Horsham Local Plan Habitats Regulations Assessment

Horsham District Council

July 2021

Quality information

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Introduction

Under the Conservation of Habitats and Species Regulations 2017 (as amended), an Appropriate Assessment is required, where a plan or project is likely to have a significant effect upon a European Site, either individually or 'in combination' with other projects.

AECOM was appointed by Horsham District Council to undertake a Habitats Regulations Assessment of its emerging Regulation 19 Draft Local Plan. The objective of this assessment was to identify any aspects of the Plan that would cause an adverse effect on the integrity of European sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), candidate Special Areas of Conservation (cSACs), potential Special Protection Areas (pSPAs) and, as a matter of Government policy, Ramsar sites), either alone or in combination with other plans and projects, and to advise on appropriate policy mechanisms for delivering mitigation where such effects were identified.

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. However, the Withdrawal Act retains the body of existing EU-derived law within our domestic law and it is clear that the HRA process continues post-Brexit.

Screening for Likely Significant Effects (LSEs)

This HRA assessed the development proposed in the emerging HLP and its policies, including at least 18,700 new residential dwellings and 111,700m^2 of employment space (B1 (now use class E), B2 & B8). It was concluded that likely significant effect could arise on Arun Valley SPA/Ramsar site (from changes in water quality, changes in water levels and flows and loss of functionally-linked land), Ebernoe Common SAC and The Mens SAC (from loss of functionally linked land) and, for The Mens SAC, atmospheric nitrogen deposition.

Appropriate Assessment

Water Quantity, Level and Flow

Natural England has expressed concerns regarding the Hardham groundwater abstraction following a review of evidence. Natural England has requested that Horsham District Council do their utmost to provide for water neutrality within the Local Plan in order to minimise the burden new development places on local water resources and thus minimise the need for Southern Water to use the Hardham Borehole to its full permitted extent. To support the production of the Local Plan, a water neutrality investigation has been undertaken by AECOM. The full Technical Note can be found in Appendix E of the Local Plan HRA report.

The Technical Note identifies that even with the tightened water use limits included within the Local Plan (80 litres/person/day for strategic residential allocations, and 100

litres/person/day for all other residential allocations), literal (i.e. total) water neutrality could only be achieved by applying the High Scenario, requiring new homes to use water at a rate of 62 l/h/d and retrofitting a minimum of 65.5% of the existing housing stock with water efficiency fittings equivalent to the Southern Water 'Target 100' standard. In other words, it would require a restriction on new-build water use unprecedented in the UK and a very high level of retrofitting of existing stock. This is considered unfeasible, particularly given than there is only a limited amount the local planning authority can do (and nothing the Local Plan itself can do) regarding retrofitting existing dwellings.

The Medium Scenario would give a minimum of 65% neutrality which would require new homes to be designed to use water at a rate of 80 l/h/d for strategic development or 100 l/h/d for non-strategic development (i.e. as required by the proposed Local Plan policy) and retrofitting 50% of the existing housing stock with water efficiency fittings equivalent to the Southern Water 'Target 100' standard. While existing Local Plan policy would achieve the necessary water efficiency standards in new builds, the extent of retrofitting is again considered unfeasible.

In the situation where new homes only are designed to use water at a rate required by the proposed Local Plan policy (i.e. without any retrofitting of the existing housing stock with water efficiency fittings) a water neutrality of 32% could be achieved. In addition, a certain amount of limited retrofitting of existing properties is within the feasible remit of the local authority, working with partners, and it is therefore considered that achieving the 'low' scenario in the Technical Note is feasible. This would involve retrofitting 20% of existing dwellings and would achieve 45% water neutrality for Horsham District.

This would demonstrate that the Council had a strong approach to doing its realistic utmost on the issue, within those areas that lie within its remit and ability to influence. The Technical Note includes a list of recommendations and requirements for the delivery of water neutrality. This includes Plan Policy, partnership approaches, and retrofitting. These recommendations/ requirements are replicated below:

Policy

"Horsham District Council is already proposing a requirement in the Local Plan (2019 – 2036) (Policy 38) that new homes delivered on strategic developments incorporate water efficiency measures and/or water recycling in order to limit water use to 80 l/h/d or 100 l/h/d on non-strategic developments; therefore, this policy element of the delivery requirements is already in place. It is recommended that the Council consider ways to support developer implementation of this policy via information sources on their website. Measures can include (but not necessarily limited to) garden water butts, low flush toilets, low volume baths, aerated taps, water efficient appliances and water recycling (greywater and/or rainwater)."

Partnership Approaches

"*Housing association partners should be targeted with a programme of retrofitting water efficient devices, to showcase the policy and promote the benefits. This should be a collaborative scheme between Horsham District Council, Southern Water and Waterwise. In addition, rainwater harvesting and/or greywater recycling schemes could be implemented into larger council owned and maintained buildings, such as schools or community centres. Rainwater harvesting could be introduced to public toilets.*

The retrofitting scheme should then be extended to non-Council owned properties, via the promotion and education programme.

A programme of water audits should be carried out in existing domestic and non-domestic buildings, again showcased by council owned properties, to establish water usage and to make recommendations for improving water efficiency measures. The water audits should be followed up by retrofitting water efficient measures in these buildings, as discussed above. In private non-domestic buildings water audits and retrofitting should be funded by the asset owner, the cost of this could be offset by the financial savings resulting from the implementation of water efficient measures.

In order to ensure the uptake of retrofitting water efficient devices for non-council properties, the council should implement an awareness and education campaign, which could include the following:

- *working with Southern Water to help with its water efficiency initiative ('Target 100'), which has seen leaflets distributed directly to customers and at events across the region each year;*
- *a media campaign, with adverts/articles in local papers and features on a local news programme;*
- *a media campaign could be supplemented by promotional material, ranging from those that directly affect water use e.g. free cistern displacement devices, to products which will raise awareness e.g. fridge magnets with a water saving message;*
- *encouraging developers to provide new residents with 'welcome packs', explaining the importance of water efficiency and the steps that they can take to reduce water use;*
- *working with retailers to promote water efficient products;*
- *carrying out educational visits to schools and colleges, to raise awareness of water efficiency amongst children and young adults;*
- *working with neighbourhood trusts, community groups and local interest groups to raise awareness of water efficiency; and,*
- *carrying out home visits to householders to explain the benefits of saving water, this may not be possible for the general population of the Borough, but rather should be used to support a targeted scheme aimed at a specific residential group."*

Loss of Functionally Linked Habitat

Appendix C of the HRA report identified that a single allocation, STO1: Land to the north of Melton Drive/Land South of Northlands Lane, Storrington, has the potential to support a significant population of Bewick's swan and thus could provide functionally linked land to the Arun Valley SPA / Ramsar site. It was considered that all others site located within 6.5km of the SPA / Ramsar site were not suitable to act as functionally linked land for Bewick's swan due to a variety of reasons, including being located within/ adjacent to an urban area, subject to existing levels of disturbance, the sites not providing green fields (but rather containing woodland/ buildings), the site comprised multiple small land parcels divided by thick hedgerows or woodland belts (so each field was less than 2ha in size and had disrupted sightlines), or the site offered no sight lines into the wider countryside.

In accordance with Policy 30 - Strategic Policy: Green Infrastructure and Biodiversity "*9. Any development with the potential to impact Arun Valley SPA / SAC / Ramsar site, The Mens SAC and / or Ebernoe Common SAC will be subject to a Habitats Regulation Assessment to determine the need for an Appropriate Assessment. In addition, development will be required to be in accordance with the necessary mitigation measures for development set out in the HRA of this plan*." As such, it is considered that the Local Plan contains a basic policy framework to ensure that no adverse effect on the integrity of the SPA / Ramsar site could result as a consequence of loss of functionally linked land. Nonetheless, recommendations are made to ensure full robustness.

It is recommended that the policy for allocation STO1 should include the following requirement, or similar: '*The applicant will be required to provide evidence that the development will not result in an adverse effect on the integrity of the Arun Valley SPA/Ramsar. To achieve this, surveys will be required to determine habitats and current use of the site to determine if it does support a significant population*[1] *of qualifying species. Where habitats are suitable, non-breeding bird surveys will be required to determine if the site and neighbouring land constitute a significant area of supporting habitat. Surveys should be required to be undertaken during autumn, winter and spring and more than 1 year of surveys may be needed (to be agreed in consultation with the local planning authority and Natural England). If habitat within the site is identified to support significant populations of designated bird features avoidance measures and mitigation will be required, such as the creation of replacement habitat nearby, and the planning application will likely need to be supported by a project specific Habitats Regulations Assessment to ensure that the development does not result in adverse effects on integrity'*. It is recognised that this is lengthy for inclusion in policy, so a brief reference could be included in the policy with this fuller text in the supporting text.

It is also recommended that the supporting text in paragraph 7.42 of the Plan is amended to state (or similar) "*In the case of Arun Valley, proposals must demonstrate that they will avoid harm to the water quality and water levels on site,* ***and do not result in the loss of significant parcels of functionally linked land that supports Bewick's Swan***"

In addition, for correctness, it is recommended that the supporting text in paragraph 7.42 of the Plan is amended to state "…*these sites are of international importance for nature conservation, and applicants will need to demonstrate that development does not* ***result in an adverse effect on the integrity*** ~~*have adverse impacts*~~ *on* ~~*either*~~ ***any*** *of these sites in accordance with relevant legislation*."

A series of site allocations (both residential and employment), were identified to be greenfield development and located either within 6.5km of The Mens SAC or between 6.5km and 12km from both The Mens SAC and Ebernoe Common SAC. In accordance with Policy 30 - Strategic Policy: Green Infrastructure and Biodiversity "*9. Any development with the potential to impact Arun Valley SPA or the Mens SAC will be subject to a Habitats Regulation Assessment to determine the need for an Appropriate Assessment. In addition, development will be required to be in accordance with the necessary mitigation measures for development set out in the HRA of this plan*." As

[1] A significant population is classified as a site that regularly used by more than 1% of the population of qualifying bird species

such, it is considered that the Local Plan contains a basic framework to ensure no adverse effect on the integrity of the SACs result as a consequence of loss of functionally linked land. Nonetheless, recommendations are made to ensure full robustness.

To ensure full robustness, it is recommended that the supporting text of the Plan is updated to include reference to the strategic Sussex Bat Protocol[2] and the requirements it sets out for development within 6.5km and 12km of both The Mens SAC and Ebernoe Common SAC. The Protocol has been created in consultation with Natural England and includes Natural England's recommendations as follows:

'There are two key impact zones from a Sussex Bat SAC:

- *6.5km Key conservation area – all impacts assessed*
- *12km Wider conservation area – significant impacts or severance to flightlines to be considered*

The 6.5 km includes the Key conservation area in which all impacts must be considered as habitats within this zone are considered critical for sustaining the populations of bats within the SACs.

The 12km encompasses the wider conservation area which is the full extent of the range of foraging areas required by the bats'.

To ensure no adverse effects on the integrity result as a consequence of development within 12km of either The Mens SAC or Ebernoe Common SAC, all development (both allocations and any windfall development) within these zones (as shown on the Local Plan Policies Map) should adhere to the requirements set out within Sussex Bat Protocol.

The following recommendation is made for additions to supporting text: *'In order to be fully compliant with the Habitats Directive regarding The Mens SAC and Ebernoe Common SAC qualifying features, proposals for the development of greenfield sites within 12km of either SAC must evaluate whether there is a potential for the loss of suitable foraging habitat and / or the severance of commuting flightlines, such as in the form of mature treelines, hedgerows and watercourses. If so, such features must be preserved or compensated for, unless bat surveys demonstrate that they are not used by barbastelle bats. Care must also be taken through development design to ensure that such features are not subject to unacceptable levels of artificial lighting*.'

The supporting text in paragraph 7.42 of the Plan should also be amended to state "…*these sites are of international importance for nature conservation, and applicants will need to demonstrate that development does not* ***result in an adverse effect on the integrity*** ~~*have adverse impacts*~~ *on* ~~*either*~~ ***any*** *of these sites in accordance with relevant legislation."*

Atmospheric Pollution

It is considered that The Mens SAC is vulnerable to nitrogen deposition and is located within 200m of an A road likely to be utilised as a journey to work route: the A272.

[2] https://www.southdowns.gov.uk/wp-content/uploads/2018/04/TLL-15-Draft-Sussex-Bat-SAC-Protocol.pdf [accessed 19/11/2020]

Modelling was undertaken along a single transect within the SAC adjacent to the road, with the closest part of the SAC being located immediately adjacent to the roadside. The traffic modelling identified that the difference between the Do Minimum and Do Something 2 scenario (i.e. the contribution of the Local Plan with congestion mitigation such as traffic improvement schemes) was 442 AADT, indicating that the Horsham Local Plan in isolation would provide approximately 1/4 of the increase in traffic flows to 2037.

Since it is likely that a significant portion of the increase in traffic flows come from a single large strategic allocation located in the western extent of the District (Strategic Policy HA3: Land East of Billingshurst, an allocation of approximately 650 net new dwellings located about 5.5km east of The Mens SAC in a straight line), a requirement should be introduced into policy for this allocation to devise a scheme-specific range of measures to reduce reliance on cars, reduce trip generation and promote ultra-low emission vehicles. The kind of measures the applicants would be expected to introduce could include, but not be limited to, the following:

a) Electric vehicle charging points at parking spaces. The government has committed to ceasing the sale of all new petrol and diesel cars and vans from 2030. In the latter part of the plan period therefore people can be expected to show particular interest in electric vehicles;

b) A proportion of parking spaces to be reserved exclusively for electric or hydrogen vehicles;

c) Provision of direct incentives to residents to convert from petrol or diesel cars to electric vehicles;

d) Provision of a communal minibus (particularly if electric), and car club space. This will be effective for housing developments but particularly for employment developments;

e) Cycle parking and shower facilities for staff;

f) On-site services (e.g. GP surgery's and shops) to reduce need for off-site movements;

g) Personalised Journey Planning services for residents. If employment premises the company could provide incentives for car-sharing and minimising car journeys for work;

h) Production of sustainable travel information for residents e.g. accurate and easily understandable bus timetables;

i) Implementation of a Staff Management Plan to place restrictions on car use by Staff;

j) For vehicles generating HGV movements, restrictions to keep movements below 200 HDV per day, or a commitment to ensuring all HGVs used will be Euro6 compliant.

The issue is also more strategic one, attributable to growth dispersed across the District. Horsham should commit to working with the South Downs National Park Authority and Natural England in implementing the Shared Nitrogen Action Plan (SNAP) for this site. This could include Horsham supporting direct interventions to

improve tree health and resilience such as through mulching3. This would probably need to be funded by a financial levy on developers so the cost of interventions would need to be identified prior to Local Plan submission. Alternatively, Horsham District could make an 'in kind' contribution of staff availability if Horsham has a conservation or land management team. The SNAP has already been identified as an intervention, but it does not appear to have been fully funded.

Other initiatives to consider would include a programme of borough-wide initiatives to reduce reliance on the private car and promoting and delivering improved public transport and low emission vehicles, such as:

- requiring 50% of parking spaces at all new developments to have active electric vehicle charging point provision, including rapid charging;
- ensuring all public car parks have active electric vehicle charging infrastructure;
- producing materials to promote use of low-emission transport (such as indicating where charging points are located in the district, informing the public of the falling cost of electric vehicles due to reducing battery costs, and identifying the range of electric vehicles available); and
- working with the transport authorities over the plan period to 2037 (the year when an adverse effect is forecast) to improve non-road connectivity between Billingshurst and Petworth (both located on the A272 and which require driving past The Mens SAC to travel between the two towns), and deliver improved bus services with less polluting buses.

These strategic initiatives would address the contribution of all new housing and employment in Horsham District even on small sites.

[3] Flores Fernández et al. (2019) demonstrated that mulch aided the recovery of soil structure of a compacted forest soil in Germany. Mulching also increases fine root growth in the surface horizons, and enhances soil biological functioning. It is important to apply mulch to an appropriate thickness (between 5 cm to 7.5 cm maximum), to facilitate rainfall percolation and oxygen diffusion into the underlying soil. Mulching is clearly a management intervention which moves beyond natural litter accumulation beneath trees, but it appears to fit with the ethos of the Adaptation Principles listed in Annex AM3 of Moffat (2019). Mulch will also provide nutrients available for uptake by the tree, and help to counter any deficiencies due to inherent soil infertility, the effects of atmospheric pollution and nutrient removal by vegetation. The RHS website gives further guidance on the practice of mulching (see RHS mulching advice).

1. Background

Introduction

1.1 Under the Conservation of Habitats and Species Regulations 2017 (as amended), an Appropriate Assessment is required, where a plan or project is likely to have a significant effect upon a European Site, either individually or 'in combination' with other projects.

1.2 AECOM was appointed by Horsham District Council to undertake a Habitats Regulations Assessment of its emerging Regulation 19 Draft Local Plan. The objective of this assessment was to identify any aspects of the Plan that would cause an adverse effect on the integrity of European sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), candidate Special Areas of Conservation (cSACs), potential Special Protection Areas (pSPAs) and, as a matter of Government policy, Ramsar sites), either alone or in combination with other plans and projects, and to advise on appropriate policy mechanisms for delivering mitigation where such effects were identified.

1.3 Horsham District contains a single European site (the Arun Valley SAC, SPA and Ramsar site) that is very hydrologically sensitive (both in terms of water quality and water levels and flows) and is also designated for wildfowl (notably Bewick swan) that often feed some distance beyond the SPA boundary. Horsham lies relatively close to (i.e. within 3km of) The Mens SAC and within 12km of Ebernoe Common SAC. Both of these sites are designated for highly mobile bat species, which in the case of barbastelle can travel to forage up to 12km from their maternity roosts within the SAC based on radio-tracking. The District boundary also lies 2.5km from Duncton to Bignor Escarpment SAC, but this site is designated for immobile beech forest and is also remote from any roads likely to be used for journeys to work associated with new housing in Horsham.

1.4 In addition to producing an appropriate assessment for their Regulation 19 Local Plan, AECOM were also asked to review the screening (likely significant effects) assessment undertaken for the Regulation 18 Local Plan, particularly in light of representations made by Natural England. This report therefore effectively restarts the HRA process for the Regulation 19 Local Plan, although it draws on the work undertaken for the Regulation 18 Local Plan where appropriate.

Legislative Context

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. However, the Withdrawal Act retains the body of existing EU-derived law within our domestic law and it is clear that the HRA process continues post-Brexit.

1.6 The need for Appropriate Assessment (Figure 1) is set out within the Conservation of Habitats and Species Regulations 2017 (as amended).

1.7 The HRA process applies the 'Precautionary Principle'[4] to European sites. Plans and projects can only be permitted having ascertained that there will be no

[4] 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: *"When human*

adverse effect on the integrity of the European site(s) in question. Plans and projects with predicted adverse impacts on European sites may still be permitted if there are no alternatives to them and there are Imperative Reasons of Overriding Public Interest (IROPI) as to why they should go ahead. In such cases, compensation would be necessary to ensure the overall integrity of the site network.

1.8 In order to ascertain whether or not site integrity will be affected, an Appropriate Assessment should be undertaken of the plan or project in question:

Figure 1: The legislative basis for 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 … shall make an appropriate assessment of the implications for the site in view of that sites conservation objectives… The authority shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site*".

1.9 Over time the phrase 'Habitats Regulations Assessment' (HRA) has come into wide currency to describe the overall process set out in the Habitats Directive from screening through to IROPI. This has arisen in order to distinguish the process from the individual stage described in the law as an 'Appropriate Assessment'.

1.10 In spring 2018 the 'Sweetman' European Court of Justice ruling[5] clarified that 'mitigation' (i.e. measures that are specifically introduced to avoid or reduce a harmful effect on a European site that would otherwise arise) should **not** be taken into account when forming a view on likely significant effects. Mitigation should instead only be considered at the Appropriate Assessment stage. This HRA has been cognisant of that ruling.

Scope of the Project

1.11 There is no guidance that dictates the physical scope of an HRA of a Plan document in all circumstances. Therefore, in considering the physical scope of the assessment, we were guided primarily by the identified impact pathways (called the source-pathway-receptor model) rather than by arbitrary 'zones'. Current guidance suggests that the following European sites be included in the scope of assessment:

- All sites within the boundary of Horsham District; and,
- Other sites shown to be linked to development within the authority boundary through a known impact 'pathway' (discussed below).

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".*

[5] People Over Wind and Sweetman v Coillte Teoranta (C-323/17)

1.12 Briefly defined, impact pathways are routes by which the implementation of a policy within a Local Plan document can lead to an effect upon a European designated site. An example of this would be new residential development resulting in an increased population and thus increased recreational pressure, which could then affect European sites by, for example, disturbance of wintering or breeding birds.

1.13 Guidance from the Ministry of Housing, Communities and Local Government (MHCLG) states that the HRA should be '*proportionate to the geographical scope of the* [plan policy]' and that '*an AA need not be done in any more detail, or using more resources, than is useful for its purpose'* (MHCLG, 2006, p.6). More recently, the Court of Appeal ruled that providing the Council (competent authority) was duly satisfied that proposed mitigation could be 'achieved in practice' to satisfy that the proposed development would have no adverse effect, then this would suffice. This ruling has since been applied to a planning permission (rather than a Core Strategy document). In this case the High Court ruled that for '*a multistage process, so long as there is sufficient information at any particular stage to enable the authority to be satisfied that the proposed mitigation can be achieved in practice it is not necessary for all matters concerning mitigation to be fully resolved before a decision maker is able to conclude that a development will satisfy the requirements of Reg 61 of the Habitats Regulations'*.

The Layout of this Report

1.14 Chapter 2 of this report explains the methodology by which this HRA has been carried out, including the three essential tasks that form part of HRA. Chapter 3 provides detailed background on the main impact pathways identified in relation to the Local Plan and the relevant European Sites (see Appendix A for detail on the European Sites). Chapter 4 undertakes the screening assessment of Likely Significant Effects (LSEs) of the Plan's policies (see Appendix B for the screening tables of Plan policies and Appendix C for the screening of the site allocations). The conclusions arising from the screening assessment are provided in Chapter 5. Chapter 6 contains the Appropriate Assessment and Chapter 7, the conclusions and recommendations.

Quality Assurance

1.15 This report was undertaken in line with AECOM's Integrated Management System (IMS). Our IMS places great emphasis on professionalism, technical excellence, quality, environmental and Health and Safety management. All staff members are committed to establishing and maintaining our certification to the international standards BS EN ISO 9001:2008 and 14001:2004 and BS OHSAS 18001:2007. In addition, our IMS requires careful selection and monitoring of the performance of all sub-consultants and contractors.

1.16 All AECOM Ecologists working on this project are members (at the appropriate level) of the Chartered Institute of Ecology and Environmental Management (CIEEM) and follow their code of professional conduct (CIEEM, 2017).

2. Methodology

Introduction

2.1 The HRA has been carried out with reference to the general EC guidance on HRA[6]; Natural England has produced its own internal guidance[7]. These have been referred to in undertaking this HRA.

2.2 Figure 2 below outlines the stages of HRA according to current EC 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.

