Figure 2: Four Stage Approach to Habitats Regulations Assessment. Source GOV.UK, 2019.

HRA Task 1 – Likely Significant Effects (LSE)

2.2 Following evidence gathering, the first stage of any Habitats Regulations Assessment is a Likely Significant Effect (LSE) test - essentially a risk assessment to decide whether the full subsequent stage known as Appropriate Assessment is required. The essential question is:

"*Is the project, either alone or in combination with other relevant projects and plans, likely to result in a significant effect upon European sites?*"

2.3 The objective is to 'screen out' those plans and projects that can, without any detailed appraisal, be said to be unlikely to result in significant adverse effects upon European sites, usually because there is no mechanism for an adverse interaction with European sites. This stage is undertaken in Chapter 5 of this report.

Geographical Scope of the HRA

2.4 There are no standard criteria for determining the ultimate physical scope of an HRA of a development plan document such as a Neighbourhood Plan. However, generally it is uncommon for Development Plans to have a significant effect on European sites located at a distance of greater than 10km. For example, most core recreational catchments (except for some coastal sites) are under 10km in size, there are few wintering waterfowl and waders that make extensive

use of functionally linked habitats located more than 10km from their core areas, and the average vehicle commuting distance of a UK resident is approx. 10km. It should be noted that the presence of a conceivable impact pathway linking a development plan to European sites does not mean that Likely Significant Effects (LSEs) will occur.

2.5 A review of mapping on MAGIC indicates that there are no European sites within 10km of the NCYNP area. However, there is one European site beyond 10km, which requires specific consideration in relation to water quality issues; the Somerset Levels & Moors SPA / Ramsar.

Confirming Other Plans and Projects That May Act 'In Combination'

2.6 It is a requirement of the Regulations that the impacts of any development plans are not only considered in isolation but in-combination with other plans and projects that may also be affecting the European site(s) in question.

2.7 For example, when considering the potential for combined regional housing development across multiple local authorities to impact on European sites, a key emphasis must be on the cumulative impact of visitor numbers (i.e. recreational pressure). While an individual parish might only contribute a minor portion of recreational pressure (with no negative impact on a European site), other adjacent parishes may also each contribute minor 'amounts' of such pressure. Cumulatively, this could result in detectable effects on designated species. Evidence for in combination assessments of recreational pressure are typically available through bespoke visitor surveys commissioned by relevant stakeholders.

2.8 When undertaking this part of the assessment it is essential to bear in mind the principal intention behind the legislation i.e. to ensure that those projects or plans (which in themselves may have minor impacts) are not simply dismissed on that basis, but are evaluated for any cumulative contribution they may make to an overall significant effect. In practice, in-combination assessment is therefore of greatest relevance when the plan or policy would otherwise be screened out because its individual contribution is negligible.

2.9 It is considered that the adopted South Somerset Local Plan (the planning document for the overarching Local Planning Authority) and its HRA would provide suitable starting points for an in-combination assessment. Furthermore, the evidence base for most impact pathways (e.g. visitor surveys, Water Resources Management Plans and their HRAs) inherently provide an in-combination assessment of impact pathways.

3. European Sites

Somerset Levels & Moors SPA / Ramsar

Introduction

3.1 This SPA in south-west England represents one of the largest and richest areas of traditionally managed wet grassland and fen in lowland UK. The Somerset Levels and Moors SPA covers an area of 35,000ha in the floodplains of the Rivers Axe, Brue, Parrett and Tone. A main part of the site lies approximately at sea level and drains through a network of ditches, rhynes and drains.

3.2 This can result in large parts of the area being flooded in winter, depending on rainfall and tidal conditions. A portion of the site in the Brue Valley includes former raised peatbog potentially modified by agriculture and peat extraction. This has created areas of open water, fen and reedbed, in turn attracting significant number of waterfowl in winter (e.g. swans, ducks and waders).

SPA Qualifying Features[2]

3.3 This site qualifies under **Article 4.1** of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

Over winter

- Bewick's Swan *Cygnus columbianus bewickii* - 191 individuals representing at least 2.7% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)
- Golden plover *Pluvialis apricaria* – 3,029 individuals representing at least 1.2% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)

3.4 This site also qualifies under **Article 4.2** of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

Over winter

- Shoveler *Anas clypeata* - 501 individuals representing at least 1.3% of the wintering Northwestern / Central Europe population (5 year peak mean 1991/2 - 1995/6)
- Teal *Ana crecca* – 13,307 individuals representing at least 3.3% of the wintering Northwestern / Central Europe population (5 year peak mean 1991/2 – 1995/6)
- Wigeon *Anas penelope* – 13,661 individuals representing at least 1.1% of the wintering Western Siberia / Northwestern / Northeastern Europe population (5 year peak mean 1991/2 – 1995/6)

Assemblage qualification: A wetland of international importance.

3.5 The area qualifies under **Article 4.2** of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl

3.6 Over winter, the area regularly supports 72,874 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Snipe *Gallinago* gallinago, Lapwing *Vanellus vanellus,* Pintail *Anas acuta*, Gadwall *Anas strepera*, Shoveler *Anas clypeata*, Teal *Anas crecca*, Wigeon *Anas Penelope*, Golden Plover *Pluvialis apricaria*, Bewick's Swan *Cygnus columbianus bewickii*, Whimbrel *Numenius phaeopus*.

[2] http://jncc.defra.gov.uk/default.aspx?page=2026 [Accessed on the 29/07/2021]

Ramsar Qualifying Features[3]

3.7 The Somerset Levels and Moors Ramsar is designated for the following criteria:

Ramsar Criterion 2

Supports 17 species of British Red Data Book invertebrates.

Ramsar Criterion 5

Assemblages of international importance:

Species with peak counts in winter: 97,155 waterfowl (5 year peak mean 1998/99-2002/2003)

Ramsar Criterion 6

Species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in winter:

Tundra swan, *Cygnus columbianus bewickii*, NW Europe: 112 individuals, representing an average of 1.3% of the GB population (5 year peak mean 1998/9-2002/3)

Eurasian teal, *Anas crecca*, NW Europe: 21,231 individuals, representing an average of 5.3% of the population (5 year peak mean 1998/9-2002/3)

Northern lapwing, *Vanellus vanellus*, Europe - breeding: 36,580 individuals, representing an average of 1% of the population (5 year peak mean for 1998/9-2002/03)

Species/populations identified subsequent to designation for possible future consideration under criterion 6.

Species with peak counts in winter:

Mute swan, *Cygnus olor*, Britain: 842 individuals, representing an average of 2.2% of the population (5 year peak mean 1998/9-2002/3)

Eurasian wigeon, *Anas penelope*, NW Europe: 25,759 individuals, representing an average of 1.7% of the population (5 year peak mean 1998/9-2002/3)

Northern pintail, *Anas acuta*, NW Europe: 927 individuals, representing an average of 1.5% of the population (5 year peak mean 1998/9-2002/3)

Northern shoveler, *Anas clypeata*, NW & C Europe: 1,094 individuals, representing an average of 2.7% of the population (5 year peak mean 1998/9-2002/3)

SPA Conservation Objectives[4]

3.8 With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

3.9 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,

[3] http://jncc.defra.gov.uk/pdf/RIS/UK11064.pdf [Accessed on the 29/07/2021]
[4] http://publications.naturalengland.org.uk/publication/4598158654963712 [Accessed on the 29/07/2021]

- The distribution of the qualifying features within the site.

Potential Threats to Site Integrity[5]

3.10 The following threats and pressures to the integrity of the Somerset Levels and Moors SPA have been identified in Natural England's Site Improvement Plan:

- Drainage
- Inappropriate water levels
- Maintain and upgrade water management structure
- Change in land management
- Agricultural management practices
- Peat extraction
- Public access / disturbance
- Offsite habitat availability / management

[5] http://publications.naturalengland.org.uk/publication/6561001356918784 [Accessed on the 29/07/2021]

4. Identified Impact Pathways

Water Quality – Nutrient Neutrality

4.1 The quality of the water that feeds European sites is an important determinant of the nature of their habitats and the species they support. Poor water quality can have a range of environmental impacts:

- At high levels, toxic chemicals and metals can result in immediate death of aquatic life, and can have detrimental effects even at lower levels, including increased vulnerability to disease and changes in wildlife behaviour.
- Eutrophication, the enrichment of plant nutrients in water, increases plant growth and consequently results in oxygen depletion. Algal blooms, which commonly result from eutrophication, increase turbidity and decrease light penetration. The decomposition of organic wastes that often accompanies eutrophication deoxygenates water further, augmenting the oxygen depleting effects of eutrophication. In the marine environment, nitrogen is the limiting plant nutrient and so eutrophication is associated with discharges containing bioavailable nitrogen.
- Some pesticides, industrial chemicals, and components of sewage effluent are suspected to interfere with the functioning of the endocrine system, possibly having negative effects on the reproduction and development of aquatic life.

4.2 The most significant issue in relation to the NCYNP is the discharge of treated sewage effluent and surface run-off from urban surfaces, both of which are likely to increase nutrient concentrations (particularly phosphate concentrations) in local watercourses such as the River Isle. Phosphate is the main limiting nutrient in freshwater ecosystems and is likely to cause eutrophication if significant increases occur. The Somerset Levels and Moors SPA is designated for bird species (rather than habitats) and so is not primarily sensitive to an increase in nutrient levels. However, the Somerset Levels and Moors Ramsar is partly designated for its invertebrate populations, including 17 Red Data Book species of national importance.

4.3 The NP assessed in this HRA provides for development in the geographic area covered by Wessex Water, responsible for the public water supply and wastewater treatment within South Somerset and the NCYNP area. The potential implications of this development are outlined in **Error! Reference source not found.**.

Table 1: Wastewater Treatment Works serving development in the NCYNP area, which may be in hydrological continuity with the Somerset Levels and Moors Ramsar.

WwTW Catchment	Residential quantum allocated in the Ilminster Neighbourhood Plan	HRA implications
North Cadbury WwTW and Woolston WwTW (both operated by Wessex Water)	34 new residential dwellings	Discharge of treated sewage effluent and phosphorus surface run-off into local watercourses, such as the River Isle (ultimately a tributary of the River Parrett), which is in hydrological continuity with the Somerset Levels and Moors Ramsar

4.4 Natural England (NE) have confirmed to South Somerset Council and surrounding authorities that development that discharges to water courses connected to the Somerset Levels and Moors Ramsar site could adversely affect the site. This issue is covered on the South Somerset Council website[6] and is documented in correspondence from NE to South Somerset Council and other

[6] https://www.southsomerset.gov.uk/services/planning/somerset-levels-and-phosphates/

councils affected by the issue[7]. It is to be noted that the distance between the NCYNP area and the closest component part of the Somerset Levels & Moors Ramsar (the Wet Moor SSSI) is beyond the typical distance for which water quality impacts are considered. However, a recent shift towards catchment-scale analysis means that such effects are now also considered for European sites with an identified problem with nutrient loading, if they are hydrologically connected to the area affected by development. The NCYNP area lies within the catchment of the Ramsar, as identified on NE's most recently published map. For European sites at risk from eutrophication, NE requires a demonstration of nutrient neutrality. This means that any new development should not result in a net increase in nutrient input to said site. To support the South Somerset Local Plan and guide development coming forward under Neighbourhood Plans of constituent parishes, SSDC have developed a phosphorus budget calculator in collaboration with NE. The methodology underpinning this calculator has been used in this HRA.

4.5 In summary, the following European site beyond 10km from the NCYNP area is sensitive to changes in water quality as a result of NP development (the site in bold is taken forward into the following chapters):

- **Somerset Levels & Moors Ramsar (located 15.2km to the west of the NCYNP area)**

[7] https://www.southsomerset.gov.uk/media/3882/natural-england-advice-to-lpas-on-nutrients-in-the-somerset-levels-and-moors-catchment-170820.pdf

5. Screening for Likely Significant Effects (LSEs)

Water Quality – Nutrient Neutrality

5.1 The policies included in the NCYNP allocate 34 new residential dwellings, which will result in an increase of approx. 82 residents. New residents will add to the volume of treated wastewater effluent that is discharged to local watercourses. A preliminary assessment indicates that the sites allocated in North Cadbury and Yarlington Parishes are likely to be served by North Cadbury Wastewater Treatment Works (WwTW), which lies adjacent to the River Cam. The R. Cam is a tributary to the R. Yeo, which in turn forms a confluence with the R. Parrett. The Environment Agency Catchment Data Explorer indicates that the Upper Cam Waterbody has an overall 2019 classification of 'Moderate', including a 'Moderate' score for phosphate[8]. This condition is a characteristic that perpetuates to downstream waterbodies, since these are all in hydrological continuity. All aforementioned surface waterbodies lie within the Somerset Levels & Moors Ramsar catchment area and could impact the water quality in this sensitive European site.

5.2 The following policies are screened in for Appropriate Assessment regarding potential water quality impacts, because they allocate new residential dwellings, which will increase the volume of treated wastewater and / or surface run-off produced in the NCYNP area:

- Policy 9: Scale and Location of New Housing (sets the overall quantum of 34 additional dwellings to be delivered over the NCYNP period)
- Policy 18: Land North of Brookhampton, West of Cary Road (allocates 14 dwellings that will add phosphorus from WwTW discharge and surface run-off to the Somerset Levels & Moors Ramsar catchment)
- Policy 19: Land North of Brookhampton, East of Cary Road (allocates 14 dwellings)
- Policy 20: Barns at North Town Farm (allocates up to 3 dwellings through the conversion of existing barns – note that this may be relevant as no net increase in wastewater and surface run-off may occur)
- Policy 21: Barns At Hill Farm (allocates up to 2 dwellings through the conversion of existing barns – note that this may be relevant as no net increase in wastewater and surface run-off may occur)
- Policy 30: Barn Off Stoke Lane (allocates 1 dwelling through the conversion of an existing barn – note that this may be relevant as no net increase in wastewater and surface run-off may occur)

5.3 The policy screening for Likely Significant Effects (LSEs) is provided in Table 2 below.

[8] Available at: https://environment.data.gov.uk/catchment-planning/WaterBody/GB108052015690 [Accessed on the 28/07/2021]

Table 2: Likely Significant Effects (LSEs) screening table of the North Cadbury and Yarlington Neighbourhood Plan policies.

Policy Number / Name	Text	Test of Likely Significant Effect
General Heritage and Design Policies		
Policy 1: The Area's Rich Heritage	In addition to the protection given to the many designated Listed buildings, the Locally Important Buildings, as described in Appendix 4 and identified on the Policies Map, should be protected as non-designated heritage assets. In recognition of North Cadbury's rich archaeological resource, development proposals (other than extensions / alterations) will be expected to be accompanied by an initial archaeological evaluation.	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects Locally Important Buildings and provides for archaeological evaluations. However, these processes have no bearing on European sites. Therefore, Policy 1 is screened out from Appropriate Assessment.
Policy 2: Character And Design Guidance	New development should respond to the area's local character and history to reinforce the sense of place, and create places that are safe, inclusive and have a high standard of amenity. Plot patterns and density should respect local character, and comparably high-density developments should be avoided unless it is clear that this would not adversely impact on local character or residential amenity. A mix of building styles, types and designs is encouraged. Obvious repetition (other than in one-off terraces or pairs of cottages) and the repetitive use of similar plots or building types in an area should be avoided. Building heights should generally vary between one and two storeys, with subtle (but not excessive) variation in the pitch and roofline between adjoining buildings, extensions and property subdivisions. Grander buildings should be limited to those required for community use or the principle building within a major land holding. The use of local building materials (walls, roofs, boundary and surface treatments) is supported. If alternative, more sustainable materials are proposed, these must complement the traditional materials in the vicinity.	The are no Likely Significant Effects of this policy on European Sites. This design management policy sets design criteria for North Cadbury, including for building style and height, building material and parking provision. However, design generally has no bearing on European sites. Therefore, Policy 2 is screened out from Appropriate Assessment.