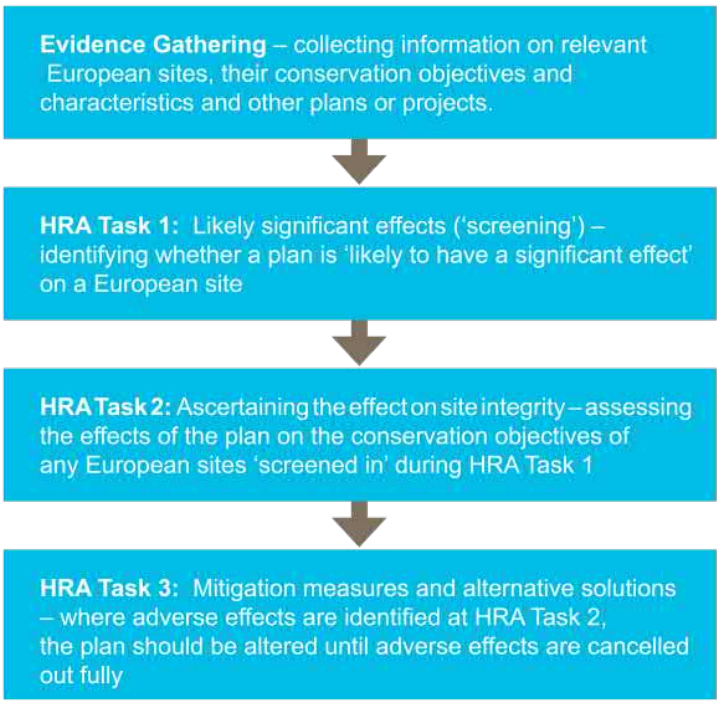

Figure 2. Four Stage Approach to Habitats Regulations Assessment. Source EC, 2001[1].

Description of HRA Tasks

HRA Task 1 – Likely Significant Effects (LSE)

2.3 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?"

[6] European Commission (2001): Assessment of plans and projects significantly affecting Natura 2000 Sites: Methodological Guidance on the Provisions of Article 6(3) and 6(4) of the Habitats Directive.
[7] http://www.ukmpas.org/pdf/practical_guidance/HRGN1.pdf

2.4 The objective is to 'screen out' those plans and projects that can, without any detailed appraisal, be concluded to be unlikely to result in significant adverse effects upon European sites, usually because there is no mechanism for an adverse interaction. This stage is undertaken in Chapter 4 of this report and in Appendix B.

HRA Task 2 – Appropriate Assessment (AA)

2.5 Where it is determined that a conclusion of 'no Likely Significant Effect' cannot be drawn, the analysis has proceeded to the next stage of HRA known as Appropriate Assessment. Case law has clarified that 'Appropriate Assessment' is not a technical term. In other words, there are no particular technical analyses, or level of technical analysis, that are classified by law as belonging to appropriate assessment rather than determination of likely significant effects.

2.6 By virtue of the fact that it follows the screening process, there is a clear implication that the analysis will be more detailed than undertaken at the previous stage. One of the key considerations during Appropriate Assessment is whether there is available mitigation that would entirely address the potential effect. In practice, the Appropriate Assessment would take any policies or allocations that could not be dismissed following the high-level screening analysis and assess the potential for an effect in more detail, with a view to concluding whether there would actually be an adverse effect on site integrity (in other words, disruption of the coherent structure and function of the European site(s)).

2.7 Also, in 2018 the Holohan ruling[8] was handed down by the European Court of Justice. Among other provisions paragraph 39 of the ruling states that '*As regards other habitat types or species, which are present on the site, but for which that site has not been listed, and with respect to habitat types and species located outside that site, … typical habitats or species must be included in the appropriate assessment, if they are necessary to the conservation of the habitat types and species listed for the protected area*' [emphasis added]. This has been considered in relation to the Dungeness, Romney Marsh and Rye Bay SPA / Ramsar, which supports mobile bird species.

HRA Task 3 – Avoidance and Mitigation

2.8 Where necessary, measures are recommended for incorporation into the Plan in order to avoid or mitigate adverse effects on European sites. There is considerable precedent concerning the level of detail that a Local Plan document needs to contain regarding mitigation for recreational impacts on European sites. The implication of this precedent is that it is not necessary for all measures that will be deployed to be fully developed prior to adoption of the Plan, but the Plan must provide an adequate policy framework within which these measures can be delivered.

2.9 In evaluating significance, AECOM has relied on professional judgement as well as the results of previous stakeholder consultation regarding development impacts on the European sites considered within this assessment.

2.10 When discussing 'mitigation' for a Local Plan document, one is concerned primarily with the policy framework to enable the delivery of such mitigation rather

[8] Case C-461/17

than the details of the mitigation measures themselves since the Local Plan document is a high-level policy document.

Geographical Scope of the HRA

2.11 There are no standard criteria for determining the ultimate physical scope of an HRA. Rather, the source-pathway-receptor model should be used to determine whether there is any potential pathway connecting development to any European sites. In the case of Horsham District, it was determined that for the initial coarse screen the following European Sites required consideration:

- Arun Valley SAC, SPA and Ramsar site
- The Mens SAC
- Duncton to Bignor Escarpment SAC
- Ebernoe Common SAC
- Singleton & Cocking Tunnels SAC
- Ashdown Forest SAC and SPA

2.12 This was based upon a search within 15km surrounding the Borough boundary as well as consideration of the vulnerabilities of these sites. All the above sites were subjected to the initial screening exercise. It should be noted that the presence of a conceivable pathway linking the district to a European site does not mean that likely significant effects will occur.

3. Relevant Impact Pathways

3.1 The following impact pathways are considered relevant to the Horsham District Local Plan:

- Recreational pressure;
- Water quality;
- Water quantity, level and flow;
- Loss of functionally linked habitat; and
- Atmospheric pollution

Background to Recreational Pressure

3.2 There is concern over the cumulative impacts of recreation on key nature conservation sites in the UK, as most sites must fulfill conservation objectives while also providing recreational opportunity. Various research reports have provided compelling links between changes in housing and access levels and impacts on European protected sites[9] [10]. This applies to any habitat, but the additional recreational pressure from housing growth on destinations designated for bird interests can be especially strong and some waterfowl qualifying for SPA designation are known to be susceptible to disturbance. Different European sites are subject to different types of recreational pressures and have different vulnerabilities. Studies across a range of species have shown that the effects from recreation can be complex. HRAs of Local Plans tend to focus on recreational sources of disturbance as a result of new residents[11].

3.3 Human activity can affect birds either directly (e.g. through causing them to flee) or indirectly (e.g. through damaging their habitat or reducing their fitness in less obvious ways e.g. stress). The most obvious direct effect is that of immediate mortality such as death by shooting, but human activity can also lead to much subtler behavioural (e.g. alterations in feeding behaviour, avoidance of certain areas and use of sub optimal areas etc.) and physiological changes (e.g. an increase in heart rate). While these are less noticeable, they might result in major population-level changes by altering the balance between immigration/birth and emigration/death[12].

3.4 Concern regarding the effects of disturbance on birds stems from the fact that they are expending energy unnecessarily and the time they spend responding to disturbance is time that is not spent feeding[13]. Disturbance therefore risks increasing energetic expenditure of birds while reducing their energetic intake, which can adversely affect the 'condition' and ultimately survival of the birds.

[9] Liley D, Clarke R.T., Mallord J.W., Bullock J.M. 2006a. The effect of urban development and human disturbance on the distribution and abundance of nightjars on the Thames Basin and Dorset Heaths. Natural England / Footprint Ecology.
[10] Liley D., Clarke R.T., Underhill-Day J., Tyldesley D.T. 2006b. Evidence to support the appropriate Assessment of development plans and projects in south-east Dorset. Footprint Ecology / Dorset County Council.
[11] The RTPI report 'Planning for an Ageing Population'(2004) which states that 'From being a marginalised group in society, the elderly are now a force to be reckoned with and increasingly seen as a market to be wooed by the leisure and tourist industries. There are more of them and generally they have more time and more money.' It also states that 'Participation in most physical activities shows a significant decline after the age of 50. The exceptions to this are walking, golf, bowls and sailing, where participation rates hold up well into the 70s'.
[12] Riley, J. 2003. Review of Recreational Disturbance Research on Selected Wildlife in Scotland. Scottish Natural Heritage.
[13] Riddington, R. *et al*. 1996. The impact of disturbance on the behaviour and energy budgets of Brent geese. *Bird Study* 43:269-279

Additionally, displacement of birds from one feeding site to others can increase the pressure on the resources available within the remaining sites, as they then must sustain a greater number of birds[14]. Moreover, the more time a breeding bird spends disturbed from its nest, the more its eggs are likely to cool and the more vulnerable they, or any nestlings, are to predators. Recreational effects on ground-nesting birds are particularly severe, with many studies concluding that urban sites support lower densities of key species, such as stone curlew and nightjar[15] [16]. Recreation disturbance in winter can be more adverse because birds are more vulnerable at this time of year due to food shortages.

3.5 Evidence in the literature suggests that the magnitude of disturbance clearly differs between different types of recreational activities. For example, dog walking leads to a significantly higher reduction in bird diversity and abundance than hiking[17]. Furthermore, key disturbance parameters, such as areas of influence and flush distance, are significantly greater for dog walkers than hikers[18]. Data on route length and the spatial mapping of routes indicate that key spatio-temporal features (e.g. the potentially impacted area of a site, how frequent or long activities are undertaken) are likely to differ between recreational activities. Overall, activity type is therefore a factor that should be taken into account in HRAs.

3.6 The potential for disturbance may be different in winter than in summer, in that there is often a smaller number of recreational users present on site. Furthermore, the impacts of disturbance at a population level may be reduced because birds are not breeding. However, recreational disturbance in winter may also be more impactful, because birds face seasonal food shortages and are likely to be sensitive to any nutritional loss. Therefore, the abandonment of suitable feeding areas due to disturbance can have serious consequences for their ability to find suitable alternative feeding sites.

3.7 Evans & Warrington[19] found that on Sundays total waterbird numbers (including shovelers and gadwalls) were 19% higher on Stocker's Lake LNR in Hertfordshire and attributed this to observed greater recreational activity on surrounding water bodies at weekends relative to weekdays displacing birds into the LNR. However, in this study, recreational activity was not quantified in detail, nor were individual recreational activities evaluated separately.

3.8 Tuite et al[20] used a large (379 sites), long-term (10-year) dataset (September – March species counts) to correlate seasonal changes in wildfowl abundance with the presence of various recreational activities. They determined that shovelers was one of the most sensitive species to recreational activities, such as sailing, windsurfing and rowing. Studies on recreation in the Solent have established that

[14] Gill, J.A., Sutherland, W.J. & Norris, K. 1998. The consequences of human disturbance for estuarine birds. *RSPB Conservation Review* 12: 67-72
[15] Clarke R.T., Liley D., Sharp J.M., Green R.E. 2013. Building development and roads: Implications for the distribution of stone curlews across the Brecks. PLOS ONE. doi:10.1371/journal.pone.0072984.
[16] Liley D., Clarke R.T. 2003. The impact of urban development and human disturbance on the numbers of nightjar *Caprimulgus europaeus* on heathlands in Dorset, England. Biological Conservation 114: 219-230.
[17] Banks P.B., Bryant J.Y. 2007. Four-legged friend or foe? Dog walking displaces native birds from natural areas. Biology Letters 3: 14pp.
[18] Miller S.G., Knight R.L., Miller C.K. 2001. Wildlife responses to pedestrians and dogs. 29: 124-132.
[19] Evans, D.M. & Warrington, S. 1997. The effects of recreational disturbance on wintering waterbirds on a mature gravel pitlake near London. International Journal of Environmental Studies 53: 167-182
[20] Tuite, C.H., Hanson, P.R. & Owen, M. 1984. Some ecological factors affecting winter wildfowl distribution on inland waters in England and Wales and the influence of water-based recreation. *Journal of Applied Ecology* 21: 41-62

human leisure activities cause direct disturbance to wintering waterfowl populations[21] [22].

3.9 A recent study on recreational disturbance on the Humber[23] assesses different types of noise disturbance on waterfowl referring to studies relating to aircraft (see Drewitt 1999[24]), traffic (Reijnen, Foppen, & Veenbaas 1997)[25], dogs (Lord, Waas, & Innes 1997[26]; Banks & Bryant 2007[27]) and machinery (Delaney et al. 1999; Tempel & Gutierrez 2003). These studies identified that there is still relatively little work on the effects of different types of water-based craft and the impacts from jet skis, kite surfers, windsurfers etc. (see Kirby et al. 2004[28] for a review). In very general terms, both distance from the source of disturbance and the scale of the disturbance (noise level, group size) will both influence the response (Delaney et al. 1999[29]; Beale & Monaghan 2005[30]). On UK estuaries and coastal sites, a review of WeBS data showed that, among the volunteer WeBS surveyors, driving of motor vehicles and shooting were the two activities most perceived to cause disturbance (Robinson & Pollitt 2002)[31].

3.10 Disturbing activities present themselves on a continuum. Generally, activities that involve irregular, infrequent and loud noise events, movement or vibration are likely to be the most disturbing. For example, the presence of dogs around waterbodies generate substantial disturbance due the areas accessed and their impact on bird behaviour. Birds are least likely to be disturbed by activities that involve regular, frequent, predictable and quiet patterns of sound, movement or vibration. The further any activity is from the birds, the less likely it is to result in disturbance. The factors that determine species responses to disturbance include species sensitivity, timing/duration of the recreational activity and the distance between source and receptor of disturbance.

3.11 Overall, the available baseline information suggests that the wintering waterfowl interest of the Arun Valley SPA / Ramsar is sensitive to recreational pressure because of the risk of disturbance. Any potential for an increase in recreational pressure due to the emerging Local Plan must therefore be investigated for the SPA / Ramsar. The following European Sites are considered to be sensitive to recreational pressure and are taken forward to the following chapters of the HRA:

- Arun Valley SPA and Ramsar site

3.12 The ramshorn snail (the reason for designation of Arun Valley SAC) is not vulnerable to recreational pressure. Ebernoe Common SAC and The Mens SAC

[21] Footprint Ecology. 2010. Recreational Disturbance to Birds on the Humber Estuary
[22] Footprint Ecology, Jonathan Cox Associates & Bournemouth University. 2010. Solent disturbance and mitigation project – various reports.
[23] Helen Fearnley Durwyn Liley and Katie Cruickshanks (2012) Results of Recreational Visitor Survey across the Humber Estuary produced by Footprint Ecology
[24] Drewitt, A. (1999) Disturbance effects of aircraft on birds. English Nature, Peterborough.
[25] Reijnen, R., Foppen, R. & Veenbaas, G. (1997) Disturbance by traffic of breeding birds: evaluation of the effect and considerations in planning and managing road corridors. Biodiversity and Conservation, 6, 567-581.
[26] Lord, A., Waas, J.R. & Innes, J. (1997) Effects of human activity on the behaviour of northern New Zealand dotterel Charadrius obscurus aquilonius chicks. Biological Conservation, 82,15-20.
[27] Banks, P.B. & Bryant, J.V. (2007) Four-legged friend of foe? Dog-walking displaces native birds from natural areas. Biology Letters, 3, 611-613.
[28] Kirby, J.S., Clee, C. & Seager, V. (1993) Impact and extent of recreational disturbance to wader roosts on the Dee estuary: some preliminary results. Wader Study Group Bulletin, 68, 53-58.
[29] Delaney, D.K., Grubb, T.G., Beier, P., Pater, L.L.M. & Reiser, H. (1999) Effects of Helicopter Noise on Mexican Spotted Owls. The Journal of Wildlife Management, 63, 60-76.
[30] Beale, C.M. & Monaghan, P. (2005) Modeling the Effects of Limiting the Number of Visitors on Failure Rates of Seabird Nests. Conservation Biology, 19, 2015-2019.
[31] Robinson, J.A. & Pollitt, M.S. (2002) Sources and extent of human disturbance to waterbirds in the UK: an analysis of Wetland Bird Survey data, 1995/96 to 1998/99: Less than 32% of counters record disturbance at their site, with differences in causes between coastal and inland sites. Bird Study, 49, 205.

are both designated for fauna that are potentially susceptible to disturbance. However, the nature of the interest features and the fact that they are not found at ground level makes them much less susceptible to the kind of casual recreational activities (e.g. dog walking) in which most people will engage than Arun Valley SPA/Ramsar. The Site Improvement Plans for both SACs identify 'disturbance' as a pressure, but this is clearly associated with the potential for increased lighting around the SAC due to development, rather than recreational footfall.

Background to Water Quality

3.13 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 available 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.

3.14 The main risk associated with the Horsham Local Plan is the discharge of treated sewage effluent from Wastewater Treatment Works (WwTWs) serving the District. This could increase the nutrient concentrations (specifically phosphorus) in the water feeding European Sites that are hydrologically linked to waterbodies that receive treated wastewater.

3.15 Much of Horsham District lies outside the River Arun surface water catchment but Horsham town itself is the largest settlement in the Arun Upper catchment, while West Chiltington lies in the Arun Lower catchment. Horsham WwTW and Pulborough WwTW both discharge to watercourses that feed the Arun catchments (although Pulborough as a settlement lies outside the Arun catchments). Overall, the following European Sites are considered to be sensitive to negative changes in water quality and are taken forward to the following chapters of the HRA:

- Arun Valley SAC/SPA/Ramsar site

Background to Water Quantity, Level and Flow

3.16 The unique nature of wetlands combines shallow water, high levels of nutrients and high primary productivity. These conditions are ideal for the growth of organisms at the basal level of food webs, which feed many species of birds, mammals, fish and amphibians. Overwintering and migrating wetland bird species are particularly reliant on these food sources, as they need to build up enough nutritional reserves to sustain their long migration routes.

3.17 Maintaining a steady water supply is of critical importance for many hydrologically dependent SPAs, SACs and Ramsars. For example, in many wetlands winter flooding is essential for sustaining a variety of foraging habitats for SPA / Ramsar wader and waterbird species. However, different species vary in their requirements for specific water levels. Splash and / or shallow flooding is required to provide suitable feeding areas and roosting sites for ducks and waders. In contrast, deeper flooding is essential to provide foraging habitats for Bewick's swans and other ducks.

3.18 Wetland habitats rely on hydrological connections with other surface waters, such as rivers, streams and lakes. A constant supply of water is fundamental to maintaining the ecological integrity of sites. However, while the natural fluctuation of water levels within narrow limits is desirable, excess or too little water supply might cause the water level to be outside of the required range of qualifying birds, invertebrate or plant species. This might lead to the loss of the structure and functioning of wetland habitats. There are two mechanisms through which urban development might negatively affect the water level in European Sites:

- The supply of new housing with potable water will require increased abstraction of water from surface water and groundwater bodies. Depending on the level of water stress in the geographic region, this may reduce the water levels in European Sites sharing the same catchment.

- The proliferation of impermeable surfaces in urban areas increases the volume and speed of surface water runoff. As traditional drainage systems often cannot cope with the volume of stormwater, sewer overflows are designed to discharge excess water directly into watercourses. Often this pluvial flooding results in downstream inundation of watercourses and the potential flooding of wetland habitats.

3.19 Specifically, the Site Improvement Plans for Arun Valley SAC/SPA/Ramsar identify inappropriate water levels as threats to the respective sites. Increases to the quantity and rate of water delivery can result in summer flooding and prolonged / deeper winter flooding. This in turn results in the reduction of feeding and roosting sites for birds and be harmful to the ramshorn snail, which has very specific water level requirements.

3.20 The emerging Local Plan could result in changes to the water quantity, level and flow in the catchment of the River Arun European sites if it required additional abstraction from such sites or the continuance of existing damaging abstraction. This could alter the water level within the designated sites themselves with potential cascading effects on qualifying species. Overall, the following European Sites are considered to be sensitive to changes in water quantity, level and flow and are taken forward to the following chapters of the HRA:

- Arun Valley SAC/SPA/Ramsar site

Background to Loss of Functionally Linked Habitat

3.21 While most European sites have been geographically defined to encompass the key features that are necessary for coherence of their structure and function, and the support of their qualifying features, this is not necessarily the case. A diverse array of qualifying species including birds, bats and amphibians are not always confined to the boundary of designated sites.

3.22 For example, the highly mobile nature of both wader and waterfowl species implies that areas of habitat of crucial importance to the maintenance of their populations are outside the physical limits of European sites. Despite not being designated, these habitats are integral to the maintenance of the structure and function of the designated site and, therefore, land use plans that may affect such functionally linked habitat require further assessment.

3.23 There is now an abundance of authoritative examples of HRA cases on plans affecting bird populations, where Natural England recognised the potential importance of functionally linked land[32]. For example, bird surveys in relation to a previous HRA established that approximately 25% of the golden plover population in the Somerset Levels and Moors SPA were affected while on functionally linked land, and this required the inclusion of mitigation measures in the relevant plan policy wording. Another important case study originates from the Mersey Estuary SPA / Ramsar, where adjacently located functionally linked land had a peak survey count of 108% of the 5 year mean peak population of golden plover. Similar to the above example, this led to considerable amendments in the planning proposal to ensure that the site integrity was not adversely affected.

3.24 Generally, the identification of an area as functionally linked habitat is not always a straightforward process. The importance of non-designated land parcels may not be apparent and require the analysis of existing data sources to be firmly established. In some instances, data may not be available at all, requiring further survey work.

Arun Valley SPA and Ramsar

1.1 Over winter the Arun Valley supports 115 Bewick's swans, representing approximately 1.6% of Britain's migratory population[33]. The Bewick's swan is a highly migratory bird species that spends summer in Russia. However, during the autumn months these swans migrate to northern Europe where they feed upon a diet of grasses, sedges and aquatic plants. The Arun Valley consists of mixed wet grasslands that provides optimal over wintering habitat for these species. In addition, much of the wider surrounding area of Arun consists of floodplain grazing marsh due to the periodic flooding of the River Arun; also supporting suitable over wintering grounds. The Bewick's swan has seen recent declines of 27% from 1995 to 2005[34] with national trends indicating continual

[32] Chapman C & Tyldesley D. 2016. Functional linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects – A review of authoritative decisions. Natural England Commissioned Reports 207: 73pp.
[33] JNCC (2001) SPA Description: Arun Valley (www.jncc.defra.gov.uk)
[34] Rees, E.C. & Beekman, J. Submitted. Bewick's Swan: a population in decline. British Birds.

declines. Preservation of significant habitat for Bewick's swan, whether it occurs within or outside the SPA and Ramsar site boundary is therefore essential.

1.2 The Arun Valley SPA and Ramsar site is designated for its wintering population of Bewick's swan. It is widely accepted[35] that Bewick's swans frequently feed on suitable farmland up to **5km** from the designated site. As such, suitable fields within 5km of the SPA could constitute important supporting habitat if they support a large enough percentage of the SPA population on a regular basis. Bewick swan feed during the day on pastures within the SPA or at a range of sites to the south of the SPA, between Arundel and Amberley. However, Bewick's swans will fly up to 10km from their roost sites to feed.

1.3 Within the Local Plan HRA for adjacent Arun District (2017) two impact risk zones were identified:

- **Impact Risk Zone 1** – where development is likely to have adverse impact to over wintering foraging habitats of migrant bird species[36]. As such comprehensive ornithological studies must be conducted within proposed development sites before planning permission is granted.
- **Impact Risk Zone 2** – this is a 500m buffer beyond zone 1 and is where functionally linked habitat is present and loss of such could therefore impact over wintering bird populations.

The Mens SAC and Ebernoe Common SAC

3.25 Ebernoe Common SAC and The Mens SAC are designated for their populations of rare bats; Bechstein's and barbastelle. Bats are not expected to be confined to the boundaries of European Sites and are anticipated to forage within the wider vicinity of their Core Sustenance Zone (CSZ). For example, in a 2001 study, female adult Bechstein's bats regularly undertook commuting distances of up to 1km[37]. A second radio-tracking study in 2002 of Ebernoe Common SAC, showed that the maximum distance travelled by tagged individuals was 1,407m, with an average of 735.7m[38]. For Bechstein's it is reasonable to assume that the core foraging areas around the Ebernoe Common SAC and The Men's SAC, for which they are designated, is likely to be within c.1km of each site boundary.

3.26 Barbastelle bats are known to travel substantial distances from their roots to feeding sites. A study on barbastelle bats determined that home range distances show considerable inter-individual differences, with bats traveling between 1 and 20km to reach their foraging areas[39]. In 2016, the Bat Conservation Trust published guidelines on how to determine CSZs for bats and highlighted that barbastelles have a mean maximum CSZ of 6.47km[40].

[35] Whilst there is no formal publication confirming this, from discussions with the Royal Society for the Protection of Birds (RSPB), Wildfowl and Wetland Trust (WWT) and Natural England (NE) on other projects it has been established that Bewick's Swan often use habitat up to 5km from the designated site for foraging in the winter months. As such 5km has been defined as a zone within which likely significant effects could result from loss of supporting habitat.
[36] https://data.gov.uk/dataset/5ae2af0c-1363-4d40-9d1a-e5a1381449f8/sssi-impact-risk-zones [Accessed: 20/09/2018]
[37] Kerth G., Wagner M. & Koenig B. 2001. Roosting together, foraging apart: Information transfer about food is unlikely to explain sociality in female Bechstein's bats (*Myotis bechsteinii*). Behavioural Ecology and Sociobiology 50: 283-291.
[38] Fitzsimmons P., Hill D., Greenaway F. (2002). Patterns of habitat use by female Bechstein's bats (*Myotis bechsteinii*) from a maternity colony in a British woodland.
[39] Zeale M.R.K., Davidson-Watts I. & Jones G. (2012). Home range use and habitat selection by barbastelle bats (*Barbastella barbastellus*): Implications for conservation. Journal of Mammalogy 93: 1110-1118.
[40] Bat Conservation Trust. (2016). Coe Sustenance Zones: Determining zone size. Available at https://cdn.bats.org.uk/pdf/Resources/Core_Sustenance_Zones_Explained_04.02.16.pdf?mtime=20190219173135 [Accessed on the 14/10/2019].

3.27 As a precaution, Natural England and South Downs National Park Authority have since agreed a Sussex Bat Protocol[41], which identifies a maximum 12km zone around the Sussex bat SACs (Ebernoe Common SAC, The Mens SAC and Singleton & Cocking Tunnels SAC) in which HRAs investigating habitat fragmentation are required. This is based on the furthest distance from the first two SACs at which foraging bats were radio-tracked. The protocol identifies two key impact zones surrounding the three bat SACs as follows:

- 6.5km: Key conservation area – all impacts assessed;
- 12km: Wider conservation area – significant impacts or severance to flightlines to be considered

3.28 The 6.5 km includes the key conservation area in which all impacts must be considered as habitats within this zone are considered critical for sustaining the populations of bats within the SACs. Horsham District lies more than 12km from Singleton and Cocking Tunnels SAC but lies within 12km of Ebernoe Common SAC and within 6.5km of The Mens SAC.

3.29 Therefore, the following European Sites are taken forward into the following chapters:

- Arun Valley SPA / Ramsar
- The Mens SAC
- Ebernoe Common SAC

Background to Atmospheric Pollution

3.30 The main pollutants of concern for European sites are oxides of nitrogen (NOx), ammonia (NH_3) and sulphur dioxide (SO_2), and are summarised in Table 1. Ammonia can have a directly toxic effect upon vegetation, particularly at close distances to the source such as near road verges[42]. NOx can also be toxic at very high concentrations (far above the annual average critical level). However, in particular, high levels of NOx and NH_3 are likely to increase the total N deposition to soils, potentially leading to deleterious knock-on effects in resident ecosystems. Increases in nitrogen deposition from the atmosphere is widely known to enhance soil fertility and to lead to eutrophication. This often has adverse effects on the community composition and quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats[43] [44].

[41] South Downs National Park Authority/ Natural England (2017). Sussex Bat Special Area of Conservation Planning and Landscape Scale Enhancement Protocol. Final Draft
[42] http://www.apis.ac.uk/overview/pollutants/overview_NOx.htm.
[43] Wolseley, P. A.; James, P. W.; Theobald, M. R.; Sutton, M. A. **2006.** Detecting changes in epiphytic lichen communities at sites affected by atmospheric ammonia from agricultural sources. Lichenologist 38: 161-176
[44] Dijk, N. **2011.** Dry deposition of ammonia gas drives species change faster than wet deposition of ammonium ions: evidence from a long-term field manipulation Global Change Biology 17: 3589-3607

Table 1: Main sources and effects of air pollutants on habitats and species[45]

Pollutant	Source	Effects on habitats and species
Sulphur Dioxide (SO_2)	The main sources of SO_2 are electricity generation, and industrial and domestic fuel combustion. However, total SO_2 emissions in the UK have decreased substantially since the 1980's. Another origin of sulphur dioxide is the shipping industry and high atmospheric concentrations of SO_2 have been documented in busy ports. In future years shipping is likely to become one of the most important contributors to SO_2 emissions in the UK.	Wet and dry deposition of SO_2 acidifies soils and freshwater and may alter the composition of plant and animal communities. The magnitude of effects depends on levels of deposition, the buffering capacity of soils and the sensitivity of impacted species. However, SO_2 background levels have fallen considerably since the 1970's and are now not regarded a threat to plant communities. For example, decreases in Sulphur dioxide concentrations have been linked to returning lichen species and improved tree health in London.
Acid deposition	Leads to acidification of soils and freshwater via atmospheric deposition of SO_2, NOx, ammonia and hydrochloric acid. Acid deposition from rain has declined by 85% in the last 20 years, which most of this contributed by lower sulphate levels. Although future trends in S emissions and subsequent deposition to terrestrial and aquatic ecosystems will continue to decline, increased N emissions may cancel out any gains produced by reduced S levels.	Gaseous precursors (e.g. SO_2) can cause direct damage to sensitive vegetation, such as lichen, upon deposition. Can affect habitats and species through both wet (acid rain) and dry deposition. The effects of acidification include lowering of soil pH, leaf chlorosis, reduced decomposition rates, and compromised reproduction in birds / plants. Not all sites are equally susceptible to acidification. This varies depending on soil type, bed rock geology, weathering rate and buffering capacity. For example, sites with an underlying geology of granite, gneiss and quartz rich rocks tend to be more susceptible.
Ammonia (NH_3)	Ammonia is a reactive, soluble alkaline gas that is released following decomposition and volatilisation of animal wastes. It is a naturally occurring trace gas, but ammonia concentrations are directly related to the distribution of livestock. Ammonia reacts with acid pollutants such as the products of SO_2 and NO_X emissions to produce fine ammonium (NH_4+) - containing aerosol. Due to its significantly longer lifetime, NH_4+ may be transferred	The negative effect of NH_4+ may occur via direct toxicity, when uptake exceeds detoxification capacity and via N accumulation. Its main adverse effect is eutrophication, leading to species assemblages that are dominated by fast-growing and tall species. For example, a shift in dominance from heath species (lichens, mosses) to grasses is often seen. As emissions mostly occur at ground level in the rural environment and NH_3

[45] Information summarised from the Air Pollution Information System (http://www.apis.ac.uk/)

Pollutant	Source	Effects on habitats and species
	much longer distances (and can therefore be a significant trans-boundary issue). While ammonia deposition may be estimated from its atmospheric concentration, the deposition rates are strongly influenced by meteorology and ecosystem type.	is rapidly deposited, some of the most acute problems of NH_3 deposition are for small relict nature reserves located in intensive agricultural landscapes.
Nitrogen oxides (NO_x)	Nitrogen oxides are mostly produced in combustion processes. Half of NO_X emissions in the UK derive from motor vehicles, one quarter from power stations and the rest from other industrial and domestic combustion processes. Nitrogen oxides have been consistently falling for decades due to a combination of coal fired power station closures, abatement of other combustion point sources and improved vehicle emissions technology. They are expected to continue to fall over the plan period.	Direct toxicity effects of gaseous nitrates are likely to be important in areas close to the source (e.g. roadside verges). A critical level of NOx for all vegetation types has been set to 30 ug/m3. Deposition of nitrogen compounds (nitrates (NO_3), nitrogen dioxide (NO_2) and nitric acid (HNO_3)) contributes to the total nitrogen deposition and may lead to both soil and freshwater acidification. In addition, NO_x contributes to the eutrophication of soils and water, altering the species composition of plant communities at the expense of sensitive species.
Nitrogen deposition	The pollutants that contribute to the total nitrogen deposition derive mainly from oxidized (e.g. NO_X) or reduced (e.g. NH_3) nitrogen emissions (described separately above). While oxidized nitrogen mainly originates from major conurbations or highways, reduced nitrogen mostly derives from farming practices. The N pollutants together are a large contributor to acidification (see above).	All plants require nitrogen compounds to grow, but too much overall N is regarded as the major driver of biodiversity change globally. Species-rich plant communities with high proportions of slow-growing perennial species and bryophytes are most at risk from N eutrophication. This is because many semi-natural plants cannot assimilate the surplus N as well as many graminoid (grass) species. N deposition can also increase the risk of damage from abiotic factors, e.g. drought and frost.
Ozone (O_3)	A secondary pollutant generated by photochemical reactions involving NOx, volatile organic compounds (VOCs) and sunlight. These precursors are mainly released by the combustion of fossil fuels (as discussed above). Increasing anthropogenic emissions of ozone precursors in the UK have led to an increased number of days when ozone levels rise above 40ppb ('episodes' or	Concentrations of O_3 above 40 ppb can be toxic to both humans and wildlife and can affect buildings. High O_3 concentrations are widely documented to cause damage to vegetation, including visible leaf damage, reduction in floral biomass, reduction in crop yield (e.g. cereal grains, tomato, potato), reduction in the number of flowers, decrease in forest

Pollutant	Source	Effects on habitats and species
	'smog'). Reducing ozone pollution is believed to require action at international level to reduce levels of the precursors that form ozone.	production and altered species composition in semi-natural plant communities.

3.31 Sulphur dioxide emissions overwhelmingly derive from power stations and industrial processes that require the combustion of coal and oil, as well as (particularly on a local scale) shipping[46]. Ammonia emissions originate from agricultural practices[47], with some chemical processes also making notable contributions. As such, it is unlikely that material increases in SO_2 or NH_3 emissions will be associated with the emerging HLP.

3.32 In contrast, NOx emissions are dominated by the output of vehicle exhausts (more than half of all emissions). A 'typical' housing development will contribute by far the largest portion to its overall NOx footprint (92%) through its associated road traffic. Other sources, although relevant, are of minor importance (8%) in comparison[48]. The emerging HLP, which will result in an increase in Horsham District's population, can therefore be reasonably expected to increase emissions of NOx through an increase in vehicular traffic.

3.33 According to the World Health Organisation, the critical NOx concentration (critical threshold) for the protection of vegetation is 30 μgm^{-3}; the threshold for sulphur dioxide is 20 μgm^{-3}. In addition, ecological studies have determined 'critical loads'[49] of atmospheric nitrogen deposition (that is, NOx combined with ammonia NH_3).

3.34 According to the Department of Transport's Transport Analysis Guidance, beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is insignificant (Figure 3 and see reference [50]). This is therefore the distance that has been used throughout this HRA to identify major commuter routes along European Sites, which are likely to be significantly affected by development outlined in the HLP.

3.35 Overall, an increase in the net population and employment opportunities within Horsham District will result in more inward and outward commuter traffic. For completeness, a change in the number of two-way vehicle trips through or within 200m of the following SACs is investigated. The following sites are taken forward to the following chapters of the HRA:

- The Mens SAC
- Ebernoe Common SAC
- Duncton to Bignor Escarpment SAC

[46] http://www.apis.ac.uk/overview/pollutants/overview_SO2.htm.
[47] Pain, B.F.; Weerden, T.J.; Chambers, B.J.; Phillips, V.R.; Jarvis, S.C. 1998. A new inventory for ammonia emissions from U.K. agriculture. Atmospheric Environment 32: 309-313
[48] Proportions calculated based upon data presented in Dore CJ et al. 2005. UK Emissions of Air Pollutants 1970 – 2003. UK National Atmospheric Emissions Inventory. http://www.airquality.co.uk/archive/index.php
[49] The critical load is the rate of deposition beyond which research indicates that adverse effects can reasonably be expected to occur
[50] http://www.dft.gov.uk/webtag/documents/expert/unit3.3.3.php#013; accessed 12/05/2016

- Ashdown Forest SAC

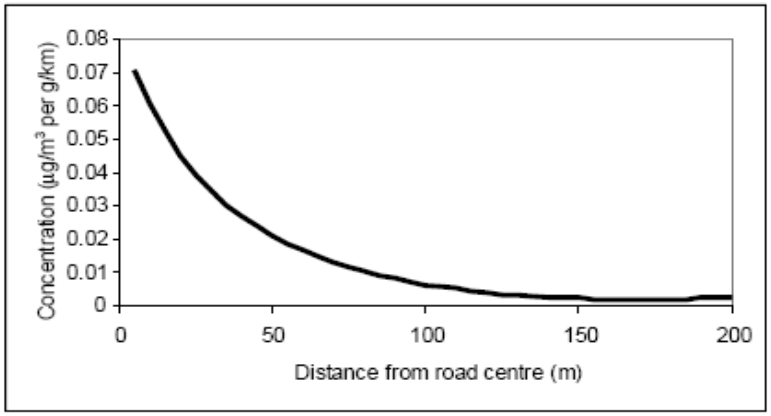

Figure 3: Traffic contribution to concentrations of pollutants at different distances from a road (Source: DfT[51])

[51] http://www.dft.gov.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf; accessed 13/07/2018

4. Screening for Likely Significant Effects (LSEs)

Recreational Pressure

Arun Valley SPA/Ramsar site

4.1 The component parts of the SPA/Ramsar site are Pulborough Brooks SSSI, Waltham Brooks SSSI and Amberley Wild Brooks SSSI. All of these are within the South Downs National Park and the Horsham Local Plan will not be allocating sites within the National Park. However, the settlement of Pulborough is within 300m of Pulborough Brooks SSSI at its closest, West Chiltington is just over 1km to the east of the same SSSI and Storrington is 2.5km east of Amberley Wild Brooks SSSI.

4.2 Although disturbance is therefore a theoretical potential pathway for this SPA/Ramsar site, it is not noted as a concern or priority for action in Natural England's Site Improvement Plan. This is presumably because two of the most potentially sensitive parts of the SPA (Amberley Wild Brooks SSSI and Pulborough Brooks SSSI) are managed by the RSPB. Unlike many other RSPB reserves, recreational visitors are not encouraged to Amberley Wild Brooks SSSI because of the sensitivity of the site, and the site is not designed or promoted to attract visitors. Access within the site is severely restricted specifically in order to ensure that disturbance is not possible. Access is therefore restricted to the Wey South Path.

4.3 Pulborough Brooks SSSI is open to the public under normal circumstances but access is well-managed with a network of hides and prohibitions on dogs in the most sensitive areas. Whilst a single Public Right of Way passes through the site from the village of Pulborough (in the north) to Wiggonholt and the RSPB visitor centre (in the south), the site is located approximately 0.6km from the village itself. Additionally, parking provision and access to the site is not advertised from the village of Pulborough. It is likely that the majority of visitors will access the site from the RSPB car park visitor centre as access is publicly advertised and managed from this location. With the exception of RSPB members, a per visit charge is in place and the limited parking provision will also limit the number of casual walkers.

4.4 Moreover, there are ample areas of alternative attractive natural greenspace already available to residents of Storrington and West Chiltington: Rackham Hill (located within the South Downs National Park) is the closest landmark, Parham Park SSSI lies between Storrington and Amberley Wild Brooks SSSI, while Hurston Warren SSSI lies between West Chiltington and the same SSSI.

4.5 Consultation comments from both the Coldwaltham Meadows Conservation Trust and the Sussex Wildlife Trust to the South Downs Local Plan HRA did identify concerns regarding recreational pressure on the Waltham Brooks SSSI component of the SAC, SPA and Ramsar site. The primary risk here would be an increase in visitor pressure (particularly involving dog walkers) disturbing grazing livestock which are used to manage the Waltham Brooks SSSI, the condition of

which is 'Recovering'. However, this part of the SPA is a minimum of 2.5km from the closest settlement in Horsham District (excluding those within the National Park) and residents would need to bypass Pulborough Brooks SSSI in order to visit the much smaller Waltham Brooks SSSI. The HRA for the adopted Horsham Core Strategy HRA scoped out recreational pressure as an impact pathway.

4.6 The principal other plans and projects of relevance to development around the Arun Valley SAC/SPA/Ramsar site are the Local Plans for South Downs National Park and to a lesser extent Arun and Adur districts. The HRA of the adopted South Downs National Park Local Plan considered recreational pressure from these local authorities collectively (including Horsham District). Horsham has its Horsham District Planning Framework which provides for 16,000 new dwellings during its Plan period, while both Adur and Arun have begun preparation of their new Local Plans which provide for an increase in dwelling provided during their Plan periods (Adur are currently providing for 3,609 new dwellings during its Plan period, whilst Arun are providing for approximately 18,700 new dwellings during its emerging Plan period), thus resulting in a potential increase of approximately 38,300 new dwellings within the three surrounding Authorities.

4.7 The HRAs for the Arun, South Downs and Adur Local Plans all considered that there would be no likely significant effects on Arun Valley SAC, SPA and Ramsar site 'in combination' with each other and growth in Horsham.

4.8 **It is therefore considered that a conclusion of no likely significant effect can be drawn regarding this impact pathway.**

Duncton to Bignor Escarpment SAC

4.9 This site lies 2.5km from the Horsham District boundary. However, that part of Horsham is in the South Downs National Park and Horsham District Council will therefore not be allocating any dwellings in that location. The nearest location where allocations are likely to be made is Pulborough, which is almost 8km from the SAC and has no direct easy road access to the SAC such that the trip by car from Pulborough to the SAC is closer to 14km. **Given the distance separating relevant Horsham settlements from the SAC it is considered that likely significant effects can be reasonably dismissed.**

Water Quality

Arun Valley SAC/SPA/Ramsar

4.10 Natural England's Site Improvement Plan[52] for the Arun Valley SAC and SPA identifies that features for designation are known to be vulnerable to changes in water quality from siltation and nutrient inputs. The Water Framework Directive (WFD)[53] for the Arun and Stor (a tributary to the Arun) have identified that they are failing on phosphate levels. The failure on phosphate levels is directly linked to point source pollution from a sewage treatment works (STW) upstream of the site. Siltation on the other hand is primarily due to agricultural runoff rather than point sources. The main source of phosphate is from Marehill STW but other smaller STWs may make a small contribution.

[52] Natural England Site Improvement Plan Arun Valley (2014) http://publications.naturalengland.org.uk/file/5185212862431232
[53] https://environment.data.gov.uk/catchment-planning/WaterBody/GB107041012100 [accessed 03/12/2020]

4.11 This issue (the potential for an effect from increased volume of treated sewage effluent) was considered in the HRA of the Southern Water WRMP, which stated that: '*Detailed water quality assessment previously undertaken identified that the River Rother had the best water quality of the major tributaries entering the tidal Arun, with the River Stor having relatively poorer water quality; treated effluent from Horsham WwTW also results in lower water quality entering from the Upper Arun*.'

4.12 The following policies have the potential to link the Plan to the Arun Valley designated sites via water quality because they will increase the volume of wastewater produced in the District:

- Strategic Policy 4 - Horsham Town
- Strategic Policy 5: Broadbridge Heath Quadrant
- Strategic Policy 6: New Employment
- Strategic Policy 7: Enhancing Existing Employment
- Strategic Policy 11 - Tourism Facilities and Visitor Accommodation
- Strategic Policy 14 - Housing Provision
- Strategic Policy 20 - Gypsy, Traveller and Travelling Showpeople Accommodation

4.13 The following residential site allocations have the potential to link the Plan to the Arun Valley designated sites via water quality because wastewater produced is likely to discharge to a Wastewater Treatment Works that ultimately drain into the Arun catchment:

- CW1: Land at Brook Hill & Cowfold Glebe
- CW2: Field West of Cowfold, North of A272
- CW3: Fields West of Cowfold, South of A272/Field W of Cowfold, S of A272, W of Little Potters
- HOR1: Land at Hornbrook Farm
- BGR1: Land South of Smugglers Lane
- BGR2: Land South of Muntham Drive
- BGR3: Land at Slaughterford Farm (Sumners Pond)
- BRH1: Land at Lower Broadbridge Farm
- BRH2: Land at Wellcross
- PLB1: Land at Greendene
- PLB2: Land at New Place Farm)
- PLB3: Land at Highfields
- RD1: Land North of Guildford Road, Bucks Green
- RD2: The former Pig Farm, Bucks Green
- CH1: Land at The Warren
- STO1: Land to the north of Melton Drive/

- STO2: Land at Rock Road (Thakeham Parish)
- TH1: Land North of High Bar Lane
- TH2: Land west of Stream House
- WRN1: Land south of Bell Road
- WCH1: Land at Hatches Estate
- WCH2: Land West of Smock Alley, S of Little Haglands
- WCH3: Land East of Hatches House
- HOR2: Land Around Mercer Road, Warnham Station
- Policy HA2: Land at Buck Barn
- Policy HA3: Land East of Billingshurst
- Policy HA6: Land West of Southwater
- FAY1: Land West of Kilnwood Vale

4.14 The Environment Agency undertook a Review of Consent Process (RoC) that examined whether consents needed to be tightened to protect the European sites and, where necessary, required the water company to make improvements (called sustainability reductions). Several of the Wastewater Treatment Works (WwTW) that provide wastewater treatment for Horsham District that ultimately discharge to the Arun were identified to have their phosphorous permits tightened to address the issue of elevated phosphate in the Arun. These were Horsham WTW (permit to be tightened from 1mg/l to 0.25mg/l annual average), Warnham WTW (permit to be tightened from 1mg/l to 0.5mg/l annual average), Rudgwick WTW (permit to be introduced at 0.4mg/l annual average), and Storrington WTW (permit to be introduced at 0.5mg/l annual average)[54]. Since the wastewater treatment standards of the relevant Sewage Treatment Works are already being tightened to protect the Arun Valley international sites from excessive phosphate loading the Horsham District Local Plan is screened out at this time.

4.15 However, it is noted that Natural England are in the process of reviewing the site condition assessments for the Arun Valley designated sites, and it may be that in the future the issue of increased phosphate levels within the Arun Valley as a result of the Horsham Local Plan will require further consideration as part of a Local Plan Review exercise (required by law every five years from plan adoption). To allow the Council to future-proof the Local Plan a 'horizon scanning' notes that includes nutrient neutrality calculations for phosphorous has been undertaken (provided in **Appendix D**). This also includes a variety of potential avoidance strategies and solutions for the Council to explore.

Water Quantity, Level and Flow

Arun Valley SAC / SPA / Ramsar

4.16 Excessive changes to the hydrological integrity, such as through effects on water flow and volume, of European Sites are most likely to be the consequence of

[54] https://data.gov.uk/dataset/a1b25bcb-9d42-4227-9b3a-34782763f0c0/water-industry-national-environment-programme [accessed 11/12/2020]

increased water abstraction for the public water supply and surface water run-off from impermeable urban surfaces.

4.17 The Arun Valley SAC is designated for its population of ram's-horn snails and Natural England's Site Improvement Plan highlights that a maintenance of adequate water levels (0.3cm below ditch neck) is critical to the survival and migration of this species. Furthermore, the Ramsar is designated for its outstanding assemblage of wetland plants and invertebrates, all of which depend on appropriate water levels throughout at least parts of their life cycle. The SAC has a relatively narrow hydrological catchment and its water level is primarily maintained by a few key rivers that traverse the plain.