	Parking provision, bin stores, meter boxes and similar utility requirements should be clearly shown on the planning application drawings and located and designed to avoid being prominent in the streetscene.	
Policy 3: Buildings Fit For The Future	Developments should provide adequate internal space that can be used for working from home and/or designs that allow easy reconfiguration / re-modelling internally. The sensitive inclusion of renewable energy and other measures to minimise the carbon footprint of the development and provide climate change mitigation will be supported, provided the resulting building would not have a detrimental impact on the local character of the area. Applicants are encouraged to submit a sustainability statement detailing the sustainable design and construction measures that have been included within the proposal.	The are no Likely Significant Effects of this policy on European Sites. This design management policy sets several parameters for new developments, including internal space, renewable energy inclusion and the provision of sustainability statements. However, this policy is not associated with impact pathways to European sites. Therefore, Policy 3 is screened out from Appropriate Assessment.
Policy 4: Practical Garden Sizes	Garden areas should be of sufficient size to meet occupiers' needs (for drying space, storage for bins, cycles and gardening equipment, with space for a sitting out and, in respect of family homes, space for children to play). As a guide, the minimum depth for all rear gardens should be 11m to ensure both that suitable levels of privacy are maintained, and that reasonable sized gardens that can include tree planting are created. Rear garden areas should be a minimum of 60sqm, rising to at least 100sqm for three- and four-bedroom family homes.	The are no Likely Significant Effects of this policy on European Sites. This design management policy sets the standards for garden sizes (depth and areal coverage) in new developments. However, this policy is not associated with impact pathways to European sites. Therefore, Policy 3 is screened out from Appropriate Assessment.
Environment		
Policy 5: The Area's Rural Character	Development should respect and, where practicable, enhance local landscape character, including the retention and reinforcement of the following key characteristics: − General tranquillity (away from the A303 corridor)	The are no Likely Significant Effects of this policy on European Sites. This is a development management policy that preserves key characteristics of the area,

	− Winding lanes, with traditional fingerpost signs and no street lighting, old drove roads and sunken lanes (Holloways) − Particularly dark night skies − Hedgerows demarcating field boundaries. − Mature oaks and other ancient trees (particularly along roadsides and stream corridors) − Presence of the River Cam with its associated riverside vegetation and small stone bridges / crossing points − Small historic apple orchards in and around settlements − Scattered farmsteads and hamlets in the wider countryside, with buildings reflecting agricultural use, and primarily of local building stone, with clay tiles or thatch roofs – new buildings should not diminish the undeveloped gaps between the main villages or appear prominent in the landscape.	including dark night skies, hedgerows, mature trees and the River Cam. These are all positive aims for the environment. There are no impact pathways that link this policy to European Sites. Therefore, Policy 5 is screened out from Appropriate Assessment.
Policy 6: Recreational Routes and Views	Development should retain the rural character of the lanes and tracks around the villages and hamlets and into the countryside, with particularly regard given to the three main recreational trails (the Macmillan Way, Leyland Trail and Monarch's Way) and the popular routes listed in Table 1 and shown on the Policies Map. Development that would significantly detract from the enjoyment of these routes by walkers and horse-riders will not be supported. The scale, design and layout of development (including any landscaping) should minimise adverse impacts on publicly accessible views over open countryside and towards key landmarks (such as the local church towers, Cadbury Court, Cadbury Castle, Yarlington Sleights as well as distant views of Glastonbury Tor) and should preserve and enhance such views where possible. Views noted as part of the evidence gathering for this Neighbourhood Plan are listed in Tables 4 (North Cadbury), -7 (Galhampton), 10 (Yarlington) and 13 (Woolston) and shown on the Policies Map. Projects that will improve recreational access to the countryside for walking and/or horse-riding will be supported.	The are no Likely Significant Effects of this policy on European Sites. This development management policy aims to preserve key recreational trails and landscape views in the NP area. Public access to outdoor spaces is considered important to help reduce recreational pressure in more sensitive areas. There are no impact pathways that link this policy to European Sites. Therefore, Policy 6 is screened out from Appropriate Assessment.
Policy 7: Protecting Local Wildlife	Development should protect and, wherever practicable, enhance biodiversity, starting with a thorough understanding of the existing wildlife areas and corridors (such as existing field hedgerow boundaries and streams) that are in the vicinity of the site, and the wildlife interest	The are no Likely Significant Effects of this policy on European Sites.

	that may be affected by the development (this can be demonstrated through the submission of a completed biodiversity checklist and any necessary supporting ecology surveys). In line with national policy, a net gain in biodiversity will be sought. In general, it is expected that: - Existing site features that support wildlife are retained (or if there are over-riding reasons for their removal, then compensatory measures should be incorporated within or adjoining the site); - New buildings and alterations to existing buildings should incorporate provision for wildlife such as bird / bat boxes and bee bricks; - Landscaping schemes should be designed to support wildlife movement / foraging through the provision of native hedgerow and tree planting, the creation of wildlife ponds where the topography and soil / geology allows, and the use of wildflower planting in areas of open space. Ongoing management and the use of external lighting schemes may need to be controlled through suitably worded conditions to ensure that biodiversity measures remain effective.	This positive environmental protection policy seeks to protect and enhance biodiversity, key wildlife areas and corridors. For example, existing site features that support wildlife must be retained and landscaping schemes should promote the movement of wildlife. There are no impact pathways that link this policy to European Sites. Therefore, Policy 7 is screened out from Appropriate Assessment.
Policy 8: Flood Risk	New development or intensification of existing vulnerable uses should avoid flood risk from all sources and must incorporate a viable and deliverable drainage system to manage surface water runoff. Measures should make an allowance for the likely effects of climate change on increased flood risk. Existing drainage infrastructure must not be adversely affected by development.	The are no Likely Significant Effects of this policy on European Sites. This is a positive environmental protection policy that minimizes flood risk in the NP area, primarily by avoiding areas of high flood risk. Furthermore, developments must deliver viable drainage systems. There are no impact pathways that link this policy to European Sites. Therefore, Policy 8 is screened out from Appropriate Assessment.
Housing		

Policy 9: Scale and Location of New Housing	Sufficient land is allocated in the Neighbourhood Plan, which together with the extant planning consents and projected windfall should more than meet the identified housing need of 45 dwellings over the plan period, as identified below: Extant consents as detailed in Appendix 3 = 27 dwellings Site allocations as detailed in Table 2 = 34 dwellings Given the identified supply exceeds the housing need requirement, the development of open market housing on alternative greenfield sites will be restricted until such time as this plan is reviewed. Should the need for additional affordable housing be substantiated through a local housing needs survey, the provision of a rural exception site for affordable housing within or well-related to the main settlements of North Cadbury and Galhampton will be supported, provided that all of the following criteria are met: i) the proposal would meet an identified, current, local need for affordable housing arising from within the Neighbourhood Plan area, ii) the affordable housing would remain affordable and available for local residents in housing need in perpetuity; iii) any open market housing provided as part of the mix must comply with Policy 11 (House Types) and be necessary to facilitate the affordable housing (demonstrated through an open book approach), and must not exceed 75% of the total housing mix on that site; iv) the scheme is of a character, scale and design appropriate to the settlement and location, taking into account the potential impact on features of heritage, wildlife or landscape value.	Likely Significant Effects of Policy 9 on European Sites cannot be excluded. This policy allocates 34 dwellings during the NP period, which currently exceeds the identified housing requirement. This will result in an increase in the local population, leading to larger volumes of treated wastewater and water surface run-off produced. The NCYNP area lies within the catchment of the Somerset Levels & Moors Ramsar, which is sensitive to nutrient input and potential eutrophication. Overall, Policy 9 is screened in for Appropriate Assessment in relation to the following impact pathway: • Water Quality – Nutrient Neutrality
Policy 10: Use of Rural Buildings	The conversion or sympathetic replacement of agricultural and other rural buildings to provide housing will be supported, provided that all of the following criteria are met: − the building is of permanent and substantial construction, and has been in active use for at least 10 years,	The are no Likely Significant Effects of this policy on European Sites. This development management policy sets the conditions under which agricultural

	− the building is not in a location where its conversion or replacement would be detrimental in wider views, − the building footprint and height would not substantially increase (either through extension or conversion), and any alterations to its design would have due regard to the rural character of the area, − a bat and barn owl survey are undertaken, and measures secured to ensure that there is a net biodiversity gain, − residential amenities of future occupants would not be adversely impacted by neighbouring land uses. Where the existing building is of sound construction and contributes positively to the rural character or the area, its conversion is to be preferred unless it can be demonstrated that there would be significant sustainability benefits from its replacement	buildings may be converted to housing. However, this conversion process has no direct relevance to European sites. There are no impact pathways that link this policy to European Sites. Therefore, Policy 10 is screened out from Appropriate Assessment.
Policy 11: House Types	The type and size of housing permitted should meet local needs by providing: − affordable homes for rent, primarily built as 1- and 2-bedroom dwellings. − low-cost affordable home ownership dwellings. − one, two and three-bedroom open market homes for rent or sale. − homes specifically designed for residents with more limited mobility and/or requiring an element of care. − agricultural and related worker's dwellings in relation to a clearly established functional need. On sites of 0.5ha or with capacity for 10 or more dwellings, a mix of these house types should be provided, including at least 35% as affordable housing options (unless a lower level is justified on viability grounds through an open book approach). Where affordable housing is provided, this should be subject to a suitably worded condition or legal agreement to ensure that the housing will remain affordable to and priority given to housing eligible persons who have a local connection to the Neighbourhood Plan Area.	The are no Likely Significant Effects of this policy on European Sites. This development management policy identifies the housing types that are to be delivered in the NP area, including parameters such as the number of bedrooms and housing for the disabled. There are no impact pathways that link this policy to European Sites. Therefore, Policy 11 is screened out from Appropriate Assessment.
Business and Employment		

Policy 12: North Cadbury Business Park	Land east of North Cadbury Business Park is safeguarded for the employment use appropriate to an industrial estate, which may be brought forward once the remainder of the business park has been developed. In order to minimise the impact on the wider landscape and rural character of the area, the following principles should be applied to further development or redevelopment at the business park: − avoid light coloured rendering and bright or highly reflective materials. − break up the massing of form through variations in the roof height. − take into account landform and screening provided by existing tree cover to minimise the visual impact and incorporate new landscaping of sufficient scale and breadth to reduce any remaining adverse visual impacts. − Reduce adverse impacts from potential noise and light pollution to levels appropriate to a rural area through appropriate mitigation / restrictive measures.	The are no Likely Significant Effects of this policy on European Sites. This is a development management policy that safeguards land east of North Cadbury Business Park for future employment uses. The policy sets guidance principles for potential future employment development. However, the mere safeguarding of land is not associated with impact pathways to European sites. Therefore, Policy 12 is screened out from Appropriate Assessment.
Policy 13: Other Employment Opportunities	Elsewhere in the plan area, new employment proposals for offices, workshops or similar uses, including provision for homeworking, will be supported, provided all of the following criteria are met: − the site is adjacent to, or physically well-related to an existing built-up area, or utilises an existing building – with previously developed land used in preference to development of greenfield land where available and suitable. − any new building is of a scale commensurate with the locality and taking into account the visibility of the site from the public rights of way and tree / hedgerow cover that can be maintained. − there would be no significant adverse impact upon local landscape character, wildlife or heritage assets as a result of the development or proposed use; and − the site can be safely accessed, and its use would not give rise to a significant increase in traffic (including parked vehicles) inappropriate to the rural network of lanes. Where new premises are provided, this should be subject to a suitably worded condition or legal agreement to ensure that the premises remain in employment use.	The are no Likely Significant Effects of this policy on European Sites. This development management policy provides principal support to employment developments, provided several criteria are fulfilled. For example, no adverse impacts on wildlife assets should occur. However, no firm quantum or location of opportunities is provided. There are no impact pathways that link this policy to European Sites. Therefore, Policy 13 is screened out from Appropriate Assessment.

Policy 14: Parking	Development proposals should meet its parking requirements on-site, in a manner that is likely to remain available (and therefore the use of outside spaces is to be preferred over garages). Proposals to improve car parking to serve the main community facilities will be supported where they accord with other development plan policies.	The are no Likely Significant Effects of this policy on European Sites. This infrastructure management policy sets the parking standards required in new developments, including a support for new car parks serving community facilities. There are no impact pathways that link this policy to European Sites. Therefore, Policy 14 is screened out from Appropriate Assessment.
Policy 15: North Cadbury – Built Character	As a general principle, buildings within the vicinity of North Cadbury should: a) have a narrow building depth and wide fronts, although there is variation according to plot size and orientation. b) include detached, semi-detached and small terraced properties of three, as well as courtyards, outbuildings and workshops in the form of traditional agricultural barns. c) use Cary or Lias stone as the predominant building material, mainly laid as coursed rubble. d) use plain clay tiles as the predominant roofing material, and brick chimneys with corbels on dwellings. e) have timber casement windows with well-proportioned and balanced casements. Other materials and designs may be considered provided that they complement the tone, scale and form of the traditional buildings, and do not detract from the overall character of the village.	Likely Significant Effects of this policy on European Sites cannot be excluded. This is a development management policy that identifies the built character of North Cadbury, including building depth, materials used and window design. There are no impact pathways that link this policy to European Sites. Therefore, Policy 15 is screened out from Appropriate Assessment.
Policy 16: North Cadbury – Local Green Spaces	Development should be sensitive to the rural setting of the village, including the river corridor and remnants of orchards. The following local green spaces should be protected from inappropriate development that would harm their character and reason for designation: − NC1 North Cadbury tennis courts and playing field.	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects several local green spaces from development. Preserving public access to

	− NC3 Clare Field, Ridgeway Lane − NC6 Glebe Field North, south of the Old Rectory − NC7 North Cadbury church grounds − NC10 Wide grass verge on Woolston Road − NC11 Avenue of Beech Trees leading to the Court. − NC12 Orchard opposite village shop	outdoor spaces is considered important for mental health and to help reduce recreational pressure in more sensitive areas. There are no impact pathways that link this policy to European Sites. Therefore, Policy 16 is screened out from Appropriate Assessment.
Policy 17: North Cadbury – Facilities	The following community facilities should be retained: − Allotments − Church − Playing fields and associated tennis courts and play area. − Primary School (plus Pre-School) and associated playing field. − Telephone box (as community book exchange) − Public House − Village Hall − Village Convenience Store Proposals that provide new facilities, allow existing facilities to modernise and adapt for future needs, or to diversify in a manner that would support a new or improved community facility to become viable, will be supported. This is likely to include: a) Improved classroom facilities within the current school grounds b) The provision of additional off-road parking provision close and convenient to the school c) Additional allotments, through the expansion of the existing allotments site.	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects against the loss of community facilities, including allotments and playing fields. Preserving public access to outdoor spaces is considered important for mental health and to help reduce recreational pressure in more sensitive areas. There are no impact pathways that link this policy to European Sites. Therefore, Policy 17 is screened out from Appropriate Assessment.

Policy 18: Land North of Brookhampton, West of Cary Road	Land North of Brookhampton, West of Cary Road, as shown on the policies map, is allocated for 14 dwellings. Its development will be subject to all of the following requirements: − The type and size of dwellings accords with Policies 2 and 11, and at least 6 homes are provided as affordable dwellings, with the provision of affordable housing phased so as to be provided in advance or at the same time as the open market dwellings. − The site's layout, scale and detailed design, including landscaping, is considered as part of a masterplanned approach together with land to the east side of Cary Road (Policy 19). This must: o accord with Policies 2 - 4 and 15; o respect the important view from further up the Cary Road (V4) in accordance with Policy 6 (by presenting a more appropriate. positive edge to the village in keeping with its historic character; o include a new pavement along Cary Road (and enabling safe crossing in conjunction with the development of the land to the east side of the road). − Hedgerow / tree planting should take place along / adjoining the site boundaries with the remainder of the field (which should help compensate for the removal of hedgerow along Cary Road as well as softening the visual impact of the development in wider views), with other measures secured as necessary to ensure that there is a net biodiversity gain. − The current alignment of footpath WN 19/73 is retained outside of the site boundaries, with the area to the south side managed for informal recreational use / sustainable drainage measures. Any diversion of WN 19/68 should be minor in extent and designed to reflect the rural character of the local footpaths in the area.	Likely Significant Effects of Policy 18 on European Sites cannot be excluded. This policy allocates 14 dwellings on Land North of Brookhampton (west of Cary Road). This will result in an increase in the local population, leading to larger volumes of treated wastewater and water surface run-off produced. The NCYNP area lies within the catchment of the Somerset Levels & Moors Ramsar, which is sensitive to nutrient input and potential eutrophication. Overall, Policy 18 is screened in for Appropriate Assessment in relation to the following impact pathway: • Water Quality – Nutrient Neutrality
Policy 19: Land North of Brookhampton, East of Cary Road	Land North of Brookhampton, East of Cary Road, as shown on the policies map, is allocated for 14 dwellings. Its development will be subject to all of the following requirements: − The type and size of dwellings accords with Policies 2 and 11, and at least 6 homes are provided as affordable dwellings, with the provision of affordable housing phased so as to be provided in advance or at the same time as the open market dwellings.	Likely Significant Effects of Policy 19 on European Sites cannot be excluded. This policy allocates 14 dwellings on Land North of Brookhampton (east of Cary Road). This will result in an increase in the local population, leading to larger volumes of treated wastewater and water surface run-off

	− The site's layout, scale and detailed design, including landscaping, is considered as part of a masterplanned approach together with land to the west side of Cary Road (Policy 18). This must: o accord with Policies 2 - 4 and 15; o respect the important view from further up the Cary Road (V4) (by presenting a more appropriate. positive edge to the village in keeping with its historic character; o include a new pavement along Cary Road (and enabling safe crossing in conjunction with the development of the land to the west side of the road). − The site's layout, scale and detailed design, including landscaping must respect the privacy and amenity of the existing occupants of adjoining properties to the south. − Hedgerow / tree planting should take place along / adjoining the site boundaries with the remainder of the field (which should help compensate for the removal of internal hedgerow and the hedgerow along Cary Road as well as softening the visual impact of the development in wider views), with other measures secured as necessary to ensure that there is a net biodiversity gain. − A new public footpath will be provided to connecting from the eastern end of the site to the lane serving Mitchell's Row to enable easy access to the public right of way network via footpath WN 19/58.	produced. The NCYNP area lies within the catchment of the Somerset Levels & Moors Ramsar, which is sensitive to nutrient input and potential eutrophication. Overall, Policy 19 is screened in for Appropriate Assessment in relation to the following impact pathway: • Water Quality – Nutrient Neutrality
Policy 20: Barns at North Town Farm	The Barns at North Town Farm, as shown on the policies map, is allocated for up to 3 dwellings through the conversion or sympathetic replacement of the existing barns, in line with Policy 10.	Likely Significant Effects of Policy 20 on European Sites cannot be excluded. This policy allocates up to 3 dwellings on Barns at North Town Farm. This will result in an increase in the local population, leading to larger volumes of treated wastewater produced. The NCYNP area lies within the catchment of the Somerset Levels & Moors Ramsar, which is sensitive to nutrient input and potential eutrophication.

		Overall, Policy 20 is screened in for Appropriate Assessment in relation to the following impact pathway: • Water Quality – Nutrient Neutrality
Policy 21: Barns At Hill Farm	The Barns at Hill Farm, as shown on the policies map, are allocated for up to 2 dwellings through the conversion or sympathetic replacement of the existing barns, in line with Policy 10.	Likely Significant Effects of Policy 21 on European Sites cannot be excluded. This policy allocates up to 2 dwellings on Barns at Hill Farm. This will result in an increase in the local population, leading to larger volumes of treated wastewater produced. The NCYNP area lies within the catchment of the Somerset Levels & Moors Ramsar, which is sensitive to nutrient input and potential eutrophication. Overall, Policy 21 is screened in for Appropriate Assessment in relation to the following impact pathway: • Water Quality – Nutrient Neutrality
Policy 22: Galhampton – Built Character	As a general principle, buildings within the vicinity of Galhampton should: a) reinforce the generally linear, rural character of the settlement layout, avoiding back land estate-style development. b) have variation in plot size and orientation, but with the majority of buildings set back from the lane with hedgerow or tree planting to the front to reinforce the generally green characteristic of the lanes. c) include detached, semi-detached and small terraced properties of three, as well as courtyards, outbuildings and workshops in the form of traditional agricultural barns.	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects the existing character of Galhampton by specifying requirements for new built development, including plot size and building materials. There are no impact pathways that link this policy to European Sites. Therefore, Policy 22 is screened out from Appropriate Assessment.

	d) use Cary, Lias or Bath stone as the predominant building material, mainly laid as coursed random rubble and dressed ashlar. e) use plain clay tiles, double Roman pantiles or slate as the predominant roofing material, and brick chimneys. Other materials and designs may be considered provided that they complement the tone, scale and form of the traditional buildings, and do not detract from the overall character of the village.	
Policy 23: Galhampton – Local Green Spaces	Development should be sensitive to the rural setting of the village, including the remnants of orchards. The following local green spaces should be protected from inappropriate development that would harm their character and reason for designation: − Playing field, south of Long Street − Field off Hearn Lane to the rear of Playing Field. − The Triangle	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects specific local green spaces in Galhampton from development. Preserving public access to outdoor spaces is considered important for mental health and to help reduce recreational pressure in more sensitive areas. There are no impact pathways that link this policy to European Sites. Therefore, Policy 23 is screened out from Appropriate Assessment.
Policy 24: Galhampton – Community Facilities	The following community facilities should be retained: − Galhampton Country Store (as a local convenience store) − Village Hall − Church − Public House − Telephone box (as community book exchange) − Playing fields	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects against the loss of community facilities, including the village hall, church and public house. However, the protection of such facilities has no direct bearing on European sites.

	Proposals that provide new facilities, allow existing facilities to modernise and adapt for future needs, or to diversify in a manner that would support a new or improved community facility to become viable, will be supported. This is likely to include an improved footpath link to the main road / country stores.	There are no impact pathways that link this policy to European Sites. Therefore, Policy 24 is screened out from Appropriate Assessment.
Policy 25: Yarlington – Built Character	As a general principle, buildings within the vicinity of Yarlington should: a) respect the focus of development around the four-way junction, with a linear pattern of development coming out of the village in all directions. b) have variation in plot size and orientation, respecting the topography and space for planting to retain the verdant feel of the settlement. c) use Cary stone as the predominant building material, plain clay tiles, or slate as the predominant roofing material, and brick chimneys. Other materials and designs may be considered provided that they complement the tone, scale and form of the traditional buildings, and do not detract from the overall character of the village.	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects the existing character of Yarlington by specifying requirements for new built development, including plot size and building materials. There are no impact pathways that link this policy to European Sites. Therefore, Policy 25 is screened out from Appropriate Assessment.
Policy 26: Yarlington – Local Green Spaces	Development should be sensitive to the rural setting of the village. The following local green spaces should be protected from inappropriate development that would harm their character and reason for designation: − Area round the church − Area by the pond − Swing Tree corner − St Mary's Church grounds	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects specific local green spaces in Yarlington from development. Preserving public access to outdoor spaces is considered important for mental health and to help reduce recreational pressure in more sensitive areas. There are no impact pathways that link this policy to European Sites. Therefore, Policy 26 is screened out from Appropriate Assessment.
Policy 27: Yarlington – Community Facilities	The following community facilities should be retained: − Village Hall	The are no Likely Significant Effects of this policy on European Sites.

	− Church − Telephone box (as community book exchange) − Public House Proposals that provide new facilities, allow existing facilities to modernise and adapt for future needs, or to diversify in a manner that would support a new or improved community facility to become viable, will be supported.	This development management policy protects against the loss of community facilities, including the village hall, church and public house. However, the protection of such facilities has no direct bearing on European sites. There are no impact pathways that link this policy to European Sites. Therefore, Policy 27 is screened out from Appropriate Assessment.
Policy 28: Woolston – Built Character	As a general principle, buildings within the vicinity of Woolston should: a) respect the pattern of well-spaced linear development and farmyard clusters. b) reinforce the predominantly agricultural character of the community with forms reflecting traditional agricultural barns and farm workers cottages. c) use cob, stone, coursed rubble or square cut Cary stone under thatch, slate or plain tiled roofs with brick chimneys, and casement windows under timber lintels. Other materials and designs may be considered provided that they complement the tone, scale and form of the traditional buildings, and do not detract from the overall character of the hamlet.	The are no Likely Significant Effects of this policy on European Sites. This development management policy protects the existing character of Woolston by specifying requirements for new built development, including respecting the linear development character of Woolston and building materials. There are no impact pathways that link this policy to European Sites. Therefore, Policy 28 is screened out from Appropriate Assessment.
Policy 29: Woolston – Community Facilities	Proposals that would provide a community facility within the hamlet to meet and identified need and can demonstrate that it is likely to be viable, will be supported.	The are no Likely Significant Effects of this policy on European Sites. This development management policy supports the provision of viable community facilities in principle. However, such facilities have no direct bearing on European sites.

		There are no impact pathways that link this policy to European Sites. Therefore, Policy 29 is screened out from Appropriate Assessment.
Policy 30: Barn Off Stoke Lane	The Barn off Stoke Lane, as shown on the policies map, is allocated for 1 dwelling through its conversion or sympathetic replacement, in line with Policy 10.	Likely Significant Effects of Policy 30 on European Sites cannot be excluded. This policy allocates 1 dwelling on Barn off Stoke Lane. This will result in an increase in the local population, leading to larger volumes of treated wastewater and water surface run-off produced. The NCYNP area lies within the catchment of the Somerset Levels & Moors Ramsar, which is sensitive to nutrient input and potential eutrophication. Overall, Policy 30 is screened in for Appropriate Assessment in relation to the following impact pathway: • Water Quality – Nutrient Neutrality

6. Appropriate Assessment

Water Quality – Nutrient Neutrality

6.1 The concept of nutrient neutrality has been driven forward by the Dutch Nitrogen Case (DNC), which ruled that where a European site is failing to reach its Conservation Objectives, any potential additions to its nutrient load from new development must necessarily be limited. Natural England's view is that any developments adding phosphorus to freshwater sites will result in Likely Significant Effects and must be further investigated in an Appropriate Assessment.

6.2 The Somerset Levels & Moors Ramsar (SLMR) is designated for its internationally important flora and fauna, including rare and threatened invertebrate ditch communities. Wetland ecosystems are critically important and provide valuable ecological services to people and wildlife. All Ramsar sites have high biodiversity and serve hydrological functions, such as flood protection. Phosphorus is the primary growth-limiting nutrient in freshwater systems, controlling the amount of primary production. For the SLMR, a high existing phosphorus loading has been documented and the site is at risk from eutrophication due to an increase in the abundance of algae (e.g. certain *Lemna* species) and duckweed, with concomitant issues such as excessive shading, oxygen depletion and fish death. Phosphorus pollution can derive from point-source as well as diffuse sources, such as Wastewater Treatment Works (WwTWs) and agricultural run-off. The main pathway through which the NCYNP is likely to contribute to phosphate loadings in the Ramsar is through an increase in the discharge of treated sewage effluent, which is the subject of this Appropriate Assessment. Many of the ditches in the Ramsar are classified as having 'unfavourable' condition due to exceedance of 0.1mg/l total phosphorus set in the Common Standards Monitoring Guidance.

6.3 Achieving nutrient neutrality is now accepted as the preferred tool to mitigate adverse effects of residential development within the catchment of aquatic European sites. Royal Haskoning DHV developed a phosphorus neutrality calculator[9] for Somerset West Taunton Council, which has now also been adopted by SSDC, the overarching Local Planning Authority for the NCYNP area. This calculator is based on nutrient neutrality guidance documents developed by Natural England (NE) for the Solent region and the Stodmarsh SPA / Ramsar / SAC. The calculator relies on several assumptions that are based on the best available information and scientific literature, including:

- Average occupancy rates of different types of residential developments (e.g. flats, care homes, hotel rooms) as provided by Local Authority sources;
- Expected water usage of 110l per person per day as stipulated under the Building Regulations (2010);
- Phosphate run-off coefficients for general and farm-specific land use types (ranging from 0.02 kg/ha/yr in nature reserves to 3.15 kg/ha/yr from pig farms on impermeable soils; and
- Definitions of key land use types and their characteristics as provided by CORINE 2018.

6.4 The NCYNP allocates five residential sites, totalling 34 dwellings. Three allocations are on existing brownfield development, including barns. Depending on the previous occupancy of these sites, these allocations may contribute little to no additional phosphorus loading to the Somerset Levels & Moors Ramsar catchment. Two residential site allocations (off Cary Road) encompass existing greenfield sites with no prior urban development. It is these sites that present the highest risk in terms of nutrient neutrality. Both sites are currently used for lowland grazing, a land use that contributes relatively little phosphorus compared to sources such as treated wastewater effluent and urban surface run-off. Appendix B provides the phosphorus neutrality calculations for the NCYNP site allocations.

[9] Royal Haskoning DHV. (2021). Phosphorus Budget Calculator. Report to Somerset West Taunton Council. 32pp.

6.5 The results presented in Appendix B show that all site allocations are associated with a phosphorus surplus of 21.63 kg/TP/yr in total. The residential development on these sites will increase the in-combination phosphorus loading in the Somerset Levels & Moors Ramsar catchment. Therefore, mitigation measures will need to be deployed to avoid adverse effects on site integrity in relation to water quality issues and eutrophication.

6.6 The exact layout of any of the sites coming forward under the NCYNP is yet to be determined. Given the relatively small number of dwellings allocated in the NP, none of the sites will deliver large amounts of greenspaces. However, any on-site greenspaces (however small) will reduce the volume of phosphate leachate associated with the NCYNP (open spaces and greenspaces have a runoff coefficient of 0.14 kg/ha/yr[10]. AECOM recommends that the amounts of greenspace / gardens / allotments within allocation boundaries should be maximised to help reduce nutrient run-off from impermeable urban surfaces. The precise site layout will be considered in planning application HRAs when phosphorus budgets will need to be recalculated.

6.7 Additional treated sewage effluent due to a growing population is the main driver of the predicted increase in phosphorus loading. Many WwTWs have consented phosphate permit limits, which are determined taking the Conservation Objectives of European sites and the available infrastructure / technology into account. This infrastructure is continually improved under Asset Management Plans (AMPs). However, the management of strategic resources, including water treatment infrastructure, and AMPs does not lie within the remit of parish councils. Rather it is pursued by water companies in dialogue with Local Planning Authorities, the Environment Agency and Natural England. Although upgrading the technology of South Somerset's WwTWs (e.g. by integrating lower phosphorus permits) is likely to be an expensive undertaking, it also means that any residual phosphorus surplus will be more easily mitigated using a package of interventions.

6.8 Phosphorus mitigation can be achieved through a combination of the following measures:

- Securing an agreement with wastewater treatment companies (in this case Wessex Water) to ensure that phosphorus removal efficiency is improved (note that this already under way with permit limits being significantly reduced at WwTWs across South Somerset District in the AMP7 period)
- Developing solutions that remove phosphorus directly at the development site or downstream from the WwTW (e.g. wetlands or reedbeds)
- Since wetlands are able to remove phosphorus, an offsetting solution being explored elsewhere is to deliver new wetlands, not to treat effluent from development, but to remove an equivalent amount of P from agricultural runoff that would otherwise enter the catchment. It should be noted that wetlands are generally only considered to be about 50% efficient at removing phosphates[11].
- Acquiring parcels of agricultural land elsewhere and change land use in perpetuity towards natural habitat types (e.g. woodland, saltmarsh, grassland)
- Increasing the proportion of greenspaces within allocated sites (see discussion above) to help reduce phosphorus leachate.

6.9 Experience in the Stodmarsh area in Kent, where phosphorus neutrality issues have also arisen, indicates that option 3 identified above is the most likely to be feasible. It should be noted, however, that Natural England guidance is that to maximise reliability such wetlands should be more than 2ha in size. Depending on the costs involved this may require several developers to collaborate to deliver a single wetland.

6.10 Natural England recognises that nutrient neutrality is difficult to achieve for small developments, both for financial and logistical reasons. Therefore, the primary burden of developing strategic mitigation solutions is placed on Local Planning Authorities. SSDC is currently progressing their Local Plan Review 2016-2036, which is at the Preferred Options Reg.18 stage. A review of the

[10] Natural England. (2020). Advice on nutrient neutrality for new development in the Stour catchment in relation to Stodmarsh Designated Sites – For Local Planning Authorities. Version 3.
[11] Land et al (2016). How effective are created or restored freshwater wetlands for nitrogen and phosphorus removal? A systematic review. Environmental Evidence 5:9

document shows that it currently only provides for a general protection of biodiversity in Policy EQ5 (Biodiversity): '*All proposals for development, including those which would affect sites of regional and local biodiversity, nationally and internationally protected sites… will: a) protect the biodiversity value of land… e) Ensure that Habitat Features, Priority Habitats and Geological Features that are used by bats and other wildlife are protected…'*.