4.18 Natural England have told Horsham Council that they are very concerned about the Hardham groundwater abstraction (a key part of the Southern Water supply strategy for Horsham during certain conditions) and the effect they think it has on water levels/flows in the Arun Valley SAC and Ramsar site. Natural England provided interim advice to Southern Water (December 2020) that identified that the existing Hardham abstraction could provide likely significant effects on the Amberley Wild Brooks SSSI part of the Arun Valley internationally designated site. In addition, Natural England could not conclude no adverse effects on the integrity with regards to the Pulborough Brooks SSSI part of the internationally designated site[55]. The interim advice identified that the SAC feature (ramshorn snail) was no longer present at Amberley Wild Brooks and despite conservation efforts was declining at Pulborough Brooks SSSI. A decline in the extent of aquatic plant populations in the North and South (but not Middle) Brooks was also noted. As such, Natural England have advised Horsham that '*The Environment Agency and Natural England are working with Southern Water to try to identify a long term more sustainable water supply. In the meantime, whilst the adverse effect remains or is uncertain, development in Horsham must be certain not to add to this adverse effect'*. They then refer the Council to '…*studies such as the Gatwick Sub Regional water cycle study regarding this issue. For example, the study cites the requirement to demonstrate water neutrality in order for sufficient water to be available to the district'*.

4.19 Given this evidence, Likely Significant Effects of the Local Plan on the Arun Valley SAC / SPA/ Ramsar regarding water quantity, level and flow cannot be excluded. The site is screened in for Appropriate Assessment.

4.20 Whilst individual site allocations would not result in likely significant effects in isolation, in combination with each other and other projects and plans they have the potential to result in adverse effects in the integrity of the SPA.

4.21 The following policies are screened in because they will increase the demand for clean drinking water within Horsham District:

- Strategic Policy 4 - Horsham Town
- Strategic Policy 5: Broadbridge Heath Quadrant
- Strategic Policy 6: New Employment
- Strategic Policy 7: Enhancing Existing Employment

[55] The interim report as identified that the Hardham abstraction would not impact the Waltham Brooks SSSI part of the internationally designated site because the SSSI is is entirely located on Marehill Clay and does not have any connectivity to the Folkestone Beds within which the abstraction is located. As such there is no linking impact pathway present.

- Strategic Policy 11 - Tourism Facilities and Visitor Accommodation
- Strategic Policy 14 - Housing Provision
- Strategic Policy 20 - Gypsy, Traveller and Travelling Showpeople Accommodation

4.22 This impact pathway cannot be screened out and is subject to Appropriate Assessment in the following chapter.

Loss of Functionally Linked Habitat

Arun Valley SPA / Ramsar

4.23 The Arun Valley SPA / Ramsar is designated for several mobile waterfowl and wader species, which are known to depend on habitats beyond the designated site boundary (known as functionally linked habitat). This particularly applies to Bewick's swans *Cygnus columbianus bewickii*, which routinely forage in agricultural land parcels up to 5km from their core wetlands and can do so up to 10km from European Sites. Natural England's Supplementary Conservation Advice Note specifies that maintaining the extent and distribution of supporting habitat for the non-breeding season does also '*apply to supporting habitat which also lies outside the site boundary*'. Therefore, the remainder of this section assesses potential functionally linked habitat parcels within Horsham District that may be affected by the emerging HLP.

4.24 Generally, development plans may lead to the loss of functionally linked habitat (mainly winter foraging resources) through the allocation of greenfield sites (e.g. grassland, agricultural stubble / cereals), meaning that qualifying species have to compete for dwindling forage. There are a cluster of settlements within Horsham District in the 5km zone around the SPA/Ramsar site including Pulborough, West Chiltington, Thakeham, Storrington and Abingworth. Development within the built-up areas of these settlements would not affect the availability of functionally-linked land, but greenfield development beyond the boundaries could do so if it resulted in the loss of farmland areas large enough to support a significant proportion (i.e. 1% of more) of the SPA/Ramsar population of Bewick swan (i.e. generally 2ha in size and upwards) and with suitably clear sightlines.

4.25 Section 3 mentions the Impact Risk Zones (an inner zone and an outer zone) that are being used by Arun District Council in their Local Plan HRA. Review of the underlying SSSI Impact Risk Zones online indicates that Impact Risk Zone 2 extends to about 6.5km from the SPA / Ramsar.

4.26 The following site allocations are located within 6.5km from the SPA / Ramsar site and currently occupy greenfield plots of more than 2ha in size (see **Appendix C1** for locations):

- PLB2: Land at New Place Farm) (10.16ha)
- ASN1: Land at Church Farm Cluster, Ashington (9.4ha)
- ASN2: Land South of Rectory Lane, Ashington (2.2ha)
- STO1: Land to the north of Melton Drive (5.4ha)
- STO2: Land at Rock Road (Thakeham Parish) (3.6ha)

- WCH1: Land West of Smock Alley, S of Little Haglands (2.5ha)
- EM6: Land South of Broomers Hill Park (2.7ha)

4.27 Therefore, likely significant effects from this pathway cannot be dismissed and an Appropriate Assessment is required.

4.28 In particular, the following policies are screened in because they could increase the amount of greenfield development within the south-west corner of Horsham District:

- Strategic Policy 4 - Horsham Town
- Strategic Policy 5: Broadbridge Heath Quadrant
- Strategic Policy 6: New Employment
- Strategic Policy 7: Enhancing Existing Employment
- Strategic Policy 10 - Equestrian Development
- Strategic Policy 11 - Tourism Facilities and Visitor Accommodation
- Strategic Policy 14 - Housing Provision
- Strategic Policy 20 - Gypsy, Traveller and Travelling Showpeople Accommodation

The Mens SAC and Ebernoe Common SAC

4.29 The Mens SAC is owned and managed by Sussex Wildlife Trust. The Mens SAC is important for its barbastelle populations and radio-tracking studies have been undertaken to identify core foraging areas. These reports have identified that the barbastelles of The Mens SAC forage to the east of the SAC, principally on the floodplain of the River Arun from close to Horsham in the north to Parham in the south. They also cross to the Adur floodplain. In some cases, the bats travelled up to 12.2km to visit foraging areas[56]. The currently available radio-tracking evidence indicates that 75% of the bat population forage within 9km of the SAC although it is conceivable for barbastelle bats of the SAC to use a wider area for activities such as migrating between hibernation roosts and summer roosts.

4.30 Much of the western half of Horsham District, roughly the area west of the A24 as far south as Storrington and as far north as Horsham, lies within 12km of The Mens SAC. The western-most area also lies within 12km of Ebernoe Common SAC. This includes the settlements of Billingshurst, Pulborough, West Chiltington and Storrington. Development within the built-up areas of any of the settlements or villages within this zone is unlikely to materially interfere with commuting or foraging opportunities for barbastelle bats associated with either SAC. However, greenfield development in this part of the District could have an adverse effect if it led to the net loss of linear features in pastoral landscapes including deciduous woodland, wet meadows and waterbodies[57]. Even if it did not lead to their loss but failed to provide an adequate physical buffer zone against construction and operational lighting (for example), it could still result in an adverse effect.

[56] Greenaway, F. (2008) Barbastelle bats in the Sussex West Weald 1997 - 2008
[57] http://www.bats.org.uk/data/files/Species_Info_sheets/barbastelle_11.02.13.pdf [accessed 08/02/2018]

4.31 The following site allocations are located within 12km of The Mens SAC and Ebernoe Common SAC:

4.32 Site Allocations located within 6.5km of The Mens SAC:

- Policy HA3: Land East of Billingshurst
- EM6: Land South of Broomers Hill Park
- EM3: Land at Hilland Farm South, Billingshurst
- PLB1: Stane Street and Green Dene Nurseries, Pulborough
- PLB2: Land at New Place Farm, Pulborough
- PLB3: Land at Highfields, Pulborough
- SA830 - Land Opposite Broomers Hill Park

4.33 Site Allocations located between 6.5km and 12km from The Mens SAC:

- BGR1: BG Land adjacent to Smugglers Lane, Barns Green
- TH1: Land North of High Bar Lane
- WCH1: Land at Hatches Estate, West Chiltington
- ASN1: Land at Church Farm Cluster, Ashington
- STO1: Land to the North of Melton Drive, Storrington
- STO2: Land at Rock Road (Thakeham Parish)
- BGR2: Land South of Muntham Drive, Barns Green
- WCH2: Land West of Smock Alley,West Chiltington
- WCH3: Land to east of Hatches House
- ASN2: Land South of Rectory Lane, Ashington
- TH2: Land West of Stream HouseBGR3: Land at Slaughterford Farm

4.34 Site Allocations located within 12km of Ebernoe Common SAC:

- Policy HA3: Land East of Billingshurst
- EM6: Land South of Broomers Hill Park
- EM9: Land at Hilland Farm South, Billingshurst
- PLB1: Stane Street and Green Dene Nurseries, Pulborough
- PLB2: Land at New Place Farm, Pulborough
- PLB3: Land at Highfields, Pulborough
- RD1: Land North of Guildford Road, Bucks Green
- RD2: The former Pig Farm, Bucks Green
- SA830 - Land Opposite Broomers Hill Park

4.35 In addition, the following policies are screened in because they could increase the amount of greenfield development west of the A24 in Horsham District:

- Strategic Policy 4 - Horsham Town

- Strategic Policy 5: Broadbridge Heath Quadrant
- Strategic Policy 6: New Employment
- Strategic Policy 7: Enhancing Existing Employment
- Strategic Policy 10 - Equestrian Development
- Strategic Policy 11 - Tourism Facilities and Visitor Accommodation
- Strategic Policy 14 - Housing Provision
- Strategic Policy 20 - Gypsy, Traveller and Travelling Showpeople Accommodation

Atmospheric Pollution

4.36 The emerging Local Plan plans for a minimum of 18,700 homes in the period between 2020 and 2037. This will lead to an increase in the District's population and the number of residents that will be commuting to workplaces outside the District. Similarly, the provision of new employment opportunities will likely lead to an increase in the commuter influx to Horsham from surrounding authorities. The question is whether this could mean more car-based trips along major commuter routes within 200m of European sites that are sensitive to atmospheric nitrogen deposition.

4.37 There are no significant roads within 200m of Arun Valley SAC/SPA/Ramsar site and phosphorus is considered to be the principal growth limiting nutrient (i.e. the nutrient controlling eutrophication) for that site rather than nitrogen. Phosphorus does not come from vehicle exhausts.

The Mens SAC

4.38 The woodland of The Mens SAC is sensitive to nitrogen deposition which could affect the ground flora and epiphytic communities of the beech forest, although it is unlikely to affect tree survival. According to the UK Air Pollution Information System nitrogen deposition is not believed to have a direct, major effect on tree growth in the UK.[58]

4.39 This European site is adjacent to an A road (the A272), although work undertaken for the South Downs Local Plan indicated that the road has relatively low traffic flows such that modelled baseline NOx concentrations did not exceed the critical level for that pollutant even at the roadside and are forecast to fall further over the plan period due to the improvements in vehicle emissions technology (i.e. people replacing older vehicles with those compliant with the most recent emissions standard, Euro6) outstripping the forecast increase in vehicle flows.

4.40 The designated habitat for this SAC is beech woodland. This habitat has a minimum Critical Load of 10 kg/N/ha/yr, and as such the background nitrogen deposition at this site is above this Critical Load (being between 24. 6 kg/N/ha/yr and 26.4 kg/N/ha/yr) according to APIS. Relatively high nitrogen deposition rates compared to relatively low NOx concentrations suggests that much of the nitrogen deposition at the SAC derives from surrounding agriculture rather than road traffic.

[58] http://www.apis.ac.uk/node/965

4.41 Nonetheless, it is considered at this point that a Likely Significant Effect due to increased traffic attributable to the Local Plan cannot be dismissed, particularly since Billingshurst is directly connected to The Mens SAC via the A272. An Appropriate Assessment is therefore required, which as a minimum will involve scrutiny of traffic modelling data to determine whether the change in flows due to growth in the Horsham District Local Plan is likely to be nugatory even in combination with other plans and projects.

Ebernoe Common SAC

4.42 The woodland of Ebernoe Common SAC is sensitive to nitrogen deposition which could affect the ground flora and epiphytic communities of the beech forest, although it is unlikely to affect tree survival. According to the UK Air Pollution Information System nitrogen deposition is not believed to have a direct, major effect on tree growth in the UK.[59]

4.43 This European site is adjacent to an A road (the A283), although work undertaken for the South Downs Local Plan indicated that the road has relatively low traffic flows such that modelled baseline NOx concentrations did not exceed the critical level for that pollutant even at the roadside and are forecast to fall further over the plan period due to the improvements in vehicle emissions technology (i.e. people replacing older vehicles with those compliant with the most recent emissions standard, Euro6) outstripping the forecast increase in vehicle flows.

4.44 The designated habitat for the SAC is beech woodland. This habitat has a minimum Critical Load of 10 kg/N/ha/yr, and as such the background nitrogen deposition at both sites is above this Critical Load (being approximately 22 kg/N/ha/yr) according to APIS. Relatively high nitrogen deposition rates compared to relatively low NOx concentrations suggests that much of the nitrogen deposition at this SAC derives from surrounding agriculture rather than road traffic.

4.45 However, the A283 past this SAC is not a major route from settlements in Horsham to likely employment locations. This is demonstrated by investigation using Google maps which recommends other routes as shorter journey times. Given this, it is considered that likely significant effects can be reasonably dismissed.

Ashdown Forest SAC

4.46 Ashdown Forest SAC is designated for two types of heathland habitat, namely Northern Atlantic wet heaths with *Erica tetralix* and European dry heaths, both with a critical nitrogen load of 10-20 kg N/ha/yr. An exceedance of this critical load leads to a transition from heather to grass dominance, declines in lichen assemblages and an increase in susceptibility to abiotic stress. Furthermore, the broad habitats of great-crested newts (standing open water and canals) are also sensitive to excessive nitrogen deposition, although a critical nitrogen load for these habitats has not been established as they tend to be phosphate limited.

4.47 Due to the sensitivity of the qualifying habitats present in the SAC, atmospheric nitrogen deposition is a well-established impact pathway and represents a strategic cross-boundary issue in south-eastern England. This culminated in the

[59] http://www.apis.ac.uk/node/965

preparation of a Statement of Common Ground by members of the Ashdown Forest Working Group, exercising their Duty to Co-operate regarding matters related to the Habitats and Species Regulations. Therefore, while the Borough of Horsham lies almost 15km in a straight-line distance from the Ashdown Forest SAC, the potential for growth in Horsham District to make a material contribution to any change in daily traffic flows through the SAC has been considered.

4.48 Ordinarily, a zone of 10km is used to screen in European sites vulnerable to reductions in air quality. This is based on the average UK car journey being approximately 10.6km[60]. Ashdown Forest SAC lies almost 15km from Horsham District and nearly 20km from the closest significant population centre within that district (Horsham itself). Moreover, there are no direct road links between Horsham town and Ashdown Forest SAC such that the journey by road is considerably more than 20km. This is clearly well outside the typical travel distance for a Horsham resident.

4.49 Given the distance involved it is considered very likely that any change in Annual Average Daily Traffic on roads through the SAC from growth in Horsham District would be in the low single figures at most. When translated into air quality results (NOx concentrations and nitrogen deposition rates) this would be inconsequential even in-combination with other projects and plans for the following reasons:

- Daily traffic flows are not fixed numerals but fluctuate from day to day. The AADT for a given road is an annual average (specifically, the total volume of traffic for a year, divided by 365 days). It is this average number that is used in air quality modelling, but the 'true' flows on a given day will vary around this average figure. Very small changes in average flow lie well within the normal variation (known as the standard deviation or variance) and would not result in a statistically significant difference in the total AADT; and

- When converted into NOx concentrations, ammonia concentrations or nitrogen deposition rates, the experience of AECOM's air quality modelling team is that very small changes in AADT would only affect the third decimal place. The third decimal place is not normally reported in air quality modelling to avoid false precision. For this reason, pollution is generally not reported to more than 2 decimal places (0.01). Anything smaller is simply reported as less than 0.01 (< 0.01) i.e. probably more than zero but too small to model with precision.

4.50 In reaching this conclusion we are mindful of paragraph 48 of Advocate-General Sharpston's Opinion in European Court of Justice Case C-258/11 where she stated that: '*the requirement for an effect to be 'significant' exists in order to lay down a de minimis threshold. Plans and projects that have no appreciable effect on the site can therefore be excluded. If all plans and projects capable of having any effect whatsoever on the site were to be caught by Article 6(3), activities on or near the site would risk being impossible by reason of legislative overkill*'.

4.51 It is also relevant that Mr Justice Jay, when ruling in Wealden v SSCLG [2017] EWHC 351 (Admin) (2017), did accept that if the contribution of an individual

[60] GOV.UK (2019). *Average number of trips made and distance travelled*. https://www.gov.uk/government/statistical-data-sets/nts01-average-number-of-trips-made-and-distance-travelled, accessed 13/03/2020

plan or project was ‘very small indeed’ (he quoted a notional 20 AADT in making this illustration) it could be legitimately and legally excluded from ‘in combination’ assessment. This is consistent with Advocate-General Sharpston’s position.

4.52 Overall, given the very small likely increase in traffic on the road links identified in relation to the Ashdown Forest SAC, it is concluded that the Horsham Local Plan will not result in Likely Significant Effects on the site regarding atmospheric pollution even in combination with other projects and plans; in the words of Advocate-General Sharpston, it would have no appreciable effect on the SAC. This impact pathway is screened out from Appropriate Assessment.

Duncton to Bignor Escarpment SAC

4.53 At 2.5km from the Horsham District boundary and 8km from the nearest area within Horsham District planning control likely to be subject to new allocations (Pulborough) this site lies within the 10km average travel distance. However, there is no direct easy road access to the SAC from Pulborough such that the trip by car from Pulborough to the SAC is closer to 14km. Moreover, it is not a major route from settlements in Horsham to likely employment locations such as Chichester. This is demonstrated by investigation using Google maps which recommends other routes as shorter journey times. Given this, it is considered that likely significant effects can be reasonably dismissed.

In-Combination Assessment

4.54 Under the Conservation of Habitats and Species Regulations 2017 (as amended) it is obligatory to not only assess LSEs of a proposed plan alone, but also to investigate whether there might be ‘in-combination’ effects with plans proposing development in other authorities surrounding a European protected site.

4.55 In practice, much of the evidence base informing the HRA process is in-combination by nature. For example, Water Resources Management Plans (WRMPs) are published for entire regions and take the water demand of large-scale growth scenarios into account when projecting their supply-demand balance. Traffic and Air Quality Impact Assessments (AQIAs) generally take in-combination traffic into account. The latter compare three distinct scenarios, including the ‘Do Something’ case which considers traffic increases due to other Plans.

4.56 In practice, such an ‘in-combination’ assessment is of greatest relevance when a plan would otherwise be screened out, due to a small individual effect. The in-combination scope is most relevant to the following impact pathways that are linked to the HLP:

- Recreational pressure
- Water quality
- Water quantity, level and flow
- Loss of functionally linked habitat
- Atmospheric pollution

4.57 This is because these impact pathways are of a cumulative nature, incorporating impacts from a scope that extends beyond the geographic boundary of individual authorities.

4.58 For the purposes of this HRA, we have identified several other authorities that have put forward their own Local Plans or Core Strategies, outlining residential and / or employment growth within their own boundary. These include Arun, the South Downs National Park Authority, Crawley, Mid-Sussex, Waverley, Chichester, Worthing and Adur. Table 2 summarises the residential growth allocated within the respective plan documents for these authorities. The growth delivered in the respective authorities will be taken into account at the Appropriate Assessment stage of this HRA.

4.59 The impact pathway loss of functionally linked land has an in-combination scope, because there might be a loss of multiple parcels of functionally linked land due to the implementation of several Local Plans. This might result in a cumulative, in-combination depletion of functionally linked land available to mobile SPA / Ramsar and SAC species.

Table 2: Quanta of housing and employment land that is to be delivered in other authorities surrounding the relevant European Sites

Local Authority	Total housing provided	Source
Arun	20,000 by 2031	Adopted Local Plan
South Downs	4,750 by 2033	Adopted Local Plan
Crawley	5,320 from 2021 - 2037	Submission Draft Local Plan[61]
Mid-Sussex	16,390 by 2031	Adopted Local Plan
Waverley	11,210 by 2032	Adopted Local Plan
Chichester	7,388 by 2029	Adopted Local Plan
Worthing	3,672 (2020 to 2036	Submission Draft Local Plan[62]
Adur	3,718 by 2032	Adopted Local Plan
Total	**72,738**	

[61] https://crawley.gov.uk/sites/default/files/2021-01/Submission_draft_local_plan_January_2021v2.pdf [accessed 15/01/2021]
[62] Submission Draft Worthing Local Plan (SDWLP) - Jan 2021 (complete document) (adur-worthing.gov.uk) [accessed 28/05/2021]

5. Conclusion of Likely Significant Effects Test

5.1 This HRA assessed the development proposed in the emerging HLP and its policies, including at least 18,700 new residential dwellings and 111,700m^2 of employment space (B1 (now use class E), B2 & B8). While some European sites were screened out due to there being no LSEs resulting from the plan, some impact pathways require Appropriate Assessment (AA). These are as follows:

- Arun Valley SAC and Ramsar – water quality and water quantity, level and flow;
- Arun Valley SPA and Ramsar – loss of functionally-linked land; and
- The Mens SAC – loss of functionally-linked land and potential air quality impacts from changes in traffic.
- Ebernoe Common SAC – loss of functionally-linked land

5.2 This is as a result of the following policies:

- Strategic Policy 4 - Horsham Town
- Strategic Policy 5: Broadbridge Heath Quadrant
- Strategic Policy 6: New Employment
- Strategic Policy 7: Enhancing Existing Employment
- Strategic Policy 10 - Equestrian Development
- Strategic Policy 11 - Tourism Facilities and Visitor Accommodation
- Strategic Policy 14 - Housing Provision
- Strategic Policy 20 - Gypsy, Traveller and Travelling Showpeople Accommodation

5.3 This is as a result of the following site allocations:

5.4 Strategic Site Allocations:

- HA2: Land at Buck Barn
- HA3: Land East of Billingshurst Policy HA6: Land West of Southwater

5.5 Residential Site Allocations:

- CW1: Land at Brook Hill & Cowfold Glebe
- CW2: Field West of Cowfold, North of A272
- CW3: Fields West of Cowfold, South of A272/Field W of Cowfold, S of A272, W of Little Potters
- HOR1: Land at Hornbrook Farm
- BGR1: Land South of Smugglers Lane
- BGR2: Land South of Muntham Drive

- BGR3: Land at Slaughterford Farm (Sumners Pond)
- BRH1: Land at Lower Broadbridge Farm
- BRH2: Land at Wellcross
- PLB1: Land at Greendene
- PLB2: Land at New Place Farm
- PLB3: Land at Highfields, Codmore Hill
- ASN1: Land at Church Farm Cluster, Ashington
- ASN2: Land South of Rectory Lane, Ashington
- RD1: Land North of Guildford Road, Bucks Green
- RD2: The former Pig Farm, Bucks Green
- CH1: Land at The Warren
- STO1: Land to the north of Melton Drive
- STO2: Land at Rock Road (Thakeham Parish)
- TH1: Land North of High Bar Lane
- TH2: Land West of Stream HouseWRN1: Land south of Bell Road
- WCH1: Land at Hatches Estate
- WCH2: Land West of Smock Alley, S of Little Haglands
- WCH3: Land East of Hatches House
- HOR2: Land Around Mercer Road, Warnham Station
- FAY1: Land West of Kilnwood Vale

5.6 Employment Site Allocations:

- EM9: Land at Hilland Farm (south)
- EM6: Land South of Broomers Hill Park
- SA830 - Land Opposite Broomers Hill Park
- It is these Policies and Site Allocations that will be subject to Appropriate Assessment in the following chapter.