6.11 Given that Local Plan policy does not currently address the issue of phosphorus neutrality (this only recently having been put on the agenda by Natural England), it is recommended that the NCYNP should acknowledge this emerging concept and explicitly require mitigation measures for residential developments. This should identify that phosphorus neutrality should be demonstrated before residential developments are consented (subject to any subsequent advice on the issue from Natural England and the LPA). A review of the NCYNP indicates that such policy text would best be placed in **Chapter 6 (Environment)** under a **new Policy 9 (Phosphorus Neutrality)**.

6.12 AECOM recommends that the following text is inserted to new Policy 9: '***Given the sensitivity of the Somerset Levels and Moors Ramsar to elevated phosphorus loading and resulting eutrophication, all residential developments contributing to the total wastewater burden in the NP area must demonstrate phosphorus neutrality. Developments with an identified phosphorus surplus, will be required to provide appropriate mitigation measures (e.g. wetlands, reedbeds) in agreement with the Local Planning Authority and Natural England. The requirement for mitigation will be commensurate with the scale of development and might be achieved strategically, particularly in the case of smaller developments.***' Provided that this text (or an appropriate equivalent) is incorporated in the next iteration of the NCYNP, it is concluded that the NP will not result in adverse effects on the integrity of the Somerset Levels and Moors Ramsar in relation to water quality, both alone and 'in-combination'.

6.13 Although details of mitigation to be delivered are a matter for the individual planning application, mitigation calculations have been undertaken to support the Neighbourhood Plan (Appendix B). These identify that a wetland of 2.53ha to treat runoff from surrounding farmland would be sufficient to offset the phosphorus that would be contributed to the catchment from the site allocations in the plan. Examination of site topography, and surface water flow directions and dominant flow pathways confirms that suitable land is available for such a wetland within the landowner's wider land holding. There is thus no reason to expect that suitable mitigation for the growth identified in the Neighbourhood Plan cannot be identified and delivered in a timely manner.

6.14 In the longer term, SSDC and its partners are developing a strategic mitigation solution in the form of a Phosphate Management Strategy. A definitive map of the Ramsar Site catchment and its sub-catchments has been developed as part of this work. The draft Strategy is scheduled to be completed by the autumn. The key aims of the strategy are to:

- Review the geographical extent of the area at risk (in relation to surface water catchments and catchments for WwTWs)
- Review types of development that contribute to increased phosphorus loadings, and review the phosphorus calculator accordingly
- Develop a strategy – based at sub-catchment area level
- Develop a nutrient policy to embed within Local Plans – such as the emerging Local Plan Review
- Produce a Supplementary Planning Document (SPD) that will develop and agree the method and tariffs for administering, implementing, managing and monitoring strategic mitigation schemes put in place to achieve phosphorus neutrality

6.15 Therefore, any mitigation solutions proposed by applicants for addressing phosphorus neutrality must therefore be in line with the emerging Phosphate Management Strategy.

7. Conclusions & Recommendations

7.1 This HRA set out to assess potential impacts of NCYNP policies on European sites potentially linked to the NP area. It identified that the sole site requiring further consideration is the Somerset Levels & Moors Ramsar, due to existing high phosphorus loadings in ditches, putting the site at risk of eutrophication and threatening its Conservation Objectives.

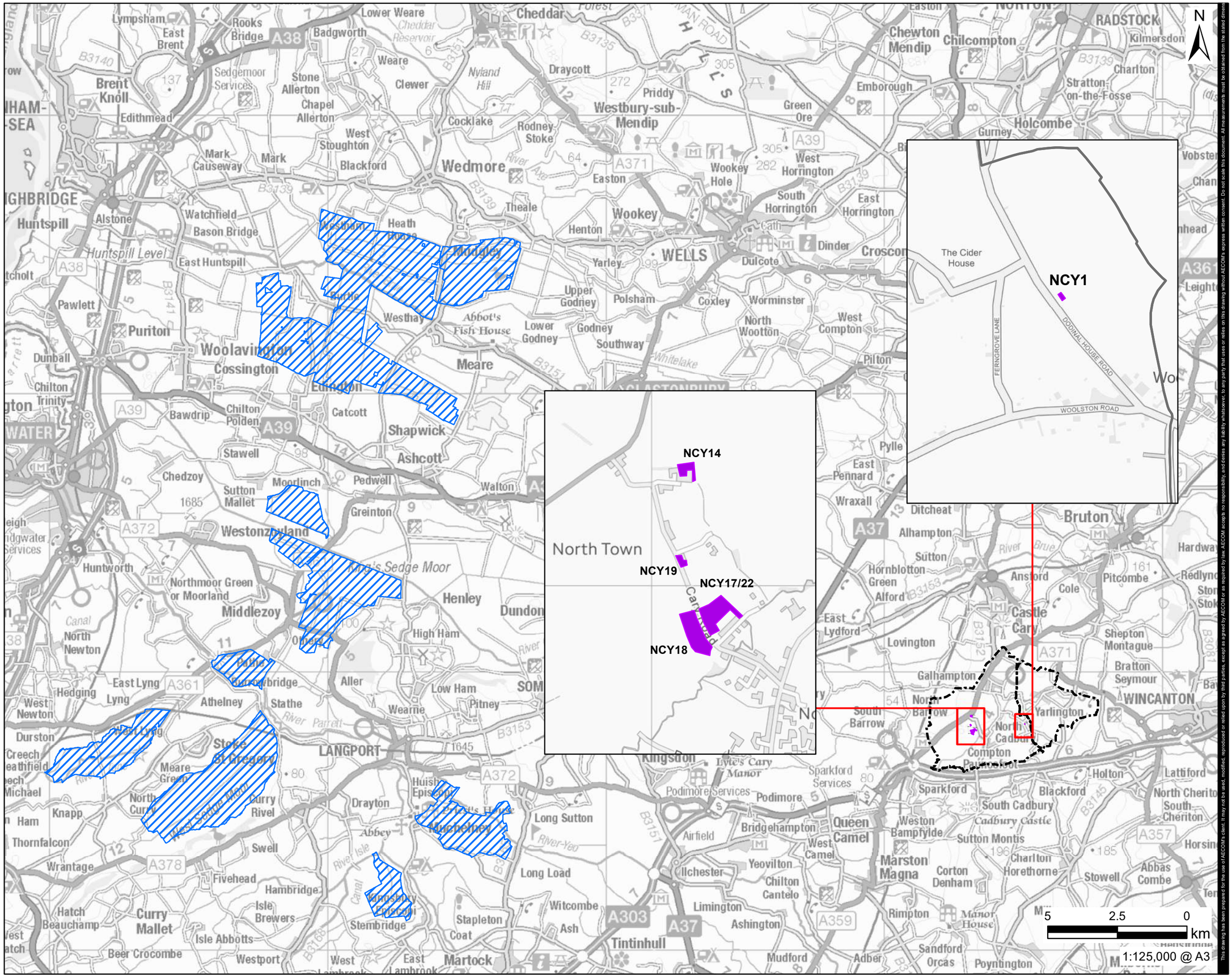
7.2 Five sites are allocated within the NCYNP for residential development, delivering up to 34 new dwellings. These will increase the total volume of treated wastewater effluent produced and surface run-off occurring within the NP area. Phosphorus neutrality calculations show that all five allocations are associated with a phosphorus surplus and will require mitigation measures. However, given that this is a NP, these interventions will need to be delivered as part of the wider nutrient-neutral strategic approach across South Somerset District.

7.3 However, until such a time that a district-wide Phosphate Management Strategy is developed and an adequate nutrient policy has been incorporated in the overarching South Somerset Local Plan, AECOM recommends that mitigation policy text is included in the NCYNP (for detailed wording see the previous chapter). This wording will ensure that the Conservation Objectives of the Somerset Levels & Moors Ramsar are met and that the NCYNP will not result in adverse effects on site integrity regarding water quality, both alone and in-combination.

Appendix A Map of European sites

Revision: Rev No. Drawn: AM Checked: NS Approved:DW Date: 31/08/2021

Filename: F:\General\GIS\01 - Jobs\#2021\210830_North Cadbury_Yarlington_HRA\02_Maps\Fig 1 Site location.mxd



AECOM

PROJECT

HABITATS REGULATIONS ASSESSMENT OF THE NORTH CADBURY & YARLINGTON NEIGHBOURHOOD PLAN

CLIENT

NORTH CADBURY & YARLINGTON PARISH COUNCILS

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LEGEND

Parishes
Ramsar - Somerset Levels & Moors
Site Allocations

NOTES

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EUROPEAN SITES RELEVANT TO THE NORTH CADBURY & YARLINGTON NEIGHBOURHOOD PLAN

SHEET NUMBER

Figure 1

Appendix B Nutrient Neutrality Technical Note

North Cadbury and Yarlington Neighbourhood Plan

Nutrient Budget and Mitigation Options: Technical Note

North Cadbury and Yarlington Parish Council

November 2021

Quality information

Prepared by	Checked by	Verified by	Approved by
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Revision History

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00	November 2021		JR	Dr James Riley	Technical Director

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1. Introduction and Scope

1.1 AECOM has been commissioned by North Cadbury and Yarlington Parish Council to undertake a Habitats Regulations Assessment (HRA) of the emerging North Cadbury and Yarlington Neighbourhood Plan (NP), which covers the vision for the parishes over the forthcoming planning period.

1.2 The NP covers an area of approximately 15km^2 in South Somerset District, which is predominantly of a rural character, although there are several settlements including North Cadbury (the largest village with approximately 210 households), Galhampton, Woolston and Yarlington. Census 2011 data[1] show that approximately 1,000 residents live in the two parishes. The area's main employment centre is the North Cadbury Business Park on the A359.

1.3 The NP area's rural character is dominated by agricultural and pastoral fields, set amidst broad ridges and steep scarps. The area also supports thick hedgerows, mature and veteran trees. Furthermore, the River Cam flows through the NP area and supports several priority habitats, including deciduous woodland, calcareous grassland and good quality semi-improved grassland.

1.4 A review of the NP indicates that the overall need for new housing in the two parishes over the planning period is modest, with the majority of dwellings to be delivered in North Cadbury. Of the 61 dwellings to be delivered in the NP area, 27 dwellings have existing planning consent and only 34 dwellings require HRA assessment.

Habitats Regulation Assessment

1.5 The HRA set out to assess potential impacts of NP policies on European sites potentially linked to the NP area. It identified that the sole site requiring further consideration is the Somerset Levels & Moors Ramsar (SLMR), due to existing high phosphorus loadings in ditches, putting the site at risk of eutrophication and threatening its Conservation Objectives.

1.6 Five sites are allocated within the NP for residential development, delivering up to 34 new dwellings. These will increase the total volume of treated wastewater effluent produced and surface run-off generated within the NP area. Phosphorus neutrality calculations undertaken to support the HRA show that all five site allocations are associated with a phosphorus surplus and will require mitigation measures. However, given that this is a NP, these interventions will need to be delivered as part of the wider nutrient-neutral strategic approach across South Somerset District.

1.7 Until such a time that a district-wide Phosphate Management Strategy is developed, and an adequate nutrient policy has been incorporated in the overarching South Somerset Local Plan, AECOM recommended within the HRA that mitigation policy text should be included in the NP as follows:

'Given the sensitivity of the Somerset Levels and Moors Ramsar to elevated phosphorus loading and resulting eutrophication, all residential developments contributing to the total wastewater burden in the NP area must demonstrate phosphorus neutrality. Developments with an identified phosphorus surplus, will be required to provide appropriate mitigation measures (e.g. wetlands, reedbeds) in agreement with the Local Planning Authority and Natural England. The requirement for mitigation will be commensurate with the scale of development and might be achieved strategically, particularly in the case of smaller developments.'

1.8 This would ensure that the conservation objectives of the SLMR are met and that the NP will not result in adverse effects on site integrity regarding water quality, both alone and in-combination.

1.9 North Cadbury and Yarlington Parish Council have subsequently requested further analysis into the deliverability of any such nutrient mitigation, in terms of land requirements and suitable sites

[1] Office for National Statistics, 2011 Census website. Available at SEPA Scotland's Environment (2021) Web Map (Online) Available online: https://map.environment.gov.scot/sewebmap/?layers=groundwaterClassification

for mitigation solutions such as a wetland. As such, this Technical Note uses the phosphate calculator developed for Somerset's four district councils[2] to determine the land requirements for mitigation of the additional 34 properties within the NP. An analysis of the available landholdings has also been undertaken using a Geographical Information Systems (GIS) approach to determine whether suitable locations for a wetland are available, and therefore what mitigation is deliverable.

[2] https://www.southsomerset.gov.uk/services/planning/somerset-levels-and-phosphates/

2. Introduction to Nutrient Neutrality

2.1 The concept of nutrient neutrality has been driven forward by the Dutch Nitrogen Case (DNC), which ruled that where a European site is failing to reach its Conservation Objectives, any potential additions to its nutrient load from new development must necessarily be limited. Natural England's view is that any developments adding phosphorus to freshwater sites will result in Likely Significant Effects and must be further investigated in an Appropriate Assessment.

2.2 The SLMR is designated for its internationally important flora and fauna, including rare and threatened invertebrate ditch communities (refer to the HRA for full details). Wetland ecosystems are critically important and provide valuable ecological services to people and wildlife. All Ramsar sites have high biodiversity and serve hydrological functions, such as flood protection. Phosphorus is the primary growth-limiting nutrient in freshwater systems, controlling the amount of primary production. For the SLMR, a high existing phosphorus loading has been documented and the site is at risk from eutrophication due to an increase in the abundance of algae (e.g. certain *Lemna* species) and duckweed, with concomitant issues such as excessive shading, oxygen depletion and fish death. Phosphorus pollution can derive from point-source as well as diffuse sources, such as Wastewater Treatment Works (WwTWs) and agricultural run-off.

2.3 Natural England (NE) have confirmed to South Somerset District Council (SSDC) and surrounding authorities that development that discharges to water courses connected to the Somerset Levels and Moors Ramsar site could adversely affect the site. This issue is covered on the South Somerset Council website[3] and is documented in correspondence from NE to South Somerset Council and other councils affected by the issue[4]. It is to be noted that the distance between the NP area and the closest component part of the Somerset Levels & Moors Ramsar (the Wet Moor SSSI) is beyond the typical distance for which water quality impacts are considered. However, a recent shift towards catchment-scale analysis means that such effects are now also considered for European sites with an identified problem with nutrient loading, if they are hydrologically connected to the area affected by development. The NP area lies within the catchment of the Ramsar, as identified on NE's most recently published map. For European sites at risk from eutrophication, NE requires a demonstration of nutrient neutrality. This means that any new development should not result in a net increase in nutrient input to said site.

2.4 The main pathway through which the NP is likely to contribute to phosphate loadings in the Ramsar is through an increase in the discharge of treated sewage effluent. Many of the ditches in the Ramsar are classified as having 'unfavourable' condition due to exceedance of 0.1mg/l total phosphorus set in the Common Standards Monitoring Guidance.

2.5 Achieving nutrient neutrality is now accepted as the preferred tool to mitigate adverse effects of residential development within the catchment of aquatic European sites. Royal Haskoning DHV developed a phosphorus neutrality calculator for Somerset West Taunton Council, which has now also been adopted by SSDC, the overarching Local Planning Authority for the NP area. This calculator is based on nutrient neutrality guidance documents developed by NE for the Solent region and the Stodmarsh SPA / Ramsar / SAC, and is endorsed by NE. The calculator relies on several assumptions that are based on the best available information and scientific literature, including:

- Average occupancy rates of different types of residential developments (e.g. flats, care homes, hotel rooms) as provided by Local Authority sources;
- Expected water usage of 110l per person per day as stipulated under the Building Regulations (2010);
- Phosphate run-off coefficients for general and farm-specific land use types (ranging from 0.02 kg/ha/yr in nature reserves to 3.15 kg/ha/yr from pig farms on impermeable soils; and
- Definitions of key land use types and their characteristics as provided by CORINE 2018.