6. Appropriate Assessment

Water Quantity, Level and Flow

Arun Valley SPA / Ramsar Site

6.1 As previously detailed, following consultation with Natural England at the Local Plan Regulation 18 stage, Natural England expressed concerns regarding the Hardham groundwater abstraction following a review of evidence. It should be noted that ultimately it is for Southern Water working with the Environment Agency to ensure that this abstraction does not result in an adverse effect on the integrity of the Arun Valley. However, until such time that this issue has been resolved at the higher tier level, Natural England has requested that Horsham District Council do their utmost to provide for water neutrality within the Local Plan in order to minimise the burden new development places on local water resources and thus minimise the need for Southern Water to use the Hardham Borehole to its full permitted extent.

6.2 To support the production of the Local Plan, a water neutrality investigation has been undertaken by AECOM. The full Technical Note can be found in **Appendix E**.

6.3 The Technical Note identifies that even with the tightened water use limits included within the Local Plan (80 litres/person/day for strategic residential allocations, and 100 litres/person/day for all other residential allocations), literal (i.e. total) water neutrality could only be achieved by applying the High Scenario, requiring new homes to use water at a rate of 62 l/h/d and retrofitting a minimum of 65.5% of the existing housing stock with water efficiency fittings equivalent to the Southern Water 'Target 100' standard. In other words, it would require a restriction on new-build water use unprecedented in the UK and a very high level of retrofitting of existing stock. This is considered unfeasible, particularly given than there is only a limited amount the local planning authority can do (and nothing the Local Plan itself can do) regarding retrofitting existing dwellings.

6.4 The Medium Scenario would give a minimum of 65% neutrality which would require new homes to be designed to use water at a rate of 80 l/h/d for strategic development or 100 l/h/d for non-strategic development (i.e. as required by the proposed Local Plan policy) and retrofitting 50% of the existing housing stock with water efficiency fittings equivalent to the Southern Water 'Target 100' standard. While existing Local Plan policy would achieve the necessary water efficiency standards in new builds, the extent of retrofitting is again considered unfeasible.

6.5 In the situation where new homes only are designed to use water at a rate required by the proposed Local Plan policy (i.e. without any retrofitting of the existing housing stock with water efficiency fittings) a water neutrality of 32% could be achieved. In addition, a certain amount of limited retrofitting of existing properties is within the feasible remit of the local authority, working with partners, and it is therefore considered that achieving the 'low' scenario in the Technical Note is feasible. This would involve retrofitting 20% of existing dwellings and would achieve 45% water neutrality for Horsham District.

6.6 This would demonstrate that the Council had a strong approach to doing its realistic utmost on the issue, within those areas that lie within its remit and ability to influence.

6.7 The Technical Note includes a list of recommendations and requirements for the delivery of water neutrality. This includes Plan Policy, partnership approaches, and retrofitting. **These recommendations/ requirements are replicated below**:

Policy

6.8 "Horsham District Council is already proposing a requirement in the Local Plan (2019 – 2036) (Policy 38) that new homes delivered on strategic developments incorporate water efficiency measures and/or water recycling in order to limit water use to 80 l/h/d or 100 l/h/d on non-strategic developments; therefore, this policy element of the delivery requirements is already in place. It is recommended that the Council consider ways to support developer implementation of this policy via information sources on their website. Measures can include (but not necessarily limited to) garden water butts, low flush toilets, low volume baths, aerated taps, water efficient appliances and water recycling (greywater and/or rainwater). "

Partnership Approaches

6.9 "Housing association partners should be targeted with a programme of retrofitting water efficient devices, to showcase the policy and promote the benefits. This should be a collaborative scheme between Horsham District Council, Southern Water and Waterwise. In addition, rainwater harvesting and/or greywater recycling schemes could be implemented into larger council owned and maintained buildings, such as schools or community centres. Rainwater harvesting could be introduced to public toilets.

6.10 The retrofitting scheme should then be extended to non-Council owned properties, via the promotion and education programme.

6.11 A programme of water audits should be carried out in existing domestic and non-domestic buildings, again showcased by council owned properties, to establish water usage and to make recommendations for improving water efficiency measures. The water audits should be followed up by retrofitting water efficient measures in these buildings, as discussed above. In private non-domestic buildings water audits and retrofitting should be funded by the asset owner, the cost of this could be offset by the financial savings resulting from the implementation of water efficient measures.

6.12 In order to ensure the uptake of retrofitting water efficient devices for non-council properties, the council should implement an awareness and education campaign, which could include the following:

- *working with Southern Water to help with its water efficiency initiative ('Target 100'), which has seen leaflets distributed directly to customers and at events across the region each year;*
- *a media campaign, with adverts/articles in local papers and features on a local news programme;*
- *a media campaign could be supplemented by promotional material, ranging from those that directly affect water use e.g. free cistern*

displacement devices, to products which will raise awareness e.g. fridge magnets with a water saving message;

- *encouraging developers to provide new residents with 'welcome packs', explaining the importance of water efficiency and the steps that they can take to reduce water use;*
- *working with retailers to promote water efficient products;*
- *carrying out educational visits to schools and colleges, to raise awareness of water efficiency amongst children and young adults;*
- *working with neighbourhood trusts, community groups and local interest groups to raise awareness of water efficiency; and,*
- *carrying out home visits to householders to explain the benefits of saving water, this may not be possible for the general population of the Borough, but rather should be used to support a targeted scheme aimed at a specific residential group."*

Relationships

6.13 *"The recommendations above are targeted at Horsham District Council and Southern Water as these are the major stakeholders, although the Environment Agency and other statutory consultees can also influence future development to ensure the water neutrality target is achieved. It is therefore suggested that responsibility for implementing water efficiency policies be shared as detailed in Table 3."*

Table 3: Responsibility for implementing water efficiency

Responsibility	Responsible stakeholder
Ensure planning applications are compliant with Local Plan Policy 38	*Horsham District Council*
Fitting water efficient devices in accordance with policy	*Developers*
Provide guidance and if necessary, enforce the installation of water efficient devices through the planning application process	*Horsham District Council*
Ensure continuing increases in the level of water meter penetration	*Southern Water*
Continue with 'Target 100' campaign	*Southern Water*
Retrofit devices within council owned housing stock	*Horsham District Council*
Retrofit devices within privately owned housing stock (via section 106 agreements)	*Developers*
Promote water audits and set targets for the number of businesses that have water audits carried out. Allocate a specific individual or team to be responsible for promoting and undertaking water audits and ensuring the targets are met. The same team or individual could also act as a community	*Horsham District Council*

liaison for households (council and privately owned) and businesses where water efficient devices are to be retrofitted, to ensure the occupants of the affected properties understand the need and mechanisms for water efficiency.	
Educate and raise awareness of water efficiency	*Horsham District Council and Southern Water*

6.14 A major aim of the education and awareness programmes would be to change peoples' attitude to water use and water saving and to make the general population understand that it is everybody's responsibility to reduce water use. Studies have shown that the water efficiencies in existing housing stock achieved by behavioural changes, such as turning off the tap while brushing teeth or reducing shower time, can be as important as the installation of water efficient devices. "

Conclusion

6.15 As previously detailed, it is ultimately up to the water company (in conjunction with the Environment Agency as the regulator) to address the underlying issue of the Hardham abstraction. However, the inclusion of the above recommendations either within the Local Plan (where appropriate) or as other initiatives and commitments from the Council will demonstrate that Horsham District Council are working to maximise the reduction in water consumption as far as feasibly possible. The inclusion of tightened water efficiency standards for strategic development (80 litres/ person/day) and non-strategic development (100 litres/ person/day) is already included with in the Local Plan document.

6.16 It is considered that if the water efficiency measures outlined above would make it more feasible for Southern Water to reduce reliance on the Hardham groundwater abstraction during periods of high demand and/or low flow and thus protect the SAC and Ramsar site.

6.17 It's also noted that Horsham District Council is partnering with Chichester and Crawley Councils to provide a supplement to the previous Water Cycle Studies to work towards addressing the water neutrality issue on a cross-boundary basis.

Loss of Functionally Linked Habitat

Arun Valley SPA / Ramsar Site

6.18 In the Test of Likely Significant Effects undertaken in **Appendix C**, the following site allocations (both residential and employment), were identified to be located within 6.5km of the Arun Valley SPA / Ramsar site, and located within greenfields sites of 2ha in size or more, thus being sufficiently large that they may feasibly constitute significant areas of functionally-linked habitat:

- PLB2: Land at New Place Farm (10.1ha)
- ASN1: Land at Church Farm Cluster, Ashington (9.4ha)
- ASN2: Land South of Rectory Lane, Ashington (2.2ha)
- STO1: Land to the north of Melton Drive (5.4ha)

- STO2: Land at Rock Road (Thakeham Parish) (3.6ha)
- WCH2: Land West of Smock Alley, S of Little Haglands (2.5ha)
- EM6: Land South of Broomers Hill Park (2.7ha)

6.19 The screening table (**Appendix C**) identified that a single allocation, STO1: Land to the north of Melton Drive/Land South of Northlands Lane, Storrington, has the potential to support a significant population of Bewick's swan and thus could provide functionally linked land to the SPA / Ramsar site for this feature. From further review of site allocations, it was considered that all others site located within 6.5km of the SPA / Ramsar site were not suitable to act as functionally linked land for Bewick's swan due to a variety of reasons, including being located within/ adjacent to an urban area, subject to existing levels of disturbance, the sites not providing green fields (but rather containing woodland/ buildings), the site comprised multiple small land parcels divided by thick hedgerows or woodland belts (so each field was less than 2ha in size and had disrupted sightlines), or the site offered no sight lines into the wider countryside. Please see **Appendix C** for full details. Allocation STO1 is assessed further below.

6.20 STO1: Land to the north of Melton Drive– From review of freely available online imagery, this site has residential development along its southern boundary (thus within a semi disturbed area) and it appears to be cropped by cereal. The field is surrounded by well-established hedgerows, thus limiting sight lines to the wider countryside. The smallest field is c. 1.5ha in size. It borders industrial land to the east, with a residential property to the north. The smaller field is well enclosed by hedgerows and woodland, thus limiting sight lines, making it unsuitable to support a significant population of Bewick's swan. The larger field is also surrounded by well-established hedgerows, thus limiting sight lines to the wider countryside. From review of aerial imagery, both fields contain many tracks. That link up to a public right of way, Northlands Lane and Downsview Avenue and as such it is possible that this site is subject to high levels of disturbance. However, it is not possible to conclude that this site could not potentially providing functionally linked land for Bewick's swan.

6.21 In addition to specific allocations, the following policies could not be screened out because they could increase the amount of greenfield development within the south-west corner of Horsham District:

- Strategic Policy 4 - Horsham Town
- Strategic Policy 5: Broadbridge Heath Quadrant
- Strategic Policy 6: New Employment
- Strategic Policy 7: Enhancing Existing Employment
- Strategic Policy 10 - Equestrian Development
- Strategic Policy 11 - Tourism Facilities and Visitor Accommodation
- Strategic Policy 14 - Housing Provision
- Strategic Policy 20 - Gypsy, Traveller and Travelling Showpeople Accommodation

6.22 In accordance with Policy 30 - Strategic Policy: Green Infrastructure and Biodiversity "*9. Any development with the potential to impact Arun Valley SPA /*

SAC / Ramsar site, The Mens SAC and / or Ebernoe Common SAC will be subject to a Habitats Regulation Assessment to determine the need for an Appropriate Assessment. In addition, development will be required to be in accordance with the necessary mitigation measures for development set out in the HRA of this plan." As such, it is considered that the Local Plan contains a basic policy framework to ensure that no adverse effect on the integrity of the SPA / Ramsar site could result as a consequence of loss of functionally linked land. Nonetheless, recommendations are made to ensure full robustness.

Recommendations:

6.23 For site allocation STO1: Land to the north of Melton Drive, to ensure no adverse effect on the integrity of the Arun Valley SPA / Ramsar site results it is recommended that policy is included requiring at least one season of wintering bird survey to confirm that it does not regularly support foraging Bewick swan during the winter. If the site does regularly support Bewick's swan then replacement habitat would be required to ensure no net loss of functionally linked land.

6.24 Therefore, in order to support an allocation, the policy for allocation STO1 should include the following requirement, or similar: '*The applicant will be required to provide evidence that the development will not result in an adverse effect on the integrity of the Arun Valley SPA/Ramsar. To achieve this, surveys will be required to determine habitats and current use of the site to determine if it does support a significant population*[63] *of qualifying species. Where habitats are suitable, non-breeding bird surveys will be required to determine if the site and neighbouring land constitute a significant area of supporting habitat. Surveys should be required to be undertaken during autumn, winter and spring and more than 1 year of surveys may be needed (to be agreed in consultation with the local planning authority and Natural England). If habitat within the site is identified to support significant populations of designated bird features avoidance measures and mitigation will be required, such as the creation of replacement habitat nearby, and the planning application will likely need to be supported by a project specific Habitats Regulations Assessment to ensure that the development does not result in adverse effects on integrity*'. It is recognised that this is lengthy for inclusion in policy, so a brief reference could be included in the policy with this fuller text in the supporting text.

6.25 It is also recommended that the supporting text in paragraph 7.42 of the Plan is amended to state (or similar) "*In the case of Arun Valley, proposals must demonstrate that they will avoid harm to the water quality and water levels on site,* ***and do not result in the loss of significant parcels of functionally linked land that supports Bewick's Swan***"

6.26 In addition, for correctness, it is recommended that the supporting text in paragraph 7.42 of the Plan is amended to state "…*these sites are of international importance for nature conservation, and applicants will need to demonstrate that development does not* ***result in an adverse effect on the integrity*** ~~*have adverse impacts*~~ *on* ~~*either*~~ ***any*** *of these sites in accordance with relevant legislation*."

[63] A significant population is classified as a site that regularly used by more than 1% of the population of qualifying bird species

The Mens SAC and Ebernoe Common SAC

6.27 Any development that has potential to impact greenfield sites or existing mature vegetation lines and/ or riverbank corridors has potential to impact upon the commuting and foraging routes of bats for which these sites are designated. This could include direct loss of habitat and light and noise/ vibration pollution.

6.28 Following the Test of Likely Significant Effects undertaken in **Appendix B** and **Appendix C**, the following site allocations (both residential and employment), were identified to be greenfield development and located either within 6.5km of the Mens SAC or between 6.5km and 12km from both The Mens SAC and Ebernoe Common SAC. As such, in accordance with the Sussex Bat Protocol[64] they potentially provide functionally linked land to support designated bat populations associated with the SACs:

6.29 Site Allocations located within 6.5km from The Mens SAC:

- Policy HA3: Land East of Billingshurst
- EM6: Land South of Broomers Hill Park
- EM9: Land at Hilland Farm South, Billingshurst
- PLB1: Stane Street and Green Dene Nurseries, Pulborough
- PLB2: Land at New Place Farm, Pulborough
- PLB3: Land at Highfields, Pulborough
- SA830 - Land Opposite Broomers Hill Park

6.30 Site Allocations located between 6.5km and 12km from The Mens SAC:

- ASN1: Land at Church Farm Cluster, Ashington
- BGR1: BG Land adjacent to Smugglers Lane, Barns Green
- TH1: Land North of High Bar Lane
- WCH1: Land at Hatches Estate, West Chiltington
- STO1: Land to the North of Melton Drive, Storrington
- STO2: Land at Rock Road (Thakeham Parish)
- BGR2: Land South of Muntham Drive, Barns Green
- WCH2: Land West of Smock Alley,West Chiltington
- WCH3: Land to east of Hatches House
- ASN2: Land South of Rectory Lane, Ashington
- TH2: Land West of Stream HouseBGR3: Land at Slaughterford Farm

6.31 Site Allocations located within 12km from Ebernoe Common SAC:

- Policy HA3: Land East of Billingshurst
- EM6: Land South of Broomers Hill Park

[64] https://www.southdowns.gov.uk/wp-content/uploads/2018/04/TLL-15-Draft-Sussex-Bat-SAC-Protocol.pdf [accessed 19/11/2020]

- EM9: Land at Hilland Farm South, Billingshurst
- PLB1: Stane Street and Green Dene Nurseries, Pulborough
- PLB2: Land at New Place Farm, Pulborough
- PLB3: Land at Highfields, Pulborough
- RD1: Land North of Guildford Road, Bucks Green
- RD2: The former Pig Farm, Bucks Green
- SA830 - Land Opposite Broomers Hill Park

6.32 In addition, the following policies are screened in because they could increase the amount of greenfield development west of the A24 in Horsham District (and thus within the relevant zone):

- Strategic Policy 4 - Horsham Town
- Strategic Policy 5: Broadbridge Heath Quadrant
- Strategic Policy 6: New Employment
- Strategic Policy 7: Enhancing Existing Employment
- Strategic Policy 10 - Equestrian Development
- Strategic Policy 11 - Tourism Facilities and Visitor Accommodation
- Strategic Policy 14 - Housing Provision
- Strategic Policy 20 - Gypsy, Traveller and Travelling Showpeople Accommodation

6.33 In accordance with Policy 30 - Strategic Policy: Green Infrastructure and Biodiversity "*9. Any development with the potential to impact Arun Valley SPA or the Mens SAC will be subject to a Habitats Regulation Assessment to determine the need for an Appropriate Assessment. In addition, development will be required to be in accordance with the necessary mitigation measures for development set out in the HRA of this plan*." As such, it is considered that the Local Plan contains a basic framework to ensure no adverse effect on the integrity of the SACs result as a consequence of loss of functionally linked land. Nonetheless, recommendations are made to ensure full robustness.

Recommendations:

6.34 To ensure full robustness, it is recommended that the supporting text of the Plan is updated to include reference to the strategic Sussex Bat Protocol[65] and the requirements it sets out for development within 6.5km and 12km of both The Mens SAC and Ebernoe Common SAC. The Protocol has been created in consultation with Natural England and includes Natural England's recommendations as follows:

'There are two key impact zones from a Sussex Bat SAC:

- *6.5km Key conservation area – all impacts assessed*
- *12km Wider conservation area – significant impacts or severance to flightlines to be considered*

[65] https://www.southdowns.gov.uk/wp-content/uploads/2018/04/TLL-15-Draft-Sussex-Bat-SAC-Protocol.pdf [accessed 19/11/2020]

The 6.5 km includes the Key conservation area in which all impacts must be considered as habitats within this zone are considered critical for sustaining the populations of bats within the SACs.

The 12km encompasses the wider conservation area which is the full extent of the range of foraging areas required by the bats'.

6.35 To ensure no adverse effects on the integrity result as a consequence of development within 12km of either The Mens SAC or Ebernoe Common SAC, all development (both allocations and any windfall development) within these zones (as shown on the Local Plan Policies Map) should adhere to the requirements set out within Sussex Bat Protocol.

6.36 The following recommendation is made for additions to supporting text: *'In order to be fully compliant with the Habitats Directive regarding The Mens SAC and Ebernoe Common SAC qualifying features, proposals for the development of greenfield sites within 12km of either SAC must evaluate whether there is a potential for the loss of suitable foraging habitat and / or the severance of commuting flightlines, such as in the form of mature treelines, hedgerows and watercourses. If so, such features must be preserved or compensated for, unless bat surveys demonstrate that they are not used by barbastelle bats. Care must also be taken through development design to ensure that such features are not subject to unacceptable levels of artificial lighting*.'

6.37 The supporting text in paragraph 7.42 of the Plan should also be amended to state "…*these sites are of international importance for nature conservation, and applicants will need to demonstrate that development does not* ***result in an adverse effect on the integrity*** ~~*have adverse impacts*~~ *on* ~~*either*~~ ***any*** *of these sites in accordance with relevant legislation."*

Atmospheric Pollution

The Mens SAC

6.38 It is considered that The Mens SAC is vulnerable to nitrogen deposition and is located within 200m of an A road likely to be utilised as a journey to work route: the A272. Modelling was undertaken along a single transect within the SAC adjacent to the road (See **Appendix F**), with the closest part of the SAC being located immediately adjacent to the roadside.

6.39 Road traffic data in the form of 24-hour AADT (Annual Average Daily Traffic) based on 2019 data and forecast to 2036 were provided by the Stantec transport team. Stantec modelled additional journeys that will be taken at the transect point, firstly as a result of the Horsham Local Plan alone (**Table 4**). Although traffic data are for 2036 this is not considered to have implications for a plan end date of 2037 as the amount of additional traffic in the one year will be minimal and the air quality modelling is already precautionary by freezing improvements in vehicle emissions technology at 2030.

Table 4. Changes in Traffic Flow on A272

Scenario	Annual Average Daily Traffic (AADT)
Base 2019	5,531
Do Minimum 2037 (without Horsham Local Plan)	6,958
2037 Do Something 2 (with mitigation)[66]	7,400

6.40 The traffic modelling (summarised in **Table 4**) identified that the difference between the Do Minimum and Do Something 2 scenario (i.e. the contribution of the Local Plan with congestion mitigation such as traffic improvement schemes) was 442 AADT, indicating that the Horsham Local Plan in isolation would provide approximately 1/4 of the increase in traffic flows to 2037.

6.41 The designated habitat for this SAC is beech woodland. According to APIS, the minimum Critical Load of nitrogen for beech woodland is 10 kg/N/ha/yr. APIS also identifies that the existing nitrogen deposition rate at the transect location is approximately 24.8 kg/N/ha/yr. Therefore, nitrogen deposition rates are already in exceedance of the critical load. The Critical Level for ammonia for beech woodlands is 3 µg NH_3/m^3.However, the site is also partially designated for its rich lichen and bryophyte populations which have a Critical Level of 1 µg NH_3/m^3. As such, it is this lower Level for ammonia that will be used in this assessment. APIS also identifies that the existing ammonia concentrations within the 1km grid square in which the SAC is situated are 1.2 µg NH_3/m^3 and thus already in exceedance for the SACs lichen and bryophyte populations.

6.42 With regards to NOx the critical level is set at 30 $\mu g/m^3$. Baseline data was utilised from the year 2019 which recorded NOx concentrations of 18.80 ug/m^3 0m from the roadside. As such the NOx Critical Level is not exceeded. Due to improvements in vehicle emissions technology (as reflected in the Defra Emission Factor Toolkit) NO_X concentrations are forecast to continue to fall to 2037 notwithstanding the expected increase in traffic due to development across Horsham District, the South Downs National Park Authority, Chichester and surrounding authorities. As both baseline and all future concentrations are forecast to be below the Critical Level of 30 $\mu g/m^3$ it can be concluded that NO_X itself will not have an adverse impact upon the SAC and will only be considered further within the assessment as a source of nitrogen deposition.

Assessment 'Alone'

6.1 An assessment of air quality was undertaken for both alone impacts i.e. the Horsham Local Plan and in-combination e.g. Horsham Local Plan in combination with all other growth from neighbouring authorities. In this section discussion will focus on the contribution of the Horsham Local alone.

Nutrient Nitrogen

6.2 As previously detailed the lowest Critical Load for nutrient nitrogen deposition of the designated habitats within the SAC is 10 kgN/ha/yr for Atlantic acidophilous beech forests with *Ilex* and a *Taxus* scrub layer and the broadleaved deciduous woodland upon which the Barbastelle bat rely. Exceedance of this level can

[66] Note that this mitigation has not been included to protect European sites but is to minimise or address congestion at junctions and other locations

result in changes in ground vegetation and mycorrhiza, nutrient imbalance, changes to soil fauna, and changes to soil processes.