[3] https://www.southsomerset.gov.uk/services/planning/somerset-levels-and-phosphates/
[4] https://www.southsomerset.gov.uk/media/3882/natural-england-advice-to-lpas-on-nutrients-in-the-somerset-levels-and-moors-catchment-170820.pdf

3. Nutrient Budget for the Allocated Sites

3.1 The North Cadbury and Yarlington NP allocates five residential sites, totalling 34 dwellings (refer to the HRA for full details). Three allocations are on existing brownfield development, including barns. Depending on the previous occupancy of these sites, these allocations may contribute little to no additional phosphorus loading to the Somerset Levels & Moors Ramsar catchment. Two residential site allocations (off Cary Road) encompass existing greenfield sites with no prior urban development. It is these sites that present the highest risk in terms of nutrient neutrality. Both sites are currently used for lowland grazing, a land use that contributes relatively little phosphorus compared to sources such as treated wastewater effluent and urban surface run-off.

3.2 The Phosphorus Budget Calculator for the Somerset Levels (v3.1) has been used to determine the nutrient budget for each individual allocation as well as the overall budget for each site combined. The results are shown in Table 1, and indicate a total TP budget of 21.63 kg/TP/yr.

Table 1: Nutrient neutrality (Total Phosphorus; TP) calculation for the allocations proposed in the NP, including Stage 1 (TP load from future wastewater)[5], Stage 2 (TP loss resulting from the conversion of current land uses)[6], Stage 3 (TP leachate from future land uses) and Stage 4 (overall phosphorus balance as a result of the individual allocation)[7].

General Parameters				Calculation Steps for Total Phosphorus			
Site Ref	Site Name	Existing land use	Site size (ha)	Stage 1 – TP from future wastewater due to population increase (kg TP yr)	Stage 2 – Phosphorus loss from current land use (kg TP / ha / yr)	Stage 3 – Phosphorus leachate from future land use (kg TP / ha /yr)	Stage 4 – Total Phosphorus Budget for the Development Site (kg TP / yr)
NCY18	Cary Road West, Brookhampton	Lowland grazing	1.7	6.75	0.37	1.41	**9.34**
NCY17/22	Cary Road East, Brookhampton	Lowland grazing	1	6.75	0.22	0.83	**8.83**
NCY19	Barns at Hill Farm	Brownfield development	0.1	0.96	0.08	0.08	**1.16**
NCY14	North Town Farm Barns	Brownfield development	0.2	1.45	0.17	0.17	**1.73**
NCY1	Stoke Lane Barn	Brownfield development	0.1	0.48	0.08	0.08	**0.58**
Total	**NP Allocated Sites**	**Lowland Grazing /Brownfield**	**3.1**	**16.38**	**0.93**	**2.57**	**21.63**

[5] The calculations for Stage 1 have used a phosphorus discharge limit for North Cadbury WwTW of 5mg/l, which is determined through the selection of the North Cadbury treatment works drop down selection embedded within the Phosphorus Budegt Calculator for the Somerset Levels (v3.1).
[6] Brownfield development has been represented by an 'urban' land use in the calculator.
[7] It is to be noted that the overall phosphorus balance includes a 20% precautionary buffer to account for the uncertainty associated with the current state of evidence and catchment modelling.

3.3 Annex 1 presents screenshots from the Phosphorus Budget Calculator v3.1 for the overall site.

3.4 The results presented in Table 1 show that all site allocations are associated with a phosphorus surplus. The residential development on these sites will increase the in-combination phosphorus loading in the Somerset Levels & Moors Ramsar catchment. Therefore, mitigation measures will need to be deployed to avoid adverse effects on site integrity in relation to water quality issues and eutrophication. As mentioned above, this is primarily due to the much lower runoff coefficient associated with agricultural uses (e.g. lowland grazing – 0.12 kg/ha/yr[8]) compared to runoff from urban development (0.83 kg/ha/yr[9]). Furthermore, the phosphorus in treated sewage effluent will also represent a net increase compared to greenfield land use types that do not generate any wastewater flow to Wastewater Treatment Works.

3.5 The exact layout of any of the sites coming forward under the North Cadbury and Yarlington NP is yet to be determined. Given the relatively small number of dwellings allocated in the NP, none of the sites will deliver large amounts of greenspaces. However, any on-site greenspaces (however small) will reduce the volume of phosphate leachate associated with the North Cadbury and Yarlington NP (open spaces and greenspaces have a runoff coefficient of 0.14 kg/ha/yr[10]). AECOM recommends that the area of greenspace / gardens / allotments within allocation boundaries should be maximised to help reduce nutrient run-off from impermeable urban surfaces. The precise site layout will be considered in planning application HRAs when phosphorus budgets will need to be recalculated, as at this stage the sites are assumed to be fully urbanised.

3.6 Additional treated sewage effluent due to a growing population is the main driver of the predicted increase in phosphorus loading. Many WwTWs have consented phosphate permit limits, which are determined taking the Conservation Objectives of European sites and the available infrastructure / technology into account. This infrastructure is continually improved under Asset Management Plans (AMPs). However, the management of strategic resources, including water treatment infrastructure, and AMPs does not lie within the remit of parish councils. Rather it is pursued by water companies in dialogue with Local Planning Authorities, the Environment Agency and Natural England. Although upgrading the technology of South Somerset's WwTWs (e.g. by integrating lower phosphorus permits) is likely to be an expensive undertaking, it also means that any residual phosphorus surplus will be more easily mitigated using a package of interventions. Where upgrades come forward the benefit of this should not simply be taken up by new development, but further measures to reduce phosphorus loadings across the catchment should be sought.

3.7 Phosphorus mitigation can be achieved through a combination of the following measures:

- Securing an agreement with wastewater treatment companies (in this case Wessex Water) to ensure that phosphorus removal efficiency is improved (note that this already under way with permit limits being significantly reduced at WwTWs across South Somerset District in the AMP7 period);
- Developing solutions that remove phosphorus directly at the development site or downstream from the WwTW (e.g. wetlands);
- Since wetlands are able to remove phosphorus, an offsetting solution being explored elsewhere is to deliver new wetlands, not to treat effluent from development, but to remove an equivalent amount of P from agricultural runoff that would otherwise enter the catchment. It should be noted that wetlands are generally only considered to be about 50% efficient at removing phosphates[11];
- Acquiring parcels of agricultural land elsewhere and change land use in perpetuity towards natural habitat types (e.g. woodland, saltmarsh, grassland); and

[8] White P.J. & Hammond J.P. (2006). Updating the estimates of phosphorus in UK Waters. Defra funded project WT0701CSF.
[9] Wessex Water. (2019). Phosphorus removal: Cost assessment C3. Wessex Water Services Ltd Response to Ofwat's PR19 Draft Determination.
[10] Natural England. (2020). Advice on nutrient neutrality for new development in the Stour catchment in relation to Stodmarsh Designated Sites – For Local Planning Authorities. Version 3.
[11] Land et al (2016). How effective are created or restored freshwater wetlands for nitrogen and phosphorus removal? A systematic review. Environmental Evidence 5:9

- Increasing the proportion of greenspaces within allocated sites (where land use is not already ‘green’) to help reduce phosphorus leachate.

4. Mitigation Considerations

Indicative Land Requirements for Mitigation

4.1 The Phosphorus Budget Calculator for the Somerset Levels (v3.1) provides a tool for determining how much land would be required on- or off-site to achieve nutrient neutrality for a development using different mitigation approaches.

4.2 Table 2 indicates the land requirements derived from the calculator for several different single mitigation options, based on the calculated nutrient budget. Screenshots indicating how these values were derived are provided in Table 2.

4.3 Please note that a 'general arable' land use category was used for the existing off-site land use in this indicative analysis. This appears to provide a slightly more conservative response when using the calculator than options such as 'cereals' or cropping'. As such, it was used as a worst case.

Table 2: Indicative Land Requirements for Mitigation Land Uses

Mitigation Scenario	Land Requirement (h)
Constructed Wetland	2.527
Open Space / Greenfield	51.516
Nature Reserve	40.066
Woodland	40.066
Heathland / Bog	40.066
Meadow / Semi-natural Grassland	60.104

4.4 The most efficient approach (in terms of requiring the smallest area of land to achieve phosphorus neutrality) would be use a wetland of a minimum size of around 2.53 ha. Other options have far greater land requirements, ranging from 40.07 ha for a woodland or nature reserve, up to 60.1 ha for meadow or semi-natural grassland. These options are unlikely to be feasible for a total development of 34 dwellings in the NP.

4.5 There is potential to combine land uses used for mitigation, and so Table 3 indicates three possible scenarios for combined mitigation scenarios.

Table 3: Indicative Land Requirements for Mitigation Land Uses (multiple mitigation)

Mitigation Scenario	Land Requirement (hectares)
Scenario 1: Wetland & Open space (SANG)	Wetland 2.43 ha; SANG 2.0 ha
Scenario 2: Wetland & Woodland	Wetland 2.405 ha; Woodland 2.0 ha
Scenario 3: Wetland & Nature Reserve / Heathland	Wetland 2.405 ha; Nature Reserve / Heathland 2.0 ha

4.6 A value of 2 ha of open space and woodland has been used in this analysis as it is considered a realistic example of potential space availability within the land holdings at North Cadbury. It is clear that even 2 ha of woodland or nature reserve would fail to appreciably reduce the size of the required wetland (i.e. approximately 2.4 ha wetland in combination with other mitigation, as opposed to approximately 2.5 ha when used in isolation).

Natural England Guidance for Mitigation

4.7 In other parts of the country experiencing nutrient neutrality issues, Natural England have issued guidance regarding mitigation design, and this will need to be taken into consideration when deciding on any future approach at North Cadbury as it is expected to apply on a national basis. An example is within the Stour Catchment in Kent where there are nutrient impacts to the Stodmarsh designated sites. Here, Natural England have provided guidance within the following documents:

- Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites - For Local Planning Authorities (latest version November 2020); and
- Advice letter to Planners in Stodmarsh (June 2021).

4.8 A summary of the key advice with regards to wetlands, woodlands and open space is provided below.

Wetland Advice

4.9 Wetlands are efficient at removing phosphorus from water that passes through them if appropriately designed and maintained and can be used as part of a sustainable drainage system (SuDS) treating runoff, or flow from existing streams or rivers can be directed through a wetland to remove nutrients. They offer additional biodiversity and potentially flood risk benefits.

4.10 The Natural England advice within the Stour Catchment indicates that the effectiveness of any wetland to remove nitrogen and phosphorus from its receiving water is highly dependent on the specific design and maintenance.

4.11 For wetlands to demonstrate the required level of certainty to be considered appropriate mitigation, Natural England advise that they need to demonstrate the following:

- Be at least 2 ha in size as inconsistencies in nutrient removal are uncertain in wetlands smaller than 2 ha;
- Have a permanent input of water;
- Have a detailed design of the proposed wetland;
- Show wetland specific N and P removal rate calculations (taking account of approximate hydraulic loading, inlet N & P loading, temperature, wetland area and temporal variation in flow rates and or water levels); and
- Demonstrate that monitoring and maintenance of proposed wetlands will be suitably secured for the lifetime of the development.

4.12 In the case of North Cadbury, the indicative wetland size is somewhat bigger than the 2 ha minimum at 2.5 ha. However, as indicated above, further detailed design and site-specific calculations would be required at the appropriate time to ensure that any wetland is appropriately sized and designed in order to achieve neutrality. The sizing should be considered indicative at this stage as it is based on a series of assumptions embedded into the phosphorus calculator.

Woodland Planting Advice

4.13 Natural England guidance indicates that woodland planting required to be considered a land use change is 20% canopy cover at maturity. This is approximately 100 trees per hectares. Native broadleaf species of local provenance should be used, to increase biodiversity benefits while lowering the risk of non-native species and disease spread.

4.14 It should also be noted that as the woodland matures it will require a felling license and woodland removal would be covered by the EIA regulations where woodland is planted as mitigation for internationally designated sites.

4.15 For the first decade, management requirements for a woodland would include plug fencing and maintenance until the canopy is at browsing height, and thereafter some thinning to allow trees to mature.

4.16 Once established, woodlands could be used for wood fuel production or coppice timber production.

Open Space

4.17 Where open space is used as mitigation there is a requirement for appropriate management to ensure that there are no additional inputs of nutrients or fertilisers onto the land for the duration of the development. Planning conditions are likely to be required for any such land to ensure that it does not revert back to an agricultural use, or any other change of use that may impact nutrient leaching potential. These sites will also need long term management to ensure the provision of dog bins and that these are regularly emptied.

4.18 Natural England also note in the Stour catchment guidance that small areas of open space within the urban fabric such as gardens, road verges and small amenity areas should not be used as an open space category, and such areas should be considered 'urban'.

Other Considerations

4.19 Natural England recognises that nutrient neutrality is difficult to achieve for small developments, both for financial and logistical reasons. Therefore, the primary burden of developing strategic mitigation solutions is placed on Local Planning Authorities.

4.20 SSDC and its partners are developing a strategic mitigation solution in the form of a Phosphate Management Strategy. A definitive map of the Ramsar Site catchment and its sub-catchments has been developed as part of this work. The draft Strategy is scheduled to be completed in 2021. The key aims of the strategy are to:

- Review the geographical extent of the area at risk (in relation to surface water catchments and catchments for WwTWs);
- Review types of development that contribute to increased phosphorus loadings, and review the phosphorus calculator accordingly;
- Develop a strategy – based at sub-catchment area level;
- Develop a nutrient policy to embed within Local Plans – such as the emerging Local Plan Review; and
- Produce a Supplementary Planning Document (SPD) that will develop and agree the method and tariffs for administering, implementing, managing and monitoring strategic mitigation schemes put in place to achieve phosphorus neutrality.

4.21 Therefore, any mitigation solutions proposed by applicants for addressing phosphorus neutrality must therefore be in line with the emerging Phosphate Management Strategy.

5. Identification of Potential Areas for Mitigation

5.1 Land parcels that might be available for providing space for off-site mitigation in close proximity to the NP allocation sites have been provided by North Cadbury and Yarlington Parish Council and are indicated in Plate 1.

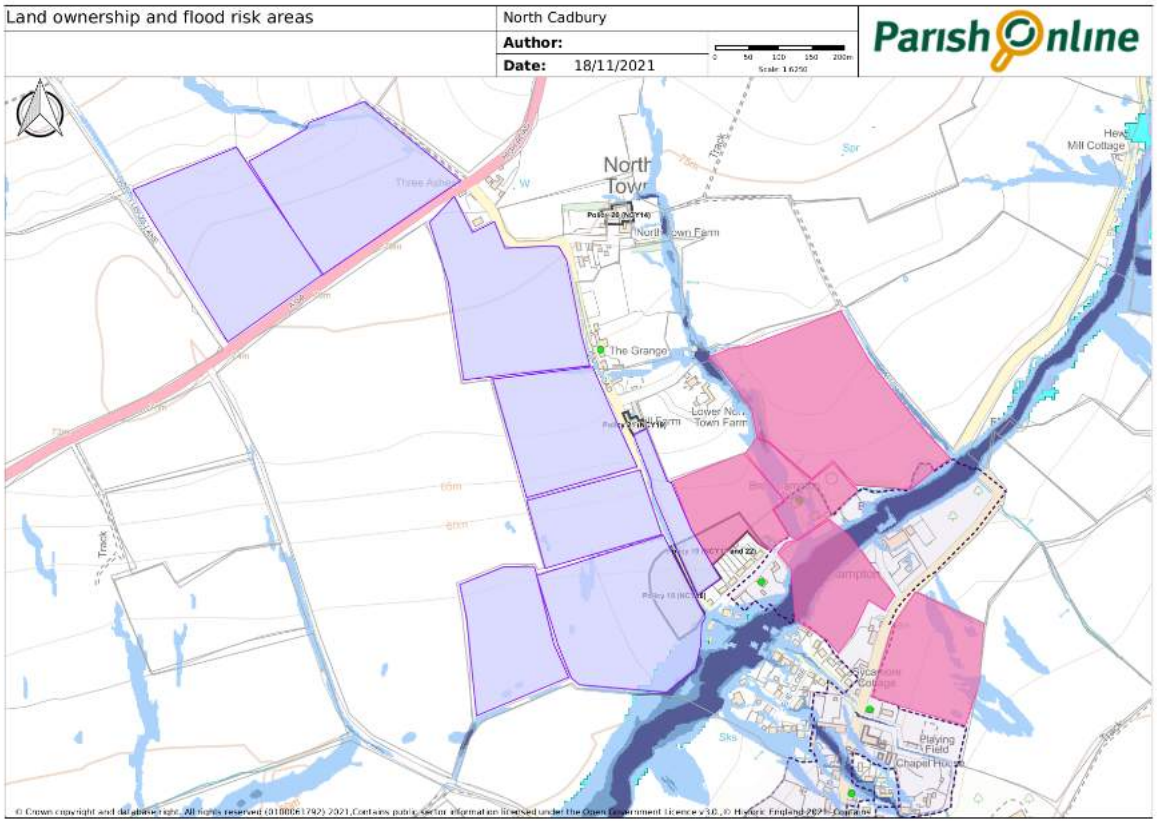


Plate 1. Potential land parcels available for mitigation (purple and pink parcels)

5.2 A GIS based analysis has been undertaken to better understand the suitability of the available land for a wetland. This analysis was performed using a watershed delineation approach in QGIS software. The site topography was derived from the publicly available DEFRA LiDAR Digital Terrain Model. The topographic data was used to determine flow direction (via the GIS-based algorithm D-8[12]) for runoff across the site, and this in turn was used to derive dominant flow pathways. A series of figures have been produced and are included in Annex 3. These figures are as follows:

- Figure 1 – Site Topography;
- Figure 2 – Site Flow Direction;
- Figure 3 – Site Flow Pathways; and
- Figure 4 – Potential Wetland Areas.

5.3 Figure 1 (Site Topography) indicates that the topography surrounding the village of North Cadbury is dominated by the river valley around the River Cam. The river is at approximately 53 m Above

[12] Garbrecht, J. and L. W. Martz, (1997), "The Assignment of Drainage Direction Over Flat Surfaces in Raster Digital Elevation Models", Journal of Hydrology, 193: 204-213.

Ordnance Datum (AOD) near Brookhampton Farm, and rises to around 80 m AOD towards the north of the potential land holdings around Three Ashes, and also rises gently towards the south.

5.4 The flow directions derived in Figure 2 largely follow the orientation of the valley sides as would be expected, with flow north of the river generally being south / southeast towards the River Cam, and that south of the river generally being north / northwest towards the river.

5.5 A permanent input of water is required by Natural England guidance for wetlands used for mitigating nutrients. Figure 3 shows where the dominant flow pathways are located based on the flow directions, and this is where the most reliable water sources will be located within the available land parcels. The main pathway shown in the land ownership parcels is a flow route from North Town Farm flowing generally south along field boundaries through Lower North Town Farm and into the River Cam. The land holdings further west and north do not appear to have a suitable water supply to provide an appropriate input to a wetland.

5.6 Construction of a wetland in close vicinity to the flow pathway south of North Town Farm is considered preferable given that there should be a supply of water. Further hydrological analysis would be required to determine the level of flow that might be available and how sustained this may be throughout the year. At this stage it is not known to what extent groundwater levels might provide additional support to wetland water levels, and this would need to be determined through ground investigation of the site. A centralised location around the watercourse, north of the River Cam would be an ideal location for a wetland, but land availability is restricted by the Brook Cottage (and associated garden) land parcel (see Brookhampton House parcel on Plate 1), which is understood to be unavailable for a wetland. However, a supply of water from the dominant flow pathway could be used to supply a wetland immediately to the east, in the field associated with Lower North Town Farm, and which extends south to the River Cam. This land parcel is indicated as area ID1 within a yellow dashed line in Figure 4: Potential Wetland Areas.

5.7 The Potential Wetland Area ID 1 is a total area of 5.6 ha and therefore is more than sufficient in size to meet the indicative wetland size of 2.53 ha outlined in Section 4. The maximum altitude of this arable field is 68.4 m above ordnance datum (AOD), decreasing to 51.4m at the River Cam. The mean slope is 4.6º. However, there may be other constraints or factors to consider when determining the location of new wetlands.

5.8 The fluvial flood risk status of the area around North Cadbury is shown in Plate 2.

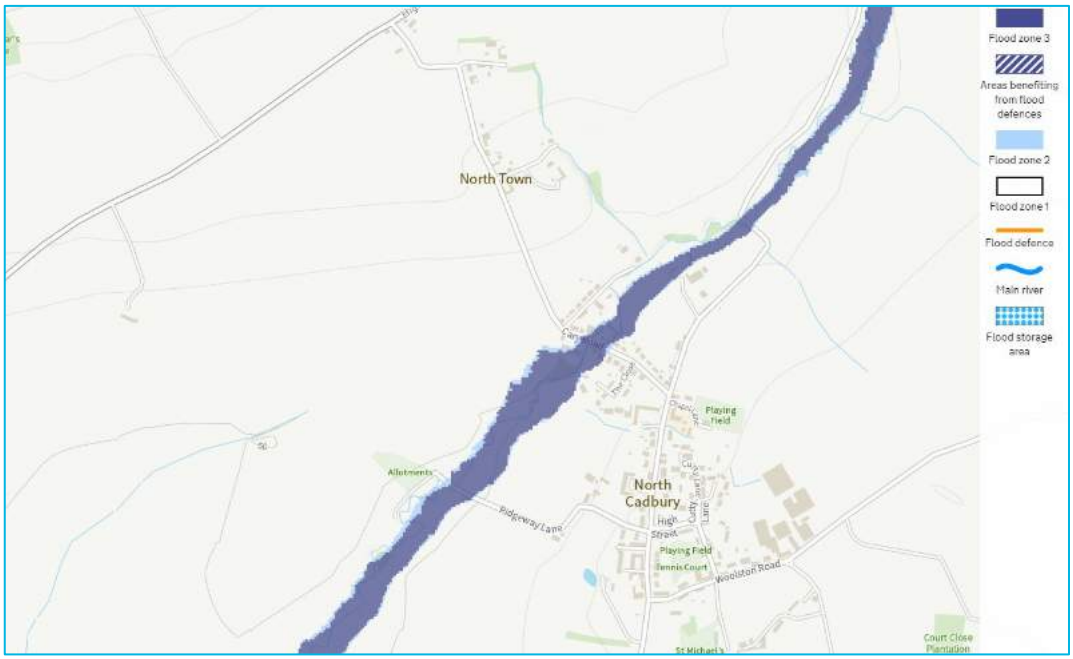


Plate 2. Fluvial flood risk around the River Cam, North Cadbury (Source: Environment Agency Flood Risk Map for Planning, https://flood-map-for-planning.service.gov.uk/)

5.9 The Potential Wetland Area ID 1 (see Figure 4) is wholly within Flood Zone 1, which is land assessed as having a less than 1 in 1,000 annual probability of river flooding. This is considered

low risk. The majority of higher flood risk in North Cadbury (shown in darker blue in Plate 2 as Flood Zone 2 and 3) is associated with the riparian corridor around the River Cam. An appropriately designed wetland of significant size, as is proposed here, has potential to delay delivery of water to the River Cam during heavy rainfall events by routing it from the dominant flow pathway and into the wetland, which will allow for storage of water. This may have secondary benefits in reducing downstream flood risk, and is an additional potential benefit of this form of mitigation. Further hydraulic modelling would be required to understand the extent of this benefit, once a wetland has been designed.

5.10 The surface water flood risk status of the area around North Cadbury is shown in Plate 3.

Plate 3. Surface water flood risk extents around the River Cam, North Cadbury (Source: Environment Agency Long Term Risk Map, https://check-long-term-flood-risk.service.gov.uk/map)

5.11 The surface wager flood risk mapping in Plate 3 indicates that the Potential Wetland Area ID 1 is largely at very low risk of surface water flood risk (chance of flooding of less than 0.1%). However, there are some low to higher risk areas (low risk is 0.1-1% annual chance of flooding, medium risk is 1-3% annual chance, and high risk is greater than 3% annual chance) for surface water flooding associated with the flow pathway to the River Cam to the west of the land parcel, and at the field boundary at the eastern extent of the parcel. Again, the wetland could help manage surface water runoff, and potentially reduce risk to the properties around Brookhampton, with appropriate design and storage provided.

5.12 A further area in Figure 4 was identified as a potential wetland location and is shown by an orange dashed line (Potential Wetland Area ID 2). If needed, and subject to agreement with the Environment Agency, it may be possible to abstract water from the River Cam from the upstream extent of this parcel and return it to the river at the downstream extent of the parcel via a new wetland. As such, there would be a suitable, permanent water supply to sustain a new wetland, and there may also be the added benefit of directly removing phosphorus from the river flow. However, this parcel is approximately 2 ha in size, and would not deliver the required 2.53 ha size (as derived from the phosphorus calculator) to achieve neutrality. As above there may also be other constraints or factors to consider (e.g. proximity to existing houses) when determining the location of a wetland, and discussions with local residents would be important. It would be possible to use this area for other types of mitigation, such as a new woodland area or open space, in combination with a larger wetland (such as a wetland located in Potential Wetland Area ID 1). Table 3 gives indicative size requirements for the wetland should 2 ha of woodland be planted, or 2 ha of open space delivered. However, the Potential Wetland Area ID2 is also partially

within Flood 3, and so the appropriateness of any change in use would need careful consideration in this context.

5.13 It is noted that the North Cadbury WwTW is located shortly downstream of the village along the River Cam. Natural England note that directing discharges from a WwTW through a wetland would be potential off-site mitigation solution. However, it appears that the WwTW is located directly adjacent to the River Cam, alongside an area of woodland. Space for a suitably sized wetland would appear to be very limited and would require woodland removal at this location. As such, at the current time the location of potential wetland area ID 1 is recommended as the preferred site.

5.14 The CIRIA C753 (2016) SuDS Manual 2nd Edition[13] provides design considerations for wetlands and the following general points are worth noting should this mitigation solution be progressed:

- Flow should gradually spread out in the wetland, avoiding creation of dead zones caused by corners. Baffles, suitable shaping and islands through the wetland can increase the flow path length and maximise water quality treatment effectiveness;
- Inlets and outlets should be positioned to maximise the flow path through the wetland; The ratio of flow path length to width should be at least 3:1 to avoid hydraulic short-circuiting, and preferably 4:1 or 5:1.
- A balance is required between deep and shallow pools. The maximum depth of a permanent pool should not exceed 2m to avoid stratification and anoxic conditions and should normally be a maximum of 1.2m. Keeping the permanent pool shallow enables oxygen to penetrate through the water column and is preferable for more diverse macrophyte growth, however, there needs to be a balance as overly shallow wetlands may be at risk of algal blooms or high biological activity in the summer or may dry out in drier summer months. Some areas of 0.6-1m depth should therefore be included.
- If wetlands re to be used for additional flow attenuation as well as treatment, then depth of temporary storage over the permanent water level should be such that the risk of plant damage is low.
- Safety benches and maintenance access routes should be provided at an appropriate level above the permanent wetland. The SuDS Manual recommends a safety bench of 3.5 m, with a slop of less than 1 in 15, although this will depend on the specifics of the site.

[13] https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

6. Conclusions

6.1 North Cadbury and Yarlington Parish Council commissioned AECOM to undertake an initial analysis into the deliverability of nutrient mitigation for the North Cadbury and Yarlington NP site allocations, in terms of land requirements and suitable sites for mitigation solutions such as a wetland.

6.2 To address this, the phosphate calculator developed for Somerset's four district councils has been applied to the NP site allocations to determine the land requirements for mitigation of the additional 34 properties. An analysis of the available landholdings has also been undertaken using GIS to determine whether suitable locations for a wetland are available, and therefore that mitigation is deliverable.

6.3 The nutrient calculator indicates that the NP site allocations have a positive phosphorus budget prior to mitigation of 21.63 kg/TP/yr. To mitigate this would require a wetland of around 2.53 ha in area. This is considered the most reasonable approach to mitigation given that the land requirements for other approaches would be significantly greater and thus they are more likely to be unfeasible (for example, a 40 ha woodland, or 52 ha of open space). It should be noted that this wetland sizing is based on it being located on land that is currently used for general arable agriculture. Sizing will change slightly should land of differing use be identified on which to build the wetland.

6.4 Topographical and watershed analysis of available land holdings has indicated that the main flow pathway aside from the River Cam is to the south of North Town Farm. Flow from this location could potentially be used to support a wetland in the land parcel at Lower North Town Farm (shown in yellow as Potential Wetland Area ID1 in Figure 4) to the north of the River Cam. There is sufficient space in this location (>5 ha) to provide an off-site wetland of sufficient size to fully mitigate the increase in nutrients from the NP site allocation.

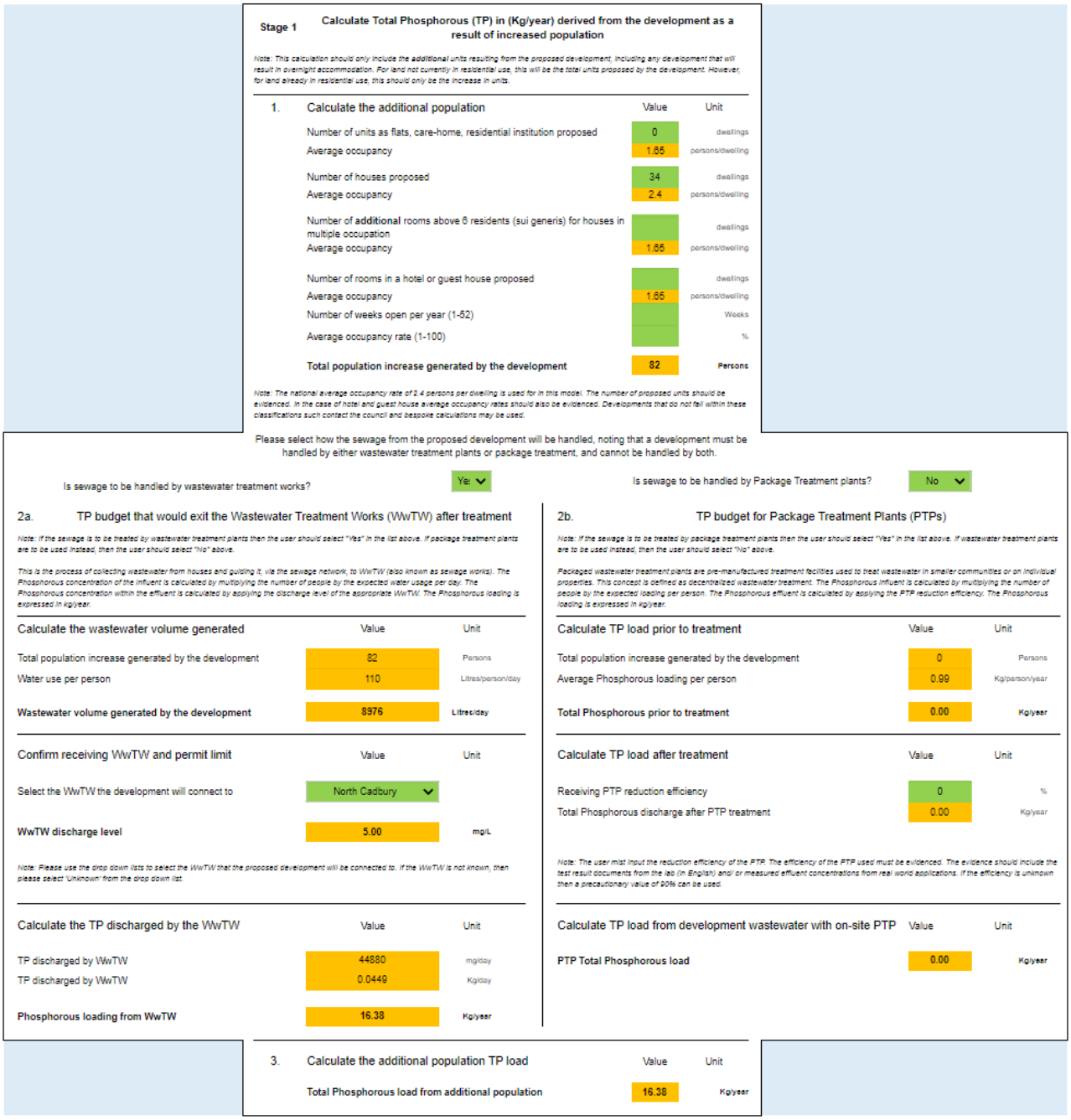
6.5 It should be noted that the nutrient calculations presented here (including mitigation sizing) is based on assumptions embedded in the Somerset Levels Phosphorus Calculator, including a default wetland treatment efficiency of 8 kg/ha/yr. In order to meet Natural England's requirements regarding certainty that the mitigation would be effective, it would be necessary to undertake further detailed design of the wetland, calculate a site-specific treatment efficiency and nutrient budget, and provide certainty over future monitoring and maintenance of the mitigation in perpetuity.