6.3 Data shows the minimum total annual mean nitrogen deposition to the SAC in the vicinity of the road during the Base year of 24.85 at 200m from the road, rising to 29.89 kgN/ha/yr adjacent to the road. Therefore, the SAC is already in exceedance of the Critical Load for nitrogen deposition on beech woodland in the Base year. However, Paragraph 5.26 of Natural England guidance[67] states that '*An exceedance alone is insufficient to determine the acceptability (or otherwise) of a project*'. Where an exceedance of the Critical Load is expected, it is also necessary to consider whether the forecast dose will be imperceptible. As per paragraph 4.25 of same guidance '*…1% of critical load/level are considered by Natural England's air quality specialists (and by industry, regulators and other statutory nature conservation bodies) to be suitably precautionary, as any emissions below this level are widely considered to be imperceptible…There can therefore be a high degree of confidence in its application to screen for risks of an effect*'.

6.4 As the deposition rate is already in exceedance of the Critical Load, this assessment therefore first looks at the contribution of the Horsham Local Plan in terms of a significant increase above the Critical Load. For The Mens SAC, 1% of the Critical Load is 0.01kgN/ha/yr.

6.5 In order to assess the contribution of the Horsham Local Plan alone it is necessary to separate it from the rest of development in the South Downs National Park Authority, Chichester District Council and other neighbouring authorities. In **Appendix F Table 11** the contribution of the Local Plan alone is shown by the difference between Do Minimum 2037 and the Do Something 2 2037. It can be seen that at 0m from the roadside the Do Minimum deposition rate is 31.04 kgN/ha/yr while the Do Something 2 deposition rate is 31.45 kgN/ha/yr. The difference between the Do Minimum 2037 and Do Something 2 2037 scenario is 0.41kgN/ha/yr, which is greater than 1% of the Critical Load for The Mens SAC (being c. 4% of the Critical Load). It is not until c. 20m from the road that the contribution of the Local Plan alone falls to 1% of the Critical Load. As such the contribution to the retardation in air quality improvement from the Horsham Local Plan needs further investigation.

Ammonia

6.6 Investigating the sources of nitrogen pollution from traffic further, it is clear that ammonia plays a large part in nitrogen deposition. For The Mens SAC, 1% of the most stringent Critical Level is 0.01 µg/m^3 **Appendix F Table 9** shows that in the Base 2019 scenario, ammonia contributions from the road are 0.46 µg/m^3, whilst in the Do Something 2 2037 scenario it is 0.77 µg/m^3 and in Do Minimum 2037 scenario it is 0.72 µg/m^3, thus indicating that, unlike NOx, there is no improvement forecast in ammonia concentrations.

6.7 This lack of improvement in ammonia mirrors the forecast deterioration in nutrient nitrogen deposition, thus suggesting that it is ammonia that is the issue rather than NOx. This is reinforced by the fact that NOx concentrations at the SAC are so low. The 'direct' impact of ammonia at the SAC on lichens (i.e. 'direct' from ammonia rather than as a contribution within total nitrogen deposition which is dealt with elsewhere) is most likely to consist of a lower percentage cover of

[67] http://publications.naturalengland.org.uk/publication/4720542048845824

lichens than would otherwise be the case, rather than actual loss of acidophytes from the assemblage, given that ammonia concentrations will remain below 2µg/m^3 even with growth. Moreover, no rare or notable lichen species are known to be present in the affected area.

6.8 Furthermore, **Appendix F Table 10** identifies that in the Base scenario, ammonia is already in exceedance of the Critical Level[68] (the concentration is 1.66 µg/m^3). This increases to 1.97 µg/m^3 under the Do Something 2 2037 scenario. The difference between the Do Minimum 2037 (1.92 µg/m^3) and Do Something 2 2037 scenarios is 0.05 µg/m^3, which is above the 1% of the Critical Level (being c.5% of the Critical Level).

6.9 It should be noted that:

- the SIP for the SAC states that '*Nitrogen deposition exceeds the site-relevant critical load for ecosystem protection and hence there is a risk of harmful effects, but the sensitive features are currently considered to be in favourable condition on the site*'. Therefore, the current elevated nitrogen deposition rates and ammonia concentrations at the SAC do not appear to be having a negative effect on the key features of the site.
- the Joint Nature Conservation Committee has recently published the results of the Nitrogen Futures project[69]. That project investigated whether a net improvement in nitrogen deposition (including expected development over the same period) was expected to occur to 2030 at a national scale, under a range of scenarios. The report concluded that *'The scenario modelling predicts a substantial decrease in risk of impacts on sensitive vegetation by 2030, under the most likely future baseline* [a scenario called '2030 NAPCP+DA (NECR NOx)'[70]]*. This is estimated to achieve the UK Government's CAS target for England, defined as a 17% decrease in total reactive N deposition onto protected priority sensitive habitats, with a predicted 18.9% decrease* [for England] *from a 2016 base year'*. The report predicted a fall in nitrogen deposition by 2030 under every modelled scenario. Therefore, in practice the impact of Horsham Local Plan is likely to involve a slowing of the rate of progress towards the critical load rather than moving away from the critical load.
- Approximately 27% of nitrogen at the SAC generally comes from livestock and fertiliser. In contrast only 8% comes from road traffic (note that this is the entire UK vehicle fleet, not just the local road network). Therefore, getting nitrogen deposition rates to the critical load will depend mainly on addressing agricultural sources of ammonia and thus nitrogen. This is underlined by the fact that the roadside ammonia and NOx concentrations are not particularly high. Indeed, roadside NOx is actually very low, being a third of the critical level, which reflects the low total traffic flows on this road. While roadside ammonia is well above the minimum critical level for protection of lichens and bryophytes, this is true even at a 200m distance

[68] Critical Level is 1 µg NH^3/m^3
[69] https://hub.jncc.gov.uk/assets/04f4896c-7391-47c3-ba02-8278925a99c5
[70] The research team considered this the most likely scenario to occur by 2030 as it would achieve the legally mandated National Air Pollution Control Programme (NECR) targets. It includes policies that had already been adopted or implemented, plus additional measures which are currently in development. These additional measures are represented by the UK's National Air Pollution Control Programme (NAPCP).

from the road indicating that background sources, mainly from agriculture, are the primary contributor to ammonia across the SAC as a whole.

- Because the lowest critical level for ammonia is itself small (being 1 μgm^{-3}) concentrations of ammonia that are close to the limit of detection of CEH ALPHA samplers (e.g. 0.02-0.05 μgm^{-3}) , would still equate to 2-5% of the critical level and thus exceed the 1% of the critical level threshold. Moreover, seasonal and inter-annual fluctuations in ammonia concentrations far exceed the annual mean 'dose' that is modelled to occur due to traffic growth. This is illustrated by long-term ammonia monitoring undertaken at a range of locations. Scrutiny of ammonia data from the UKEAP national ammonia monitoring network for three sites in the South of England covering 2010-2019. show that the variation in ammonia concentrations throughout a year can be as high as 3-4 $\mu g/m^3$ and at rural sites concentrations generally fluctuate by more than 1 $\mu g/m^3$ (100% of the critical level) throughout the year due to constantly varying factors such as meteorology. In other words, the forecast ammonia doses fall well within the expected variance in existing ammonia concentrations, are unlikely to be statistically significant and could never be detected in the field.

6.10 Nonetheless, as Horsham's contribution to the increase in traffic flows and nitrogen deposition rates are above '1% of the critical level/load' in isolation (being c. 4% of the critical level/load), no in combination assessment is required and an adverse effect on integrity cannot be dismissed without mitigation. It is clear that this is attributable to the fact that Horsham Local Plan is responsible for 1/4 (24%) of the expected traffic growth on the A272 past the SAC and a c.8% increase compared to baseline flows.

6.11 In the previous iteration of this HRA, to determine the source of the increased traffic flows along the A272 as a result of the Horsham Local Plan, more detailed traffic source analysis was undertaken. This identified that 32% of the increase in traffic flows attributable to the Horsham Local Plan stems from a single site - Strategic Policy HA3: Land East of Billingshurst (providing an increase of 170 AADT) - with the remaining 68% of traffic increase stemming from all other Local Plan development. It is still anticipated that a large portion of traffic flows past The Mens on the A272 will stem from the same allocation (HA3).

Recommendations

6.12 Since it is likely that a significant portion of the increase in traffic flows come from a single large strategic allocation located in the western extent of the District (Strategic Policy HA3: Land East of Billingshurst, an allocation of approximately 650 net new dwellings located about 5.5km east of The Mens SAC in a straight line), a requirement should be introduced into policy for this allocation to devise a scheme-specific range of measures to reduce reliance on cars, reduce trip generation and promote ultra-low emission vehicles. The kind of measures the applicants would be expected to introduce could include, but not be limited to, the following:

k) Electric vehicle charging points at parking spaces. The government has committed to ceasing the sale of all new petrol and diesel cars and vans from 2030. In the latter part of the plan period therefore people can be expected to show particular interest in electric vehicles;

l) A proportion of parking spaces to be reserved exclusively for electric or hydrogen vehicles;

m) Provision of direct incentives to residents to convert from petrol or diesel cars to electric vehicles;

n) Provision of a communal minibus (particularly if electric), and car club space. This will be effective for housing developments but particularly for employment developments;

o) Cycle parking and shower facilities for staff;

p) On-site services (e.g. GP surgery's and shops) to reduce need for off-site movements;

q) Personalised Journey Planning services for residents. If employment premises the company could provide incentives for car-sharing and minimising car journeys for work;

r) Production of sustainable travel information for residents e.g. accurate and easily understandable bus timetables;

s) Implementation of a Staff Management Plan to place restrictions on car use by Staff;

t) For vehicles generating HGV movements, restrictions to keep movements below 200 HDV per day, or a commitment to ensuring all HGVs used will be Euro6 compliant.

6.13 The issue is also more strategic one, attributable to growth dispersed across the District. Horsham should commit to working with the South Downs National Park Authority and Natural England in implementing the Shared Nitrogen Action Plan (SNAP) for this site. This could include Horsham supporting direct interventions to improve tree health and resilience such as through mulching[71]. This would probably need to be funded by a financial levy on developers so the cost of interventions would need to be identified prior to Local Plan submission. Alternatively, Horsham District could make an 'in kind' contribution of staff availability if Horsham has a conservation or land management team. The SNAP has already been identified as an intervention, but it does not appear to have been fully funded.

6.14 Other initiatives to consider would include a programme of borough-wide initiatives to reduce reliance on the private car and promoting and delivering improved public transport and low emission vehicles, such as:

[71] Flores Fernández et al. (2019) demonstrated that mulch aided the recovery of soil structure of a compacted forest soil in Germany. Mulching also increases fine root growth in the surface horizons, and enhances soil biological functioning. It is important to apply mulch to an appropriate thickness (between 5 cm to 7.5 cm maximum), to facilitate rainfall percolation and oxygen diffusion into the underlying soil. Mulching is clearly a management intervention which moves beyond natural litter accumulation beneath trees, but it appears to fit with the ethos of the Adaptation Principles listed in Annex AM3 of Moffat (2019). Mulch will also provide nutrients available for uptake by the tree, and help to counter any deficiencies due to inherent soil infertility, the effects of atmospheric pollution and nutrient removal by vegetation. The RHS website gives further guidance on the practice of mulching (see RHS mulching advice).

- requiring 50% of parking spaces at all new developments to have active electric vehicle charging point provision, including rapid charging;
- ensuring all public car parks have active electric vehicle charging infrastructure;
- producing materials to promote use of low-emission transport (such as indicating where charging points are located in the district, informing the public of the falling cost of electric vehicles due to reducing battery costs, and identifying the range of electric vehicles available); and
- working with the transport authorities over the plan period to 2037 (the year when an adverse effect is forecast) to improve non-road connectivity between Billingshurst and Petworth (both located on the A272 and which require driving past The Mens SAC to travel between the two towns), and deliver improved bus services with less polluting buses.

6.15 These strategic initiatives would address the contribution of all new housing and employment in Horsham District even on small sites.

7. Conclusions and a Summary of Recommendations and Considerations

Conclusions

7.1 HRA was undertaken of the Regulation 19 Draft Local Plan. Screening was undertaken of Plan policy and site allocations in relation to the following internationally designated sites and impact pathways illustrated in **Table 5**:

Table 5: International Designated Sites and Potential Impact Pathways Subject to a Screening for Likely Significant Effects

Internationally Designated Site	Potential Linking Impact Pathways
Arun Valley SAC, SPA and Ramsar site	- Recreational pressure - Water quality - Water quantity, level and flow - Loss of functionally linked habitat
The Mens SAC	- Loss of functionally linked habitat - Atmospheric pollution
Duncton to Bignor Escarpment SAC	- Recreational pressure - Atmospheric pollution
Ebernoe Common SAC	- Loss of functionally linked habitat - Atmospheric pollution
Singleton & Cocking Tunnels SAC	- Atmospheric pollution
Ashdown Forest SAC and SPA	- Atmospheric pollution

7.2 Following the Screening Assessment Appropriate Assessment was undertaken of potential linking impact pathways that could not be screened out and were identified to potentially result in an adverse effect on the integrity of an international site. Appropriate Assessment was undertaken of the impact pathways relating to the following international designated sites as identified in **Table 6**.

Table 6: International Designated Sites and Potential Impact Pathways Subject to Appropriate Assessment

Internationally Designated Site	Linking Impact Pathway Subject to Appropriate Assessment
Arun Valley SAC, SPA and Ramsar site	- Water quantity, level and flow - Loss of functionally linked habitat
The Mens SAC	- Loss of functionally linked habitat - Atmospheric pollution
Ebernoe Common SAC	- Loss of functionally linked habitat

7.3 To support the Appropriate Assessment, bespoke investigations were undertaken in relation to:

- Phosphate nutrient neutrality (provided in **Appendix D**),
- Water neutrality (provided in **Appendix E**), and
- Traffic modelling and associated air quality modelling (provided in **Appendix F**).

Recommendations and Considerations

7.4 Following Appropriate Assessment, to ensure the Local Plan does not result in an adverse effect on the integrity of an internationally designated site either in combination or in isolation, the following recommendations were made:

Water Quantity, Level and Flow: Arun Valley SPA/ Ramsar site

7.5 It is ultimately up to the water company (in conjunction with the Environment Agency as the regulator) to address the underlying issue of the Hardham abstraction. However, the inclusion of the following recommendations either within the Local Plan (where appropriate) or as other initiatives and commitments from the Council will demonstrate that Horsham District Council are working to maximise the reduction in water consumption as far as feasibly possible:

Policy

7.6 "Horsham District Council is already proposing a requirement in the Local Plan (2019 – 2036) (Policy 39) that new homes delivered on strategic developments incorporate water efficiency measures and/or water recycling in order to limit water use to 80 l/h/d or 100 l/h/d on non-strategic developments; therefore, this policy element of the delivery requirements is already in place. It is recommended that the Council consider ways to support developer implementation of this policy via information sources on their website. Measures can include (but not necessarily limited to) garden water butts, low flush toilets, low volume baths, aerated taps, water efficient appliances and water recycling (greywater and/or rainwater)."

Partnership Approaches

7.7 "Housing association partners should be targeted with a programme of retrofitting water efficient devices, to showcase the policy and promote the benefits. This should be a collaborative scheme between Horsham District Council, Southern Water and Waterwise. In addition, rainwater harvesting and/or greywater recycling schemes could be implemented into larger council owned and

maintained buildings, such as schools or community centres. Rainwater harvesting could be introduced to public toilets.

7.8 *The retrofitting scheme should then be extended to non-Council owned properties, via the promotion and education programme.*

7.9 *A programme of water audits should be carried out in existing domestic and non-domestic buildings, again showcased by council owned properties, to establish water usage and to make recommendations for improving water efficiency measures. The water audits should be followed up by retrofitting water efficient measures in these buildings, as discussed above. In private non-domestic buildings water audits and retrofitting should be funded by the asset owner, the cost of this could be offset by the financial savings resulting from the implementation of water efficient measures.*

7.10 *In order to ensure the uptake of retrofitting water efficient devices for non-council properties, the council should implement an awareness and education campaign, which could include the following:*

- *working with Southern Water to help with its water efficiency initiative ('Target 100'), which has seen leaflets distributed directly to customers and at events across the region each year;*
- *a media campaign, with adverts/articles in local papers and features on a local news programme;*
- *a media campaign could be supplemented by promotional material, ranging from those that directly affect water use e.g. free cistern displacement devices, to products which will raise awareness e.g. fridge magnets with a water saving message;*
- *encouraging developers to provide new residents with 'welcome packs', explaining the importance of water efficiency and the steps that they can take to reduce water use;*
- *working with retailers to promote water efficient products;*
- *carrying out educational visits to schools and colleges, to raise awareness of water efficiency amongst children and young adults;*
- *working with neighbourhood trusts, community groups and local interest groups to raise awareness of water efficiency; and,*
- *carrying out home visits to householders to explain the benefits of saving water, this may not be possible for the general population of the Borough, but rather should be used to support a targeted scheme aimed at a specific residential group*."

Relationships

7.11 *"The recommendations above are targeted at Horsham District Council and Southern Water as these are the major stakeholders, although the Environment Agency and other statutory consultees can also influence future development to ensure the water neutrality target is achieved. It is therefore suggested that responsibility for implementing water efficiency policies be shared as detailed in Table 3".*

Table 3: Responsibility for implementing water efficiency

Responsibility	Responsible stakeholder
Ensure planning applications are compliant with Local Plan Policy 38	*Horsham District Council*
Fitting water efficient devices in accordance with policy	*Developers*
Provide guidance and if necessary, enforce the installation of water efficient devices through the planning application process	*Horsham District Council*
Ensure continuing increases in the level of water meter penetration	*Southern Water*
Continue with 'Target 100' campaign	*Southern Water*
Retrofit devices within council owned housing stock	*Horsham District Council*
Retrofit devices within privately owned housing stock (via section 106 agreements)	*Developers*
Promote water audits and set targets for the number of businesses that have water audits carried out. Allocate a specific individual or team to be responsible for promoting and undertaking water audits and ensuring the targets are met. The same team or individual could also act as a community liaison for households (council and privately owned) and businesses where water efficient devices are to be retrofitted, to ensure the occupants of the affected properties understand the need and mechanisms for water efficiency.	*Horsham District Council*
Educate and raise awareness of water efficiency	*Horsham District Council and Southern Water*

7.12 A major aim of the education and awareness programmes would be to change peoples' attitude to water use and water saving and to make the general population understand that it is everybody's responsibility to reduce water use. Studies have shown that the water efficiencies in existing housing stock achieved by behavioural changes, such as turning off the tap while brushing teeth or reducing shower time, can be as important as the installation of water efficient devices."

Loss of Functionally Linked Land

Arun valley SPA/ Ramsar site

7.13 The screening table (**Appendix C**) identified that site allocation: Land to the north of Melton Drive has the potential to support a significant population of Bewick's swan and thus could provide functionally linked land to the SPA / Ramsar site for this feature.

7.14 For site allocationSTO1: Land to the north of Melton Drive, to ensure no adverse effect on the integrity of the Arun Valley SPA / Ramsar site results, it is recommended that policy is included requiring at least one season of wintering bird survey to confirm that they do not regularly support foraging Bewick swan during the winter. If they do regularly support Bewick's swan then replacement habitat would be required to ensure no net loss of functionally linked land.

7.15 Therefore, in order to support an allocation, the policy for allocation STO1 should include the following requirement, or similar: '*The applicant will be required to provide evidence that the development will not result in an adverse effect on the integrity of the Arun Valley SPA/Ramsar. To achieve this, surveys will be required to determine habitats and current use of the site to determine if it does support a significant population[72] of qualifying species. Where habitats are suitable, non-breeding bird surveys will be required to determine if the site and neighbouring land constitute a significant area of supporting habitat. Surveys should be required to be undertaken during autumn, winter and spring and more than 1 year of surveys may be needed (to be agreed in consultation with the local planning authority and Natural England). If habitat within the site is identified to support significant populations of designated bird features avoidance measures and mitigation will be required, such as the creation of replacement habitat nearby, and the planning application will likely need to be supported by a project specific Habitats Regulations Assessment to ensure that the development does not result in adverse effects on integrity*'. It is recognised that this is lengthy for inclusion in policy, so a brief reference could be included in the policy with this fuller text in the supporting text.

7.16 It is also recommended that the supporting text in paragraph 7.42 of the Plan is amended to state (or similar) "*In the case of Arun Valley, proposals must demonstrate that they will avoid harm to the water quality and water levels on site,* ***and do not result in the loss of significant parcels of functionally linked land that supports Bewick's Swan***"

7.17 In addition, for correctness, it is recommended that the supporting text in paragraph 7.42 of the Plan is amended to state "…*these sites are of international importance for nature conservation, and applicants will need to demonstrate that development does not* ***result in an adverse effect on the integrity*** ~~*have adverse impacts*~~ *on* ~~*either*~~ ***any*** *of these sites in accordance with relevant legislation*."

7.18 With the inclusion of the above recommendations it can be concluded that no adverse effect on the integrity of the Arun Valley SPA / Ramsar site will arise as a result of loss of functionally linked land.

The Mens SAC and Ebernoe Common

7.19 It is recommended that the supporting text of the Plan is updated to include reference to the strategic Sussex Bat Protocol[73] and the requirements it sets out for development within 6.5km and 12km of both The Mens SAC and Ebernoe Common SAC. The Protocol has been created in consultation with Natural England and includes Natural England's recommendations as follows:

[72] A significant population is classified as a site that regularly used by more than 1% of the population of qualifying bird species
[73] https://www.southdowns.gov.uk/wp-content/uploads/2018/04/TLL-15-Draft-Sussex-Bat-SAC-Protocol.pdf [accessed 19/11/2020]

7.20 There are two key impact zones from a Sussex Bat SAC:

- "*6.5km Key conservation area – all impacts assessed*
- *12km Wider conservation area – significant impacts or severance to flightlines to be considered*
- *The 6.5 km includes the Key conservation area in which all impacts must be considered as habitats within this zone are considered critical for sustaining the populations of bats within the SACs.*
- *The 12km encompasses the wider conservation area which is the full extent of the range of foraging areas required by the bats"*

7.21 To ensure no adverse effects on the integrity result as a consequence of development within 12km of either The Mens SAC or Ebernoe Common SAC, all development (both allocations and any windfall development) within these zones (as shown on the Local Plan Policies Map) should adhere to the requirements set out within Sussex Bat Protocol.

7.22 The following recommendation is made for additions to supporting text: *'In order to be fully compliant with the Habitats Directive regarding The Mens SAC and Ebernoe Common SAC qualifying features, proposals for the development of greenfield sites within 12km of either SAC must evaluate whether there is a potential for the loss of suitable foraging habitat and / or the severance of commuting flightlines, such as in the form of mature treelines, hedgerows and watercourses. If so, such features must be preserved or compensated for, unless bat surveys demonstrate that they are not used by barbastelle bats. Care must also be taken through development design to ensure that such features are not subject to unacceptable levels of artificial lighting*.'

7.23 The supporting text in paragraph 7.42 of the Plan should also be amended to state "…*these sites are of international importance for nature conservation, and applicants will need to demonstrate that development does not* ***result in an adverse effect on the integrity*** ~~*have adverse impacts*~~ *on* ~~*either*~~ ***any*** *of these sites in accordance with relevant legislation."*

7.24 With the inclusion of the above recommendations it can be concluded that no adverse effect on the integrity of The Mens SAC and Ebernoe Common SAC site will arise as a result of loss of functionally linked land.