6.6 **It should be noted that the purpose of this technical note is to illustrate that there is sufficient land available in suitable locations to serve as mitigation for the allocations in the Neighbourhood Plan, should updated calculations at the planning application stage confirm mitigation is required. They do not prejudge the actual solution that may ultimately be decided for each and every planning application as this is a matter for each developer and other solutions may be available or preferable.**

Annex 1 Phosphorus Calculator Screenshots

The following screenshots indicate how the Total Phosphorus budget for the combined allocated sites were derived using the Somerset Levels Phosphorus Calculator v 3.1.

Stage 1: Total Phosphorus derived from the development as a result of increased population



Stage 1 — Calculate Total Phosphorous (TP) in (Kg/year) derived from the development as a result of increased population

Note: This calculation should only include the additional units resulting from the proposed development, including any development that will result in overnight accommodation. For land not currently in residential use, this will be the total units proposed by the development. However, for land already in residential use, this should only be the increase in units.

1. Calculate the additional population	Value	Unit
Number of units as flats, care-home, residential institution proposed	0	dwellings
Average occupancy	1.65	persons/dwelling
Number of houses proposed	34	dwellings
Average occupancy	2.4	persons/dwelling
Number of **additional** rooms above 6 residents (sui generis) for houses in multiple occupation		dwellings
Average occupancy	1.65	persons/dwelling
Number of rooms in a hotel or guest house proposed		dwellings
Average occupancy	1.65	persons/dwelling
Number of weeks open per year (1-52)		Weeks
Average occupancy rate (1-100)		%
Total population increase generated by the development	82	Persons

Note: The national average occupancy rate of 2.4 persons per dwelling is used for in this model. The number of proposed units should be evidenced. In the case of hotel and guest house average occupancy rates should also be evidenced. Developments that do not fall within these classifications such contact the council and bespoke calculations may be used.

Please select how the sewage from the proposed development will be handled, noting that a development must be handled by either wastewater treatment plants or package treatment, and cannot be handled by both.

Is sewage to be handled by wastewater treatment works? Yes

Is sewage to be handled by Package Treatment plants? No

2a. TP budget that would exit the Wastewater Treatment Works (WwTW) after treatment

Note: If the sewage is to be treated by wastewater treatment plants then the user should select "Yes" in the list above. If package treatment plants are to be used instead, then the user should select "No" above.

This is the process of collecting wastewater from houses and guiding it, via the sewage network, to WwTW (also known as sewage works). The Phosphorous concentration of the influent is calculated by multiplying the number of people by the expected water usage per day. The Phosphorous concentration within the effluent is calculated by applying the discharge level of the appropriate WwTW. The Phosphorous loading is expressed in kg/year.

Calculate the wastewater volume generated	Value	Unit
Total population increase generated by the development	82	Persons
Water use per person	110	Litres/person/day
Wastewater volume generated by the development	8976	**Litres/day**

Confirm receiving WwTW and permit limit	Value	Unit
Select the WwTW the development will connect to	North Cadbury	
WwTW discharge level	5.00	**mg/L**

Note: Please use the drop down lists to select the WwTW that the proposed development will be connected to. If the WwTW is not known, then please select 'Unknown' from the drop down list.

Calculate the TP discharged by the WwTW	Value	Unit
TP discharged by WwTW	44880	mg/day
TP discharged by WwTW	0.0449	Kg/day
Phosphorous loading from WwTW	16.38	**Kg/year**

2b. TP budget for Package Treatment Plants (PTPs)

Note: If the sewage is to be treated by package treatment plants then the user should select "Yes" in the list above. If wastewater treatment plants are to be used instead, then the user should select "No" above.

Packaged wastewater treatment plants are pre-manufactured treatment facilities used to treat wastewater in smaller communities or on individual properties. This concept is defined as decentralized wastewater treatment. The Phosphorous influent is calculated by multiplying the number of people by the expected loading per person. The Phosphorous effluent is calculated by applying the PTP reduction efficiency. The Phosphorous loading is expressed in kg/year.

Calculate TP load prior to treatment	Value	Unit
Total population increase generated by the development	0	Persons
Average Phosphorous loading per person	0.99	Kg/person/year
Total Phosphorous prior to treatment	0.00	**Kg/year**

Calculate TP load after treatment	Value	Unit
Receiving PTP reduction efficiency	0	%
Total Phosphorous discharge after PTP treatment	0.00	Kg/year

Note: The user must input the reduction efficiency of the PTP. The efficiency of the PTP used must be evidenced. The evidence should include the test result documents from the lab (in English) and/ or measured effluent concentrations from real world applications. If the efficiency is unknown then a precautionary value of 20% can be used.

Calculate TP load from development wastewater with on-site PTP	Value	Unit
PTP Total Phosphorous load	0.00	**Kg/year**

3. Calculate the additional population TP load	Value	Unit
Total Phosphorous load from additional population	16.38	**Kg/year**

Stage 2: Existing TP from current land use

Stage 2 Calculate existing (pre-development) TP from current land use of the development

Note: Where development sites include existing areas that are to be retained, these areas can be excluded from the calculations in both Stages 2 and 3.

1. Total area of development site	Value	Unit
Enter the total area of the development site	3.100	Hectares

2. Identify current land uses of the development site	Value	Unit
Identify the drainage type of the soil on site		
Is the soil type free draining?	No	

Note: Identify the soil drainage type from the Viewer, and use the criteria table in the Help tab to identify if the soil is either permeable or impermeable

Urban development	0.400	Hectares
Mineral workings and quarries		Hectares
Open space / Greenfield		Hectares
Allotments and city farms		Hectares
Sports and leisure facilities		Hectares
Transport tracks and ways		Hectares
Transport terminals		Hectares
Cereals		Hectares
Dairy		Hectares
Cropping		Hectares
Horticulture		Hectares
Pig Farming		Hectares
Lowland Grazing / paddock	2.700	Hectares
Mixed livestock		Hectares
Poultry Farming		Hectares
General Arable		Hectares
Improved grass		Hectares
Unimproved grass		Hectares
Woodland (e.g. conifer, mixed, broad-leaved)		Hectares
shrub / heathland / bracken / bog		Hectares
freshwater marsh		Hectares
Meadow / semi natural grassland		Hectares
Sum total of land uses	3.100	Hectares

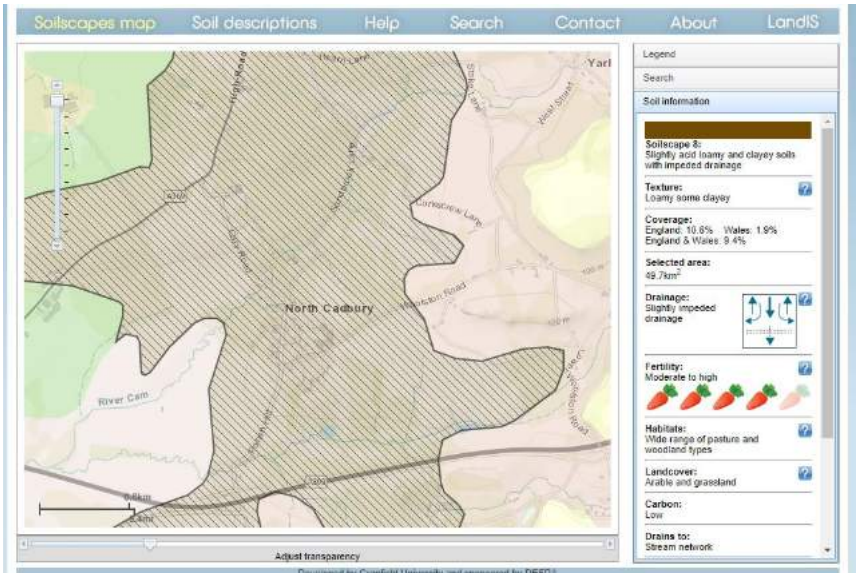
Note: The sum total of land uses must equal the development site area - the box will colour red if the areas do not match.

3. Calculate TP from current land usage	Value	Unit
TP load from current land usage	0.93	Kg/year

Note that Stage 2 requires the user to select whether the site is freely draining. The calculator guidance suggests using Cranfield University's Soilscapes website[14] for this purpose. This indicates that the entire site is underlain by 'slightly acid loamy and clayey soils with impeded drainage'. The guidance indicates that this should not be considered 'freely draining'.

A screenshot from the Soilscapes website is provided below to evidence this selection:

[14] http://www.landis.org.uk/soilscapes/



Stage 3: Proposed TP from future land use

Stage 3 **Calculate TP for the proposed development**

Note: This section should include all land uses within the proposed development. Where the proposed scheme is to create new wetlands, woodlands, nature reserves, etc. within the development site area, then this should be included within this section. Any offsite mitigation, proposed by either the developer or the Council should not be included below, and should instead be inputted in Stage 5 (if mitigation is required).

		Value	Unit
1.	Total area of development site		
	Total area of the development site	3.100	**Hectares**
2.	Identify proposed land uses of the development site	Value	Unit
	Urban development	3.100	Hectares
	Open Space / Greenfield		Hectares
	Woodland		Hectares
	Nature reserve		Hectares
	Heathland / Bog		Hectares
	Allotment		Hectares
	Meadow/semi-natural grassland		Hectares
	Sports and Leisure facilities		Hectares

Note: The sum total of land uses must equal the development site area inputted in stage 1 - the box will colour red if the areas do not match. Wetland refers to specific wetland off a watercourse - for more information refer to the land use definitions in the help tab.

3.	Designed Wetlands / SuDS		
	Wetland / SuDS area	0	Hectares
	Banking coefficient		Kg/ha/year

Note: Please input the banking coefficient calculated for the designed wetland / SuDS. The calculated value should be justifiable.

	Sum total of land uses	3.100	**Hectares**
4.	Calculate TP from proposed land usage	Value	Unit
	TP load from proposed land usage	2.57	**Kg/year**
5.	Calculation of gross P loading	Value	Unit
	Gross TP load from current and proposed land usage	18.03	**Kg/year**

Note: this step is for illustrative purposes when iteratively creating mitigation land on-site

Stage 4: TP Budget (pre-mitigation)

Stage 4 — **Calculate the net change in Phosphorous load from the proposed development**

Note: This stage calculates the net change in total phosphorous load to the catchment from the proposed development. This is derived by calculating the difference between the total phosphorous load calculated for the proposed development (wastewater, urban area, open space etc.) and that for the existing land uses. The phosphorous budget for the site has been calculated under current and AMP7 WwTW permit levels.

		Current	AMP7		Summary	
					No. of dwellings	34
1.	Identify the Phosphorous load from additional population	Value	Value	Unit	WwTW location	North Cadbury
					Current permit limit	5
	Phosphorous loading from additional population	16.38	16.38	Kg/year	AMP7 permit limit	5
2.	Calculate net change in Phosphorous load from land use change	Value	Value	Unit	TP current land use	0.93
	Phosphorous load from land use change	1.65	1.65	Kg/year	TP proposed land use	2.57
3.	Calculate phosphorous budget for the development site	Value	Value	Unit		
	Phosphorous budget for the site	18.03	18.03	Kg/year		
4.	Calculate phosphorous budget precautionary buffer	Value	Value	Unit		
	Buffer amount	20	20	%		
	Phosphorous precautionary buffer	3.61	3.61	Kg/year		

Note: The figures used throughout this model are based on scientific research, evidence and modelled catchments and represent the best available evidence. However, it is important that a precautionary buffer is used that recognises the uncertainty with these figures and ensures, with reasonable certainty, that there will be no adverse effect on site integrity. As such, a 20% precautionary buffer is built into the calculation.

5.	**Total phosphorous budget for the development site**	Value	Value	Unit
	Total Phosphorous budget for the site	21.63	21.63	Kg/year

Current WwTW Permit levels

Development will generate additional Phosphorous (Mitigation required) - Please progress to Stage 5

AMP7 WwTW Permit levels

Development will generate additional Phosphorous (Mitigation required) - Please progress to Stage 6

Annex 2 Mitigation Areas (derived from Somerset Calculator)

Somerset Calculator Stage 5: Wetland Mitigation only

Stage 5 — Calculate the current TP banking for the proposed development

Note: This section is only required for projects that will generate additional phosphorous and as a result need to implement mitigation measures, in order to achieve phosphorous neutrality under the current WwTW permit limits.

1. Total Phosphorous budget for the development site

	Value	Unit
Total phosphorous budget to be mitigated	21.63	Kg/year

2. Identify current land use of mitigation area

2a. On-site mitigation: No

2b. Off-site mitigation: Yes

Note: If the mitigation is to be implemented on-site then the user should select "Yes" in the list above. If off-site mitigation is to be implemented instead, then the user should select "No" above.

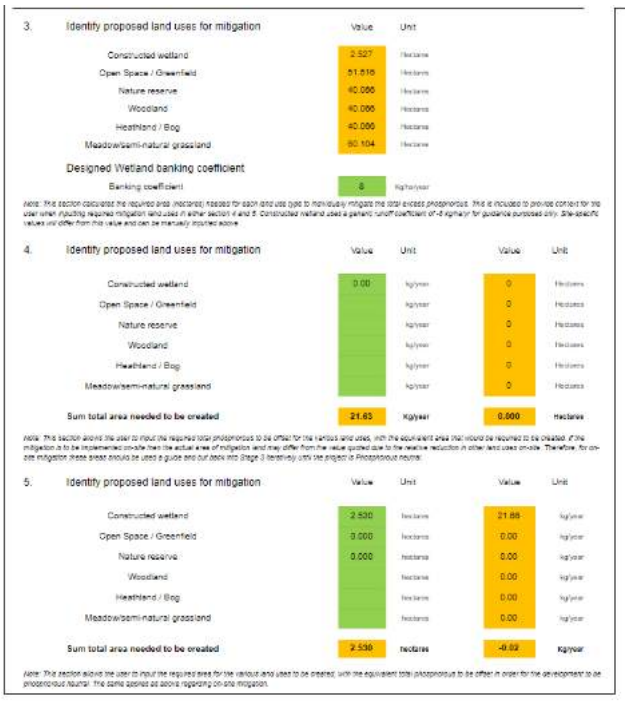
Identify current land use on-site mitigation area	Value		Unit
Average land use of the on-site mitigation area	0.30	No	Kg/ha/year
Specific land use of on-site mitigation area			
Urban development	0.83	No	Kg/ha/year
Mineral workings and quarries		No	Kg/ha/year
Open space / Greenfield		No	Kg/ha/year
Allotments and city farms		No	Kg/ha/year
Sports and leisure facilities		No	Kg/ha/year
Transport tracks and ways		No	Kg/ha/year
Transport terminals		No	Kg/ha/year
Cereals		No	Kg/ha/year
Dairy		No	Kg/ha/year
Cropping		No	Kg/ha/year
Horticulture		No	Kg/ha/year
Pig Farming		No	Kg/ha/year
Lowland Grazing	0.22	No	Kg/ha/year
Mixed Livestock		No	Kg/ha/year
Poultry Farming		No	Kg/ha/year
General Arable		No	Kg/ha/year
Improved grass		No	Kg/ha/year
Unimproved grass		No	Kg/ha/year
Woodland (e.g. conifer, mixed, broad-leaved)		No	Kg/ha/year
shrub / heathland / bracken / bog		No	Kg/ha/year
freshwater marsh		No	Kg/ha/year
Meadow / semi natural grassland		No	Kg/ha/year
On-site mitigation land runoff coefficient	0.00		

Identify the drainage type of the soil on the mitigation site		
Is the soil type free draining?	No	

Note: Identify the soil drainage type from the Viewer, and use the criteria table in the Help tab to identify if the soil is either permeable or impermeable.