Atmospheric Pollution: The Mens SAC

7.25 Recommendations are made as follows:

7.26 A requirement should be introduced into policy for Strategic Policy HA3: Land East of Billingshurst to devise a scheme-specific range of measures to reduce reliance on cars, reduce trip generation and promote ultra-low emission vehicles. The kind of measures the applicants would be expected to introduce could include, but not be limited to, the following:

u) Electric vehicle charging points at parking spaces. The government has committed to ceasing the sale of all new petrol and diesel cars and vans from 2030. In the latter part of the plan period therefore people can be expected to show particular interest in electric vehicles;

v) Provision of a communal minibus (particularly if electric), and car club space. This will be effective for housing developments but particularly for employment developments;

w) Cycle parking and shower facilities for staff;

x) On-site services (e.g. GP surgery's and shops) to reduce need for off-site movements;

y) Personalised Journey Planning services for residents. If employment premises the company could provide incentives for car-sharing and minimising car journeys for work;

z) Production of sustainable travel information for residents e.g. accurate and easily understandable bus timetables;

aa) Implementation of a Staff Management Plan to place restrictions on car use by Staff;

bb) For vehicles generating HGV movements, restrictions to keep movements below 200 HDV per day, or a commitment to ensuring all HGVs used will be Euro6 compliant.

7.27 Horsham should also commit to working with the South Downs National Park Authority and Natural England in implementing the Shared Nitrogen Action Plan (SNAP) for this site. This could include Horsham supporting direct interventions to improve tree health and resilience such as through mulching[74]. This would probably need to be funded by a financial levy on developers so the cost of interventions would need to be identified prior to Local Plan submission. Alternatively, Horsham District could make an 'in kind' contribution of staff availability if Horsham has a conservation or land management team. The SNAP has already been identified as an intervention, but it does not appear to have been fully funded.

7.28 Other initiatives to consider would include a programme of borough-wide initiatives to reduce reliance on the private car and promoting and delivering improved public transport and low emission vehicles, such as:

- requiring 50% of parking spaces at all new developments to have active electric vehicle charging point provision, including rapid charging;
- ensuring all public car parks have active electric vehicle charging infrastructure;
- producing materials to promote use of low-emission transport (such as indicating where charging points are located in the district, informing the

[74] Flores Fernández et al. (2019) demonstrated that mulch aided the recovery of soil structure of a compacted forest soil in Germany. Mulching also increases fine root growth in the surface horizons, and enhances soil biological functioning. It is important to apply mulch to an appropriate thickness (between 5 cm to 7.5 cm maximum), to facilitate rainfall percolation and oxygen diffusion into the underlying soil. Mulching is clearly a management intervention which moves beyond natural litter accumulation beneath trees, but it appears to fit with the ethos of the Adaptation Principles listed in Annex AM3 of Moffat (2019). Mulch will also provide nutrients available for uptake by the tree, and help to counter any deficiencies due to inherent soil infertility, the effects of atmospheric pollution and nutrient removal by vegetation. The RHS website gives further guidance on the practice of mulching (see RHS mulching advice).

public of the falling cost of electric vehicles due to reducing battery costs, and identifying the range of electric vehicles available); and

- working with the transport authorities over the plan period to 2037 (the year when an adverse effect is forecast) to improve non-road connectivity between Billingshurst and Petworth (both located on the A272 and which require driving past The Mens SAC to travel between the two towns), and deliver improved bus services with less polluting buses.

Appendix A European Sites Relevant to the Local Plan

Figure: A1. Location of Internationally Designated Site

Guildford District (B)

Thursley, Ash, Pirbright & Chobham

Waverley District (B)

Wealden Heaths Phase II

Mole Valley District

Tandridge District

Crawley District (B)

Ebernoe Common

The Mens

Chichester District

Horsham District

Mid Sussex District

Duncton to Bignor Escarpment

Arun Valley

Lewes District

Arun District

Adur District

The City of Brighton and Hove (B)

Castle Hill

Worthing District (B)

N

2 1 0 2 4 6 km

1:150,000 @ A3

AECOM

PROJECT

HORSHAM LOCAL PLAN HRA

CLIENT

HORSHAM DISTRICT COUNCIL

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LEGEND

- Horsham District
- Other Districts
- Site Allocation 2021
- Strategic Site Allocation 2021
- Employment Allocation 2021
- Ramsar
- Special Protection Area (SPA)
- Special Area of Conservation

NOTES

ISSUE PURPOSE

HRA

PROJECT NUMBER

60640455

SHEET TITLE

SITE ALLOCATIONS

SHEET NUMBER

Figure 1

The Mens SAC

Introduction

7.29 The Mens is one of the largest ancient woodlands in West Sussex and supports a significant population of barbastelle *Barbastella barbastellus*. This site is located 7.9km south-east of Chiddingfold Parish Boundary. Most of the SAC woodland lies on Weald Clay although in some places Paludina limestone outcrops at the surface. It is a varied site with a range of woodland communities and age structures which have developed due to differences in underlying soils and past management. The site also supports outstanding invertebrate, fungi, lichen and bryophyte assemblages.

7.30 The woodland is predominantly high forest of sessile oak *Quercus petraea* and pedunculate oak Q*uercus robur,* beech *Fagus sylvatica*, holly *Ilex aquifolium* and locally, ash *Fraxinus excelsior*, birches *Betula* spp. and wild service tree *Sorbus torminalis*. Beech dominates the lighter soils over an understorey of holly and yew *Taxus baccata*. On the heavier clay soils oak-ash woodland occurs over a mixed shrub layer which includes hazel *Corylus avellana*, hawthorn *Crataegus monogyna*, crab apple *Malus sylvestris* and blackthorn *Prunus spinosa*. It is developing a near-natural high forest structure, in response to only limited silvicultural intervention over the 20th century, combined with the effects of natural events such as the 1987 great storm. Barbastelles roost within the woodland but tend to forage outside of the site, commuting along woodland corridors into the wider countryside[75].

Reason for Designation[76]

7.31 Annex I habitats that are a primary reason for site selection include:

- Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*); Beech forests on acid soils. The Mens is an extensive area of mature beech Fagus sylvatica woodland rich in lichens, bryophytes, fungi and saproxylic invertebrates, and is one of the largest tracts of Atlantic acidophilous beech forests in the south-eastern part of the habitat's UK range.
    - This Annex I type comprises beech *Fagus sylvatica* forests with holly, growing on acid soils, in a humid Atlantic climate. Sites of this habitat type often are, or were, managed as wood-pasture systems, in which pollarding of beech and oak *Quercus* spp. was common. This is known to prolong the life of these trees.

7.32 Annex II species that are supported by the site that are primary reason for site selection include:

- Barbastelle Barbastella barbastellus
    - The Mens SAC has been selected for classification as an example of a maternity colony of barbastelles *Barbastella barbastellus* which utilise a range of tree roost's in The Mens; usually in dead tree stumps.

[75] Natural England (2019). *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features.* Available online from: http://publications.naturalengland.org.uk/publication/5642356338458624 [Accessed; 14/01/20].
[76] JNCC (2019) *The Mens SAC.* Available online at*:* https://sac.jncc.gov.uk/site/UK0012716 [Accessed: 14/01/20].

However, the species appears to be present throughout the year; but it is not clear how many bats hibernate at the site.

Current Threats and Pressures[77]

7.33 The Mens is an extensive and structurally diverse woodland site. Like Ebernoe Common, the woodland site adjacent to it, it is ancient woodland, having been under continuous woodland cover for the last 500 years. Its diversity supports a range of species including lichen, fungi and invertebrates. Barbastelle bats *Barbastella barbastellus* - who favour ancient woodland - breed in the site because it provides the nesting and feeding habitats they require. Barbastelles commute into the surrounding countryside using the woodland corridors which branch out from the site. Current threats and pressures experienced by the site include:

- Forestry and woodland management;
- Habitat connectivity;
- Invasive species;
- Change in land management;
- Air pollution; and
- Public access and disturbance.

Conservation Objectives[78]

7.34 ‘Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.’

Arun Valley SPA / Ramsar

Introduction

7.35 The Arun Valley SPA / Ramsar comprises an area of wet meadows on the floodplain of the River Arun between Pulborough and Amberley. The grassland is neutral wet and subject to winter as well as occasional summer flooding. An

[77] Natural England (2015). *Site improvement plan The Mens.* Available online at: http://publications.naturalengland.org.uk/publication/5548316158853120 [Accessed: 14/01/20].
[78] Natural England (2018). *European Site Conservation Objectives for The Mens Special Area of Conservation*. Available online at: http://publications.naturalengland.org.uk/publication/5642356338458624 [Accessed: 14/01/20].

extensive network of drainage ditches runs through the SPA, providing habitat for biodiverse aquatic flora and invertebrate communities. Additionally, the site is also classified as a Site of Community Importance (SCI) for little whirlpool ram's-horn snail *Anisus vorticulus*.

7.36 The plant communities present in the fields are primarily determined by the management history and water levels present. For example, the drier fields are dominated by meadow grasses, such as crested dog's-tail *Cynosurus cristatus* and perennial rye-grass *Lolium perenne*. In wetter areas rushes, sedges and tufted hair-grass *Deschampsia cespitosa* are more frequent. The ungrazed fields have developed into fen, scrub and woodland. Fen areas comprise common reed *Phragmites australis* and greater tussock-sedge *Carex paniculate*. On drier ground there is alder *Alnus glutinosa*, willow *Salix* sp. and birch *Betula* sp.

7.37 Most notably the Arun Valley SPA supports important numbers of wintering waterfowl, such as Bewick's swan *Cygnus columbianus bewickii*, shoveler *Anas clypeata*, teal *Anas crecca* and wigeon *Anas Penelope*. These feed in the wetter, low-lying fields of the floodplain adjacent to drainage ditches.

SPA Qualifying Features[79]

7.38 Qualifying individual species listed in Annex I of the Wild Birds Directive (Article 4.1)

- Bewick's swan Cygnus columbianus bewickii

7.39 Qualifying assemblages of species (Article 4.2)

During the non-breeding season the SPA regularly supports an assemblage of waterfowl with the area regularly supporting 27,241 individual waterfowl (5 year peak mean for 1992/93 to 1996/97) including: Shoveler *Anas clypeata*, teal *Anas crecca*, wigeon *Anas penelope*, Bewick's swan *Cygnus columbianus bewickii*.

Ramsar Qualifying Features[80]

7.40 The Arun Valley qualifies as a Ramsar site under the following Ramsar criteria:

Criterion 2

The site holds seven wetland invertebrate species listed in the British Red Data Book as threatened. One of these, *Pseudamnicola confusa*, is considered to be endangered. The site also supports four nationally rare and four nationally scarce plant species.

Criterion 3

In addition to the Red Data Book invertebrate and plant species, the ditches intersecting the site have a particularly diverse and rich flora. All five British duckweed *Lemna* species, all five water-cress *Rorippa* species, and all three British water milfoils (*Myriophyllum* species), all but one of the seven British water dropworts (*Oenanthe* species), and two-thirds of the British pondweeds (*Potamogeton* species) can be found on site.

[79] http://publications.naturalengland.org.uk/publication/4567444756627456 [Accessed on the 02/03/2020]
[80] https://jncc.gov.uk/jncc-assets/RIS/UK11004.pdf [Accessed on the 02/03/2020]

Criterion 5

Assemblages of international importance

Species with peak counts in winter: 13,774 waterfowl (5 year peak mean 1998/99-2002/03)

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

Species with peak counts in winter: Northern pintail, *Anas acuta*, NW Europe: 641 individuals, representing an average of 1% of the population (5-year peak mean 1998/99-2002/03)

Conservation Objectives[81]

7.41 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;

7.42 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

Threats / Pressures to Site Integrity[82]

7.43 The following threats / pressures to the site integrity of the Arun Valley SPA / Ramsar have been identified in Natural England's Site Improvement Plan:

- Inappropriate water levels
- Water pollution
- Inappropriate ditch management

Arun Valley SAC

Introduction

7.44 The Arun Valley SAC, largely overlapping with the Arun Valley SPA / Ramsar, is a 487.48ha site comprising humid / mesophile grassland (95%), inland water bodies (2%) and bogs / marshes (2%). Given the overlap with the SPA / Ramsar (discussed in the previous section), the ecological characteristics are similar. However, the SAC is primarily designated for the ramshorn snail *Anisus*

[81] http://publications.naturalengland.org.uk/publication/4567444756627456 [Accessed on the 02/03/2020]
[82] http://publications.naturalengland.org.uk/publication/5353882309885952 [Accessed on the 02/03/2020]

vorticulus. The snail occurs across a range of sites in southern and eastern England, with the Arun Valley being one of the three main population centres in the UK. Two of the core sites for the ramshorn snail lie in the wash lands of the Arun floodplain: the Pulborough Brooks and Amberley Wild Brooks SSSIs.

Qualifying Features[83]

7.45 Annex II species that are a primary reason for selection of this site:

- Ramshorn snail Anisus vorticulus

Conservation Objectives[84]

7.46 With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

7.47 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of the habitats of qualifying species
- The structure and function of the habitats of qualifying species
- The supporting processes on which the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

Threats / Pressures to Site Integrity[85]

7.48 The following threats / pressures to the site integrity of the Arun Valley SAC have been identified in Natural England's Site Improvement Plan:

- Inappropriate water levels
- Water pollution
- Inappropriate ditch management

7.49 Potential loss of functionally linked habitat has also been identified as a concern, although it is not mentioned in the Site Improvement Plan.

Ashdown Forest SAC

Introduction

7.50 The Ashdown Forest SAC is a 2,715.88ha site comprising heath / scrub (60%) and mixed woodland (40%) in south England. It is an area of tranquil open heathland straddling the highest sandy ridge-top of the High Weald Area of Outstanding Natural Beauty. It is situated approx. 30 miles south of London. Its underlying sandstone geology combines with a local wetter and cooler climate to

[83] https://sac.jncc.gov.uk/site/UK0030366 [Accessed on the 02/03/2020]
[84] http://publications.naturalengland.org.uk/publication/4924283725807616 [Accessed on the 02/03/2020]
[85] http://publications.naturalengland.org.uk/publication/5353882309885952 [Accessed on the 02/03/2020]

produce acidic and nutrient-poor soils that produce fertile ground for heathland, valley mires and damp woodland.

7.51 Notably, the Ashdown Forest SAC contains the largest single continuous block of lowland heathland in south-east England, including dry heaths and a large proportion of wet heaths. It is particularly important in the context of the recent loss of heathland, which has shrunk by 50% in East Sussex over the past 200 years. The site supports important assemblages of beetles, dragonflies, damselflies and butterflies. Bird species of European importance are European nightjar, Dartford warbler and Eurasian hobby.

7.52 Atmospheric pollution in the SAC particularly from traffic associated with Local Plans has become a significant issue in the past years. The SAC is permeated by a network of roads, many of which form major routes-to-work for local residents. A joint Air Quality Impact Assessment (AQIA) has been undertaken by Wealden District Council, Lewes District Council and other adjoining authorities. This has shown that the additional urban development will result in marginal retardation of the drop in atmospheric nitrogen deposition, but this will not affect / reduce plant species richness. Notwithstanding this, air quality remains a strategic issue in the wider geographic area around Ashdown Forest.

Qualifying Features[86]

7.53 Annex I habitats that are a primary reason for selection of this site

- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths

7.54 Annex II species present as a qualifying feature, but not a primary reason for site selection

- Great-crested newt *Triturus cristatus*

Conservation Objectives[87]

7.55 With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

7.56 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species

[86] Available at: https://sac.jncc.gov.uk/site/UK0030080 [Accessed on the 03/09/2020]
[87] Available at: http://publications.naturalengland.org.uk/publication/6183967367626752 [Accessed on the 03/09/2020]

- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

Threats / Pressures on Site Integrity[88]

7.57 Natural England's Site Improvement Plan lists the following threats / pressure on the site integrity of the Ashdown Forest SAC:

- Change in land management
- Air pollution: Impact of atmospheric nitrogen deposition
- Public access / disturbance
- Hydrological changes

Duncton to Bignor Escarpment SAC

Introduction

7.58 Duncton to Bignor Escarpment covers 214.47ha. Within the SAC *Asperulo-Fagetum* beech forests occur on steep scarp slopes and on more gently-sloping hillsides in mosaic with ash *Fraxinus excelsior* woodland, scrub and grassland. Much of the beech woodland is high forest but with some old pollards. Rare plants present include the white helleborine *Cephalanthera damasonium*, yellow bird's nest *Monotropa hypopitys* and green hellebore *Helleborus viridis*. The woods also have a rich mollusc fauna.

Reasons for Designation

7.59 Duncton to Bignor Escarpment qualifies as a SAC for the Habitats Directive Annex I habitat of:

- Beech forests on acid soils.

Conservation Objectives

7.60 The Conservation Objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats
- The structure and function (including typical species) of qualifying natural habitats, and
- The supporting processes on which the qualifying natural habitats rely

[88] Available at: http://publications.naturalengland.org.uk/publication/5793096570765312 [Accessed on the 03/09/2020]

Historic Trends and Current Pressures

7.61 Historically this site has relatively few threats. The JNCC Natura 2000 Data Sheet documents '*The escarpment woodland hosts a number of pheasant shoots which, in general, pose no threat to the woodland. Expansion of these shoots from current levels is undesirable. Plantations of non-native conifers are targeted for complete or partial removal. A large resident deer population is controlled by deer stalkers'.*

7.62 In the most recent Natural England condition assessment process, 92.33% of the component SSSI of the SAC was considered to be in favourable condition.

7.63 The key environmental conditions that support the features of European interest have been defined as appropriate woodland management. According to the Site Improvement Plan '*No current issues affecting the Natura 2000 feature(s) have been identified on this site'.*

Ebernoe Common SAC

Introduction

7.64 Ebernoe Common is a 234.93ha site of international importance as an example of ancient woodland. It contains a wide range of structural and vegetation community types which have been influenced in their development by differences in the underlying soils and past management. The native trees, particularly those with old growth characteristics, support rich lichen and fungal communities, and a diverse woodland breeding bird assemblage. Nationally important maternity roosts for barbastelle bat and Bechstein's bat occur within the woodland.

Reasons for Designation

7.65 Ebernoe Common SAC qualifies as a SAC for both habitats and species. Firstly, the site contains the Habitats Directive Annex I habitats of:

- Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)

7.66 Secondly, the site contains the Habitats Directive Annex II species:

- Barbastelle bat; and
- Bechstein's bat

Conservation Objectives[89]

"Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- *The extent and distribution of qualifying natural habitats and habitats of qualifying species*
- *The structure and function (including typical species) of qualifying natural habitats*

[89] http://publications.naturalengland.org.uk/file/5942973099671552 [accessed 16/12/2020]

- *The structure and function of the habitats of qualifying species*
- *The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely*
- *The populations of qualifying species, and,*
- *The distribution of qualifying species within the site."*

Historic Trends and Current Pressures

7.67 Ebernoe Common SAC is owned and managed by Sussex Wildlife Trust (SWT). There is evidence that the Common has contained a mixture of open pasture and high forest for centuries. Ebernoe Nature Reserve is an Open Access site and is fairly well used (SWT estimate up to 3,000 visitors per annum)[90].

7.68 In the most recent Natural England condition assessment process, 92.81% of Ebernoe Common SSSI was considered to be in favourable condition with the remainder recovering from unfavourable status

7.69 Ebernoe Common is an exceptional site for both barbastelle and Bechstein bats. Most of what is known about the foraging behaviour of barbastelle bats has been derived by studies carried out over the past ten years, and the studies are able to give detailed information on flight lines surrounding Ebernoe Common of the barbastelle bat:

- Greenaway, F. (2004) Advice for the management of flightlines and foraging habitats of the barbastelle bat *Barbastellus barbastellus*. *English Nature Research Report*, Number 657.
- Greenaway, F. (2008) Barbastelle bats in the Sussex West Weald 1997 - 2008

7.70 The barbastelles at Ebernoe Common SAC had flightlines that followed watercourses, particularly the River Kird, and woodland cover for distances of typically 7km. Flightlines outside the SAC are particularly to the south (the Petworth and Tillington area) but also to the west, north and east. There has been less study of the Bechstein bat populations. However, those radio-tracking projects which have been implemented for the species have established that the tracked individuals generally remained within approximately 1.5 km of their roosts[91]. These distances do fit with those identified from radio-tracking of Bechstein's that has been undertaken at Ebernoe Common SAC from 2001, which identified that the maximum distance travelled by a tagged Bechstein's bat to its foraging area was 1,407m, with the average 735.7m[92].

7.71 Studies have indicated that barbastelle bat flightlines from Ebernoe Common SAC cross the northern part of Chichester District. Most of this area now lies within the South Downs National Park for strategic planning purposes.

7.72 The key vulnerabilities to the SAC are:

[90] Monk-Terry, M and Lyons, G. Sussex Wildlife Trust Ebernoe Nature Reserve Management Plan 2010-2015.
[91] Cited in: Schofield H & Morris C. 2000. 'Ranging Behaviour and Habitat Preferences of Female Bechstein's Bats in Summer'. Vincent Wildlife Trust
[92] Fitzsimmons P, Hill D, Greenaway F. 2002. Patterns of habitat use by female Bechstein's bats (Myotis bechsteinii) from a maternity colony in a British woodland

- Traditional management to maintain the structural diversity and associated lichen and fungal flora, including appropriate grazing regime.
- The retention of deadwood within the site
- Minimal atmospheric pollution - may increase the susceptibility of beech trees to disease and alter epiphytic communities.
- Absence of disturbance.
- In a wider context, bats require good connectivity of landscape features to allow foraging and commuting. For barbastelle bats this is up to 7km from a known roost and up to 1.5km for Bechstein bats.
- Both bat species have close association with woodland. Areas of undesignated woodland adjacent to SAC may be of most importance to population.
- Barbastelles require a constant humidity around their roosts; any manipulation of the shrub layer must be carefully considered.

Appendix B LSEs Screening Table of The Plan Policies

Where a column is identified in green, this impact pathway does not contain any potential linking impact pathways to an international site. Where a column is identified in Orange, potential linking impact pathways exist between the allocation and an international site and the site will be subject to further discussions and appropriate assessment.

Policy number/ name	Policy detail	Likely Significant Effects Screening Assessment
Strategic Policy 1: Sustainable Development	• This is a development management policy relating to sustainable development with in the District	No Likely Significant Effect Sustainable development, by definition, must exclude any development that would have an adverse effect on European sites as these could not be described as 'sustainable'.
Strategic Policy 2: Development Hierarchy and Settlement Expansion	This is development management policy relating to development hierarchy and the expansion of settlements.	No Likely Significant Effect This policy simply sets out the development hierarchy and does not specifically identify a quantum or location of growth.
Strategic Policy 3: Settlement Expansion	A development management policy relating to settlement expansion	No Likely Significant Effect This policy simply sets out the development hierarchy and does not specifically identify a quantum or location of growth.