Specific land use of off-site mitigation area	
Urban development	No
Mineral workings and quarries	No
Open space / Greenfield	No
Allotments and city farms	No
Sports and leisure facilities	No
Transport tracks and ways	No
Transport terminals	No
Cereals	No
Dairy	No
Cropping	No
Horticulture	No
Pig Farming	No
Lowland Grazing	No
Mixed Livestock	No
Poultry Farming	No
General Arable	Yes
Improved grass	No
Unimproved grass	No
Woodland (e.g. conifer, mixed, broad-leaved)	No
shrub / heathland / bracken / bog	No
freshwater marsh	No
Meadow / semi natural grassland	No
Off-site mitigation land runoff coefficient	0.58

mitigation land runoff coefficient 0.58



3. Identify proposed land uses for mitigation

	Value	Unit
Constructed wetland	2.527	Hectares
Open Space / Greenfield	51.516	Hectares
Nature reserve	40.000	Hectares
Woodland	40.000	Hectares
Heathland / Bog	40.000	Hectares
Meadow/semi-natural grassland	80.104	Hectares

Designed Wetland banking coefficient

Banking coefficient	8	Kg/ha/year

Note: This section calculates the required area (hectares) needed for each land use type to individually mitigate the total excess phosphorous. This is included to provide context for the user when inputting required mitigation land uses in either section 4 and 5. Constructed wetland uses a generic runoff coefficient of 0.8 Kg/ha/yr for guidance purposes only. Site-specific values will differ from this value and can be manually inputted above.

4. Identify proposed land uses for mitigation

	Value	Unit	Value	Unit
Constructed wetland	0.00	kg/year	0	Hectares
Open Space / Greenfield		kg/year	0	Hectares
Nature reserve		kg/year	0	Hectares
Woodland		kg/year	0	Hectares
Heathland / Bog		kg/year	0	Hectares
Meadow/semi-natural grassland		kg/year	0	Hectares
Sum total area needed to be created	21.63	Kg/year	0.000	Hectares

Note: This section allows the user to input the required total phosphorous to be offset for the various land uses, with the equivalent area that would be required to be created. If the mitigation is to be implemented on-site then the actual area of mitigation land may differ from the value quoted due to the relative reduction in other land uses on-site. Therefore, for on-site mitigation these areas should be used a guide and cut back into Stage 3 iteratively until the project is Phosphorous neutral.

5. Identify proposed land uses for mitigation

	Value	Unit	Value	Unit
Constructed wetland	2.530	hectares	21.66	kg/year
Open Space / Greenfield	0.000	hectares	0.00	kg/year
Nature reserve	0.000	hectares	0.00	kg/year
Woodland		hectares	0.00	kg/year
Heathland / Bog		hectares	0.00	kg/year
Meadow/semi-natural grassland		hectares	0.00	kg/year
Sum total area needed to be created	2.530	hectares	-0.03	Kg/year

Note: This section allows the user to input the required area for the various land uses to be created, with the equivalent total phosphorous to be offset in order for the development to be phosphorous neutral. The same applies as above regarding on-site mitigation.

Somerset Calculator Stage 5: Wetland & Open Space Mitigation

Stage 5 — Calculate the current TP banking for the proposed development

Note: This section is only required for projects that will generate additional phosphorous and as a result need to implement mitigation measures, in order to achieve phosphorous neutrality under the current WwTW permit limits.

1. Total Phosphorous budget for the development site

	Value	Unit
Total phosphorous budget to be mitigated	21.63	Kg/year

2. Identify current land use of mitigation area

2a. On-site mitigation: No

Note: If the mitigation is to be implemented on-site then the user should select "Yes" in the list above. If off-site mitigation is to be implemented instead, then the user should select "No" above.

Identify current land use on-site mitigation area	Value		Unit
Average land use of the on-site mitigation area	0.30	No	Kg/ha/year
Specific land use of on-site mitigation area			
Urban development	0.83	No	Kg/ha/year
Mineral workings and quarries		No	Kg/ha/year
Open space / Greenfield		No	Kg/ha/year
Allotments and city farms		No	Kg/ha/year
Sports and leisure facilities		No	Kg/ha/year
Transport tracks and ways		No	Kg/ha/year
Transport terminals		No	Kg/ha/year
Cereals		No	Kg/ha/year
Dairy		No	Kg/ha/year
Cropping		No	Kg/ha/year
Horticulture		No	Kg/ha/year
Pig Farming		No	Kg/ha/year
Lowland Grazing	0.22	No	Kg/ha/year
Mixed Livestock		No	Kg/ha/year
Poultry Farming		No	Kg/ha/year
General Arable		No	Kg/ha/year
Improved grass		No	Kg/ha/year
Unimproved grass		No	Kg/ha/year
Woodland (e.g. conifer, mixed, broad-leaved)		No	Kg/ha/year
shrub / heathland / bracken / bog		No	Kg/ha/year
freshwater marsh		No	Kg/ha/year
Meadow / semi natural grassland		No	Kg/ha/year
On-site mitigation land runoff coefficient	0.00		

2b. Off-site mitigation: Yes

Note: If the mitigation is to be implemented off-site then the user should select "Yes" in the list above. If on-site mitigation is to be implemented instead, then the user should select "No" above.

Identify current land use of off-site mitigation area

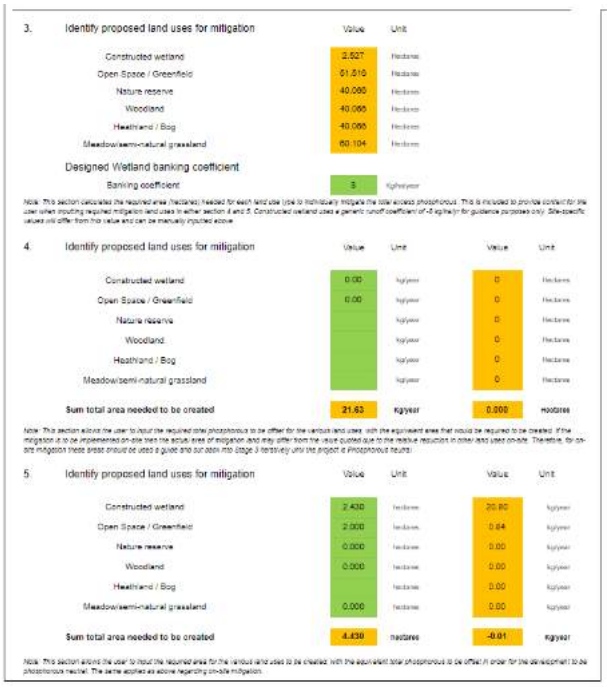
Identify the drainage type of the soil on the mitigation site

Is the soil type free draining? No

Note: Identify the soil drainage type from the Viewer, and use the criteria table in the Help tab to identify if the soil is either permeable or impermeable.

Specific land use of off-site mitigation area	
Urban development	No
Mineral workings and quarries	No
Open space / Greenfield	No
Allotments and city farms	No
Sports and leisure facilities	No
Transport tracks and ways	No
Transport terminals	No
Cereals	No
Dairy	No
Cropping	No
Horticulture	No
Pig Farming	No
Lowland Grazing	No
Mixed Livestock	No
Poultry Farming	No
General Arable	Yes
Improved grass	No
Unimproved grass	No
Woodland (e.g. conifer, mixed, broad-leaved)	No
shrub / heathland / bracken / bog	No
freshwater marsh	No
Meadow / semi natural grassland	No
Off-site mitigation land runoff coefficient	0.58

mitigation land runoff coefficient 0.56



3. Identify proposed land uses for mitigation

	Value	Unit
Constructed wetland	2.527	Hectares
Open Space / Greenfield	51.510	Hectares
Nature reserve	40.066	Hectares
Woodland	40.066	Hectares
Heathland / Bog	40.066	Hectares
Meadow/semi-natural grassland	60.104	Hectares

Designed Wetland banking coefficient

Banking coefficient	3	Kg/ha/yr

Note: This section calculates the required area (hectares) needed for each land use type to individually mitigate the total excess phosphorous. This is included to provide context for the user when inputting required mitigation land uses in either section 4 and 5. Constructed wetland uses a generic runoff coefficient of -0 kg/ha/yr for guidance purposes only. Site-specific values will differ from this value and can be manually inputted above.

4. Identify proposed land uses for mitigation

	Value	Unit	Value	Unit
Constructed wetland	0.00	kg/year	0	Hectares
Open Space / Greenfield	0.00	kg/year	0	Hectares
Nature reserve		kg/year	0	Hectares
Woodland		kg/year	0	Hectares
Heathland / Bog		kg/year	0	Hectares
Meadow/semi-natural grassland		kg/year	0	Hectares
Sum total area needed to be created	21.63	**Kg/year**	0.000	**Hectares**

Note: This section allows the user to input the required total phosphorous to be offset for the various land uses, with the equivalent area that would be required to be created. If the mitigation is to be implemented on-site then the actual area of mitigation land may differ from the value quoted due to the relative reduction in total land uses on-site. Therefore, for on-site mitigation these areas should be used a guide and run back into Stage 3 iteratively until the project is phosphorous neutral.

5. Identify proposed land uses for mitigation

	Value	Unit	Value	Unit
Constructed wetland	2.430	hectares	20.60	kg/year
Open Space / Greenfield	2.000	hectares	0.84	kg/year
Nature reserve	0.000	hectares	0.00	kg/year
Woodland	0.000	hectares	0.00	kg/year
Heathland / Bog		hectares	0.00	kg/year
Meadow/semi-natural grassland	0.000	hectares	0.00	kg/year
Sum total area needed to be created	4.430	**hectares**	-0.01	**Kg/year**

Note: This section allows the user to input the required area for the various land uses to be created, with the equivalent total phosphorous to be offset, in order for the development to be phosphorous neutral. The same applies as above regarding on-site mitigation.

Somerset Calculator Stage 5: Wetland & Woodland Mitigation

Stage 5 — **Calculate the current TP banking for the proposed development**

Note: This section is only required for projects that will generate additional phosphorous and as a result need to implement mitigation measures, in order to achieve phosphorous neutrality under the current WwTW permit limits.

1. Total Phosphorous budget for the development site

	Value	Unit
Total phosphorous budget to be mitigated	21.63	Kg/year

2. Identify current land use of mitigation area

2a. On-site mitigation: No

2b. Off-site mitigation: Yes

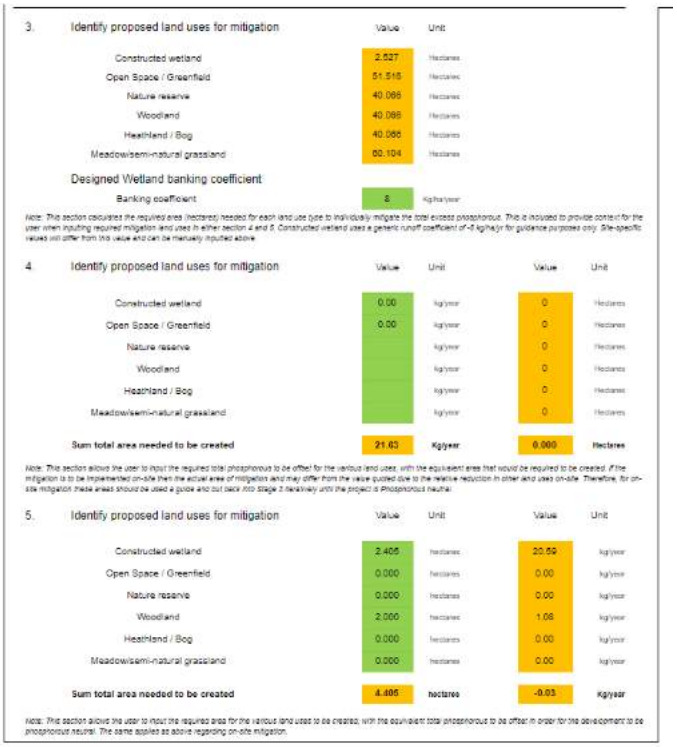
Note: If the mitigation is to be implemented on-site then the user should select "Yes" in the list above. If off-site mitigation is to be implemented instead, then the user should select "No" above.

Identify current land use on-site mitigation area	Value		Unit
Average land use of the on-site mitigation area	0.30	No	Kg/ha/year

Identify current land use of off-site mitigation area	
Identify the drainage type of the soil on the mitigation site	
Is the soil type free draining?	No

Note: Identify the soil drainage type from the Viewer, and use the criteria table in the Help tab to identify if the soil is either permeable or impermeable.

Specific land use of on-site mitigation area			Unit	Specific land use of off-site mitigation area	
Urban development	0.03	No	Kg/ha/year	Urban development	No
Mineral workings and quarries		No	Kg/ha/year	Mineral workings and quarries	No
Open space / Greenfield		No	Kg/ha/year	Open space / Greenfield	No
Allotments and city farms		No	Kg/ha/year	Allotments and city farms	No
Sports and leisure facilities		No	Kg/ha/year	Sports and leisure facilities	No
Transport tracks and ways		No	Kg/ha/year	Transport tracks and ways	No
Transport terminals		No	Kg/ha/year	Transport terminals	No
Cereals		No	Kg/ha/year	Cereals	No
Dairy		No	Kg/ha/year	Dairy	No
Cropping		No	Kg/ha/year	Cropping	No
Horticulture		No	Kg/ha/year	Horticulture	No
Pig Farming		No	Kg/ha/year	Pig Farming	No
Lowland Grazing	0.22	No	Kg/ha/year	Lowland Grazing	No
Mixed Livestock		No	Kg/ha/year	Mixed Livestock	No
Poultry Farming		No	Kg/ha/year	Poultry Farming	No
General Arable		No	Kg/ha/year	General Arable	Yes
Improved grass		No	Kg/ha/year	Improved grass	No
Unimproved grass		No	Kg/ha/year	Unimproved grass	No
Woodland (e.g. conifer, mixed, broad-leaved)		No	Kg/ha/year	Woodland (e.g. conifer, mixed, broad-leaved)	No
shrub / heathland / bracken / bog		No	Kg/ha/year	shrub / heathland / bracken / bog	No
freshwater marsh		No	Kg/ha/year	freshwater marsh	No
Meadow / semi natural grassland		No	Kg/ha/year	Meadow / semi natural grassland	No
On-site mitigation land runoff coefficient	0.00			**Off-site mitigation land runoff coefficient**	0.58
mitigation land runoff coefficient	0.58				



3. Identify proposed land uses for mitigation

	Value	Unit
Constructed wetland	2.527	Hectares
Open Space / Greenfield	51.516	Hectares
Nature reserve	40.086	Hectares
Woodland	40.086	Hectares
Heathland / Bog	40.086	Hectares
Meadow/semi-natural grassland	60.104	Hectares

Designed Wetland banking coefficient

Banking coefficient	6	Kg/ha/year

Note: This section calculates the required area (hectares) needed for each land use type to individually mitigate the total excess phosphorous. This is included to provide context for the user when inputting required mitigation land uses in either section 4 and 5. Constructed wetland uses a generic runoff coefficient of 6 kg/ha/yr for guidance purposes only. Site-specific values will differ from this value and can be manually inputted above.

4. Identify proposed land uses for mitigation

	Value	Unit	Value	Unit
Constructed wetland	0.00	kg/year	0	Hectares
Open Space / Greenfield	0.00	kg/year	0	Hectares
Nature reserve		kg/year	0	Hectares
Woodland		kg/year	0	Hectares
Heathland / Bog		kg/year	0	Hectares
Meadow/semi-natural grassland		kg/year	0	Hectares
Sum total area needed to be created	21.63	**Kg/year**	0.000	**Hectares**

Note: This section allows the user to input the required total phosphorous to be offset for the various land uses, with the equivalent area that would be required to be created. If the mitigation is to be implemented on-site then the actual area of mitigation land may differ from the value quoted due to the relative reduction in other land uses on-site. Therefore, for on-site mitigation these areas should be used a guide and cut back into Stage 3 iteratively until the project is Phosphorous neutral.

5. Identify proposed land uses for mitigation

	Value	Unit	Value	Unit
Constructed wetland	2.405	hectares	20.59	kg/year
Open Space / Greenfield	0.000	hectares	0.00	kg/year
Nature reserve	0.000	hectares	0.00	kg/year
Woodland	2.000	hectares	1.08	kg/year
Heathland / Bog	0.000	hectares	0.00	kg/year
Meadow/semi-natural grassland	0.000	hectares	0.00	kg/year
Sum total area needed to be created	4.405	**hectares**	-0.03	**Kg/year**

Note: This section allows the user to input the required area for the various land uses to be created, with the equivalent total phosphorous to be offset in order for the development to be phosphorous neutral. The same applies as above regarding on-site mitigation.

Annex 3 Topographic Analysis Figures