Strategic Policy 4 - Horsham Town	This policy provides the development strategy for Horsham Town. It promotes the delivery of housing, employments and leisure development.	Likely Significant Effects (LSEs) of this policy cannot be excluded. This policy provides the development strategy for Horsham Town. It does not specify a quantum of development but does clearly promote and seek to deliver housing, employment and leisure development. The following impact pathways on European sites are linked to this policy: • Recreational Pressure • Water Quality • Water Level and Flow • Atmospheric Pollution • Loss of Functionally Linked Habitat This policy is screened in for Appropriate Assessment.
Strategic Policy 5: Broadbridge Heath Quadrant	This policy provides the development strategy for the Broadbridge Heath Quadrant. It does not specify a quantum of development but does clearly promote and seek to deliver housing, employment and leisure development.	Likely Significant Effects (LSEs) of this policy cannot be excluded. The following impact pathways on European sites are linked to this policy: • Recreational Pressure • Water Quality • Water Level and Flow • Atmospheric Pollution

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- Loss of Functionally Linked Habitat

This policy is screened in for Appropriate Assessment.
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<tr>
<td>Strategic Policy 6: New Employment:</td>
<td>A strategic policy supporting sustainable economic growth via the provision of sufficient employment land.
This policy allocates the following employment site allocations:
<table>
<tr><th>Site Name</th><th>Indicative employment floorspace sqm (Use Classes B2/B8/part E [former B1])</th></tr>
<tr><td>Strategic Allocations</td><td>All strategic site allocations are expected to provide opportunities for employment and for people to live and work locally.</td></tr>
<tr><td>Site EM1 - Land at Lower Broadbridge Farm, Broadbridge Heath</td><td>3.7ha is allocated for B2 and B8 with some former B1 uses (c.11,000sqm in total). Appropriate regard will need to be given to the safeguarded quarry and minerals (Building Stone and Clay), comply with Policy M10 of the JMLP, and also any potential impacts from surface water and wastewater on the Arun SSSI.</td></tr>
<tr><td>Site EM2 - Land South of Star Road Industrial Estate, Partridge Green</td><td>3.9ha is allocated for B2 and B8 uses with some former B1 uses (c.9,000sqm in total). A 15m buffer or greater, as appropriate, adjacent the ancient woodland will be required. An operational buffer must also be provided around the sewage treatments works, as appropriate.</td></tr>
<tr><td>Site EM3 - North of Mercer Road, Warnham Station</td><td>3ha is allocated for B2 and B8 uses with some former B1 uses (c.9,000sqm in total). A 15m buffer or greater, as appropriate, adjacent the ancient woodland will be required. Appropriate regard must be given to the nearby waste</td></tr>
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Likely Significant Effects (LSEs) of this policy cannot be excluded.

The following impact pathways on European sites are linked to this policy:

- Recreational Pressure
- Water Quality
- Water Level and Flow
- Atmospheric Pollution
- Loss of Functionally Linked Habitat

This policy is screened in for Appropriate Assessment.

Individual site allocations are subject to a Test of Likely Significant Effects in Appendix C, Table C3
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		facilities and comply with Policy 2 of the Waste Local Plan.	
	Site EM4 - Land to the West of Graylands Estate, Langhurstwood Road, Horsham	3.2ha is allocated for B2 and B8 uses with some former B1 uses (c.9,500sqm in total) as an expansion to the west of the existing employment site, taking into account the proximity of the allocation of Land to the North of Horsham. A 15m buffer or greater, as appropriate, adjacent the ancient woodland will be required. Appropriate regard must be given to the nearby waste facilities and comply with Policy 2 of the Waste Local Plan.	
	Site EM6 - Land South of Broomers Hill Park	2.7ha is allocated for B2, B8 and former B1 uses (c. 7,000sqm in total) as an expansion of the existing employment site. Appropriate regard will need to be given to any potential impacts from surface water and waste water on the Arun SSSI.	
	Site EM7 - Land South of Hillier Garden Centre	4.0ha is allocated for B2 and B8 uses with some former B1 uses (c.11,000sqm in total). This site should complement the existing commercial activities to the north. A 15m buffer or greater, as appropriate, adjacent the ancient woodland will be required.	
	Site EM8 - Land South West of Hop Oast Roundabout	1ha is allocated for B2 and B8 uses with some former B1 uses (c.3,000sqm in total). Appropriate regard will need to be given to any potential impacts from surface water and waste water on the Arun SSSI.	
	Site EM9 - Land at Hilland Farm	2.3ha is allocated for B2 and B8 uses with some former B1 uses (c.5,000sqm) as an expansion of the employment being developed to the north of the site. Appropriate regard will need to be given to any potential	

	impacts from surface water and waste water on the Arun SSSI.	
Strategic Policy 7: Enhancing Existing Employment	This policy provides the development strategy for employment. It does not specify a quantum of development but does clearly promote and seek to deliver housing, employment and leisure development and provides Key Employment Areas within the District as follows: Huffwood & Eagle Trading Estates, Brookers Road, Billingshurst • Daux Road Industrial Estate, Billingshurst • Gillmans Industrial Estate, Natts Lane, Billingshurst • Lawson Hunt Industrial Park, Broadbridge Heath • Mackley Industrial Estate, Small Dole • Blatchford Road, Horsham • Foundry Lane, Horsham • Nightingale Road, Horsham • Station Approach, Pulborough • Oakhurst Business Park, Wilberforce Way, Southwater • Water Lane Trading Estate, Storrington • Huffwood Trading Estate, and Star Road Partridge Green • Wiston Business Park, London Road, Ashington • Henfield Business Park, Shoreham Road, Henfield • Graylands Estate, Langhurstwood Road, Horsham • North Heath Lane Industrial Estate, North Heath Lane, Horsham • Parsonage Business Park, Parsonage Way, Horsham • Spring Copse Business Park, Slinfold • The Business Park, Maydwell, Slinfold	Likely Significant Effects (LSEs) of this policy cannot be excluded. The following impact pathways on European sites are linked to this policy: • Water Quality • Water Level and Flow • Atmospheric Pollution • Loss of Functionally Linked Habitat This policy is screened in for Appropriate Assessment.

	• Southwater Business Park, Worthing Road, Southwater • Rock Business Park, The Hollow, Washington • Rosier Commercial Centre, Billingshurst • Oakendene Industrial Estate, Cowfold .	
Policy 8 - Rural Economic Development	A development management policy relating to rural economic development. No location type or quantum are identified.	No Likely Significant Effect Sustainable development, by definition, must exclude any development that would have an adverse effect on European sites as these could not be described as 'sustainable'.
Policy 9: Conversion of Agricultural and Rural Buildings to Commercial, Community or Residential Uses	A development management policy providing for the conversion of agricultural and rural buildings to commercial, community or residential use. No location or quantum of development is provided.	No Likely Significant Effect Conversion of agricultural buildings to residential use would be associated with an increase in housing. However, any housing will be part of the overall housing strategy in the district. This policy simply sets out the parameters that would determine conversion to be acceptable.
Policy 10 - Equestrian Development	Policy provides for equestrian development. It does not identify any explicit quantum, location or type of development.	Likely Significant Effects (LSEs) of this policy cannot be excluded. This policy provides the development strategy for equestrian activities. It does not specify a quantum of development but does clearly promote and seek to deliver housing, employment and leisure development.

		The following impact pathways on European sites are linked to this policy: • Atmospheric Pollution • Loss of Functionally Linked Habitat This policy is screened in for Appropriate Assessment.
Strategic Policy 11 - Tourism Facilities and Visitor Accommodation	This policy provides the development strategy for tourism. It does not specify a quantum of development but does clearly promote and seek to deliver housing, employment and leisure development.	Likely Significant Effects (LSEs) of this policy cannot be excluded. The following impact pathways on European sites are linked to this policy: • Recreational Pressure • Water Quality • Water Level and Flow • Atmospheric Pollution • Loss of Functionally Linked Habitat This policy is screened in for Appropriate Assessment.
Policy 12: Strategic Policy – Town Centre Hierarchy	A strategic development management policy setting out the retail hierarchy. It does not provide for any development.	No Likely Significant Effect This policy simply sets out the retail hierarchy and does not promote development or identify a quantum of development.
Strategic Policy 13 - Town Centre Uses	A strategic development management policy relating to the use of town centres. No quantum location or type of development is provided for.	No Likely Significant Effect

		This policy simply describes acceptable town centre uses and does not promote development or identify a quantum of development.
Strategic Policy 14: Housing Provision	Provision is made for the development of at least 18,700 homes associated infrastructure within the period 2020-2038 at an average delivery rate of 1,100 homes per year. The target for the first five years of the plan will be 900 homes a year, rising to 1,180 for the remainder of the plan period. This figure will be achieved by 1. Housing completions for the period 2021-2022 2. Homes that are already permitted or agreed for release, including previously allocated strategic sites at Land North of Horsham (2,750) and Land West of Southwater (600), Land at Kilnwood Vale (2,500) and Land South of Billingshurst; 3. Strategic Sites: a) At least 3,250 homes on Land West of Ifield b) At least 1,200 homes on Land West of Southwater c) At least 650 homes on Land East of Billingshurst d) At least 2,100 homes at Land at Buck Barn 4. At least 2,200 homes from smaller scale allocations to be allocated in this Local Plan or in Neighbourhood Plans 5. An additional 500 homes within the existing Land North of Horsham allocation and 1,875 windfall units, including 10% provision on land less than 1ha.	Likely Significant Effects (LSEs) of this policy cannot be excluded. This policy provides the development strategy for housing. It does not specify a quantum of development but does clearly promote and seek to deliver housing, employment and leisure development. The following impact pathways on European sites are linked to this policy: • Recreational Pressure • Water Quality • Water Level and Flow • Atmospheric Pollution • Loss of Functionally Linked Habitat This policy is screened in for Appropriate Assessment.
Strategic Policy 15 - Meeting Local Housing Needs	A development management policy supporting residential development where it provides housing to meet the needs of the District's communities as evidenced by the SHMA.	No Likely Significant Effect This policy simply sets out the principles underlying acceptable Strategic Sites and does not promote development or identify a quantum of development.

<table>
<tr><td>Strategic Policy 16 - Affordable Housing</td><td>A development management policy relating to the provision of affordable housing.</td><td>No Likely Significant Effect

This policy does not promote development or identify a quantum of development.</td></tr>
<tr><td>Policy 17 - Improving Housing Standards in the District</td><td>A development management policy relating to housing standards within the District.</td><td>No Likely Significant Effect

This policy does not promote development or identify a quantum of development.</td></tr>
<tr><td>Policy 18: Rural Exception Homes</td><td>A development management policy providing for, in exceptional circumstances, limited amounts of land that would not otherwise be released for general market housing may be released for the development of affordable homes</td><td>No Likely Significant Effect

This policy does not promote development or identify a quantum of development.</td></tr>
<tr><td>Policy 19 Retirement Housing and Specialist Care</td><td>A development management policy relating to the provision of retirement housing and specialist care.</td><td>No Likely Significant Effect

This policy does not promote development or identify a quantum of development.</td></tr>
<tr><td>Policy 20 - Gypsy, Traveller and Travelling Showpeople Accommodation</td><td>A strategic development policy providing accommodation for Gypsy, Traveller and Travelling Showpeople.
Site allocations are provided as follows:
<table>
<tr><th>Site</th><th>Existing Authorised Gypsy & Traveller Pitches</th><th>Proposed Additional Net Pitches</th><th>Total Gross Pitches (Total Net Pitches)</th></tr>
<tr><td>1. Land at Junction of Hill Farm Lane and Stane Street, Codmore Hill (Existing Site)</td><td>2</td><td>2</td><td>4 (2)</td></tr>
<tr><td>2. Lane Top/ Oak Tree View, Pulborough (Existing Site)</td><td>2</td><td>5</td><td>7 (5)</td></tr>
<tr><td>3. Northside Farm, Rusper Road (Existing site)</td><td>1</td><td>3</td><td>4 (3)</td></tr>
</table></td><td>Likely Significant Effects (LSEs) of this policy cannot be excluded.

This policy provides the development strategy for travellers. It clearly promotes and seeks to deliver residential development.

The following impact pathways on European sites are linked to this policy:

• Recreational Pressure
• Water Quality
• Water Level and Flow
• Atmospheric Pollution</td></tr>
</table>

<table>
<tr>
<td></td>
<td>
<table>
<tr><td>4. Southview, The Haven, Slinfold (Existing Site)</td><td>1</td><td>4</td><td>5 (4)</td></tr>
<tr><td>5. Sussex Topiary, Rudgwick (Existing Site)</td><td>4</td><td>8</td><td>12 (8)</td></tr>
<tr><td>6. Plot 3, Bramblefield, Crays Lane, Thakeham (Existing Site)</td><td>1</td><td>3</td><td>4 (3)</td></tr>
<tr><td>7. Land West of Ifield (Strategic Site Allocation)</td><td>0</td><td>15</td><td>15 (15)</td></tr>
<tr><td>8. Land East of Billingshurst (Strategic Site Allocation)</td><td>0</td><td>5</td><td>5 (5)</td></tr>
<tr><td>9. Rookwood, Horsham town (Strategic Site Allocation)</td><td>0</td><td>5</td><td>5 (5)</td></tr>
<tr><td>10. Land West of Southwater (Strategic Site Allocation)</td><td>0</td><td>5</td><td>5 (5)</td></tr>
<tr><td>11. Buck Barn (Strategic Site Allocation)</td><td>0</td><td>15</td><td>15 (15)</td></tr>
<tr><td>TOTAL</td><td>11 pitches</td><td>70 pitches</td><td>81 pitches (70 pitches)</td></tr>
</table>
</td>
<td>
Loss of Functionally Linked Habitat
This policy is screened in for Appropriate Assessment.

Site Allocations are subject to a Test of Likely Significant Effects in Appendix C, Table C4
</td>
</tr>
<tr>
<td>Policy 21 - Rural Workers' Accommodation</td>
<td>A development management policy relating to rural workers accommodation. This policy does not promote development or identify a quantum of development</td>
<td>No Likely Significant Effect

This policy does not promote development or identify a quantum of development.</td>
</tr>
<tr>
<td>Policy 22 - Replacement Dwellings and House Extensions in the Countryside</td>
<td>A development management policy relating to replacement dwellings and house extensions in the countryside. This policy does not promote development or identify a quantum of development</td>
<td>No Likely Significant Effect

This policy does not promote development or identify a quantum of development. Moreover, this policy would not be associated with a net increase in housing.</td>
</tr>
</table>

Policy 23- Ancillary Accommodation	A development management policy relating to ancillary development. This policy does not promote development or identify a quantum of development	No Likely Significant Effect This policy does not promote development or identify a quantum of development. Moreover, this policy would not be associated with a net increase in housing
Policy 24 - Strategic Policy: Environmental Protection	A strategic development management policy providing environmental protections.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy 25: Air Quality	This strategic policy provides for air quality management.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy 26: The Natural Environment and Landscape Character	A strategic policy providing for the protection of the natural environment and landscape character.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Policy 27 - Strategic Policy: Countryside Protection	A strategic policy providing for the protection of the countryside	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy 28: Settlement Coalescence	A strategic policy protecting settlements from coalescence.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy 29: Protected Landscapes	A strategic development management policy relating to th protection of landscapes such as the High Weald AONB And the South Downs National Park.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.

Policy 30 - Strategic Policy: Green Infrastructure and Biodiversity	This strategic policy provides for the protection of green infrastructure and biodiversity. It includes the following text that provides explicit protection for internationally designated sites: *"7. Particular consideration will be given to the hierarchy of sites and habitats within, or functionally linked to, the District as follows:* *a) Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites;…* 8. *9. Any development with the potential to impact Arun Valley SPA / SAC / Ramsar site, The Mens SAC and / or Ebernoe Common SAC will be subject to a Habitats Regulation Assessment to determine the need for an Appropriate Assessment. In addition, development will be required to be in accordance with the necessary mitigation measures for development set out in the HRA of this plan."*	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Policy 31- Local Green Space	A strategic policy relating to the protection and creation of local green space.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy 32 - Development Quality	A strategic policy providing for the quality of development.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy 33: Development Principles	A strategic policy providing development management regarding Development Principles.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Policy 34 - Heritage Assets and Managing change in the Historic Environment	A development management policy relating to heritage assets and the historic environment.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Policy 35 - Shop Fronts and Advertisements	A development management policy relating to shop fronts and advertisements.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.

Strategic Policy 36 - Climate Change	A strategic policy relating to climate change within the District. It supports the provision of renewable and low carbon development.	No Likely Significant Effect This policy does not promote development or identify a quantum of development. Some forms of renewable energy could pose the potential for adverse effects on European sites, but this policy leaves decisions of that nature to individual applications.
Strategic Policy 37 - Appropriate Energy Use	A strategic policy supporting clean and efficient energy use within the District.	No Likely Significant Effect This policy does not promote development or identify a quantum of development. Some forms of renewable energy could pose the potential for adverse effects on European sites, but this policy leaves decisions of that nature to individual applications.
Policy 38 - Sustainable Design and Construction	A strategic policy providing for improved sustainability of development.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy 39 - Flooding	A strategic policy relating to flooding.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy 40 - Infrastructure Provision	A strategic development management policy relating to infrastructure provision. This is a positive policy as it ensures the timely provision of new infrastructure as needed to serve development.	No Likely Significant Effect This policy does not promote development or identify a quantum of development. Rather it is an environmentally positive policy that ensures the infrastructure to

		service development is in place before that development is occupied.
Strategic Policy 41 - Sustainable Transport	This is a positive strategic policy relating to sustainable transport. This has the potential to reduce atmospheric pollution contributions.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Policy 42 - Parking	A development management policy relating to parking	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Policy 43 - Gatwick Airport Safeguarded Land	A development management policy relating to the safeguarding of land for Gatwick Airport and the aerodrome.	No Likely Significant Effect This policy does not promote development or identify a quantum of development. A safeguarding policy simply ensures that potential future uses are not sterilized by inappropriate conflicting development. It carries no presumption that the development for which safeguarding is occurring will be permitted.
Strategic Policy 44- Inclusive Communities, Health and Wellbeing	A strategic policy relating to inclusive communities, health and wellbeing.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Policy 45 - Community Facilities and Uses	A development management policy relating to community facilities and uses.	No Likely Significant Effect This policy does not promote development or identify a quantum of development.
Strategic Policy HA1: Strategic Site Development Principles	This is a development management policy providing Development Principles for Strategic Sites.	No Likely Significant Effect

		This policy does not promote development or identify a quantum of development.

Appendix C LSEs Screening Table of Site Allocations

Figure C1: Location of Site Allocations

Table C1: Strategic Site Allocation Screening

Where a column is identified in green, this impact pathway does not contain any potential linking impact pathways to an international site. Where a column is identified in Orange, potential linking impact pathways exist between the allocation and an international site and the site will be subject to further discussions and appropriate assessment.

Site Allocation	HRA Screening Implications				
	Water Quality (Arun Valley SPA / Ramsar)	Water Quantity, Level and Flow (Arun Valley SPA / Ramsar)	Loss of Functionally Linked Land (Arun Valley SPA / Ramsar)	Loss of Functionally Linked Land (The Mens SAC)	Loss of Functionally Linked Land (Ebernoe Common SAC)
HA2: Land at Buck Barn	Likely to use Horsham STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
Strategic Policy HA3: Land East of Billingshurst	Likely to use Billingshurst STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	Yes, located within 6.5km of the SAC and located within a greenfield site. Potential linking impact pathways present	Yes, located within 12km of the SAC and located within a greenfield site. Potential linking impact pathways present

Strategic Policy HA6: Land West of Southwater	Likely to use Horsham STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
Strategic Policy HA5: West of Crawley Area of Search and Land West of Ifield	Likely to use London (Crawley) STW which discharges into the River Thames catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present

Table C2: Residential Site Allocation Screening

Where a column is identified in green, this impact pathway does not contain any potential linking impact pathways to an international site. Where a column is identified in Orange, potential linking impact pathways exist between the allocation and an international site and the site will be subject to further discussions and appropriate assessment.

Site Allocation	HRA Screening Implications				
	Water Quality (Arun Valley SPA / Ramsar)	Water Quantity, Level and Flow (Arun Valley SPA / Ramsar)	Loss of Functionally Linked Land (Arun Valley SPA / Ramsar)	Loss of Functionally Linked Land (The Mens SAC)	Loss of Functionally Linked Land (Ebernoe Common SAC)
CW1: Land at Brook Hill & Cowfold Glebe	Likely to use Cowfold WwTW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
CW2: Field West of Cowfold, North of A272	Likely to use Cowfold WwTW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
CW3: Fields West of Cowfold, South of A272/Field W of	Likely to use Cowfold WwTW which discharges	Only an in-combination potential linking	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is	No, located more than 12km from the SAC. There are no	No, located more than 12km from the SAC. There are no

Cowfold, S of A272, W of Little Potters	into the River Arun catchment. Thus, potential in combination linking impact pathways.	impact pathway is present. the allocation itself is screened out in-isolation.	located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	realistic linking impact pathways present	realistic linking impact pathways present
HOR1: Land at Hornbrook Farm	Likely to use Horsham STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
BGR1: Land South of Smugglers Lane	Likely to use Barns Green WwTW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
BGR2: Land South of Muntham Drive	Likely to use Barns Green WwTW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
BGR3: Land at Slaughterford	Likely to use Barns Green WwTW which	Only an in-combination	This site is located more than 6.5km from the Arun Valley SPA /	Yes, located between 6.5km and	No, located more than 12km from the

Farm (Sumners Pond)	discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	12km of the SAC and located within a greenfield site. Potential linking impact pathways present	SAC. There are no realistic linking impact pathways present
BRH1: Land at Lower Broadbridge Farm	Likely to use Horsham STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
BRH2: Land at Wellcross	Likely to use Horsham STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
LWB1: Land at Glayde Farm, West of Church Lane	Likely to use Lower Beeding WwTW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present

LWB2: Land North of Sandygate Lane	Likely to use Lower Beeding WwTW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
LWB3: Land at Trinity Cottage	Likely to use Lower Beeding WwTW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
PLB1: Land at Greendene	Likely to use Pulborough STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	Yes, located within 6.5km of the SAC and located within a greenfield site. Potential linking impact pathways present	Yes, located within 12km of the SAC and located within a greenfield site. Potential linking impact pathways present
PLB2: at New Place Farm	Likely to use Pulborough STW which discharges into the River Arun catchment. Thus, potential in	Only an in-combination potential linking impact pathway is present. the allocation itself is	Located within 6.5km of the Arun Valley SPA/ Ramsar site and 10.2ha in size. From review of freely available online imagery, this site contains a plant nursery with a complex of greenhouses. It is not considered suitable to	Yes, located within 6.5km of the SAC and located within a greenfield site. Potential linking impact pathways present	Yes, located within 12km of the SAC and located within a greenfield site. Potential linking impact pathways present

	combination linking impact pathways.	screened out in-isolation.	act as functionally linked land for Bewick's Swan		
PLB3: Land at Highfields, Codmore Hill	Likely to use Pulborough STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site but less than 2ha in size (1.0ha). As such it is not considered suitable to act as functionally linked land for Bewick's swan. As such there is no realistic linking impact pathway present.	Yes, located within 6.5km of the SAC and located within a greenfield site. Potential linking impact pathways present	Yes, located within 12km of the SAC and located within a greenfield site. Potential linking impact pathways present
RS1: Rusper Glebe	Likely to use Rusper WwTW which discharges into the River Thames catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
RS2: Land at East Street	Likely to use Rusper WwTW which discharges into the River Thames catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
RS3: Land North of East Street, Rusper	Likely to use Rusper WwTW which discharges into the River Thames catchment. There	Only an in-combination potential linking impact pathway is present. the	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered	No, located more than 12km from the SAC. There are no realistic linking	No, located more than 12km from the SAC. There are no realistic linking

	are no linking impact pathways present.	allocation itself is screened out in-isolation.	to provide functionally linked land. There are no linking impact pathways present.	impact pathways present	impact pathways present
STE1: Land at Glebe Farm, Steyning	Likely to use Steyning STW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
UPB1: Land at Smugglers Lane Cluster, Upper Beeding	Likely to use Steyning STW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
HNF1: Land West of Backsettown Farm	Likely to use Henfield STW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
HNF2: Land at Wantley Hill	Likely to use Henfield STW which discharges into the River Adur	Only an in-combination potential linking impact pathway is	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the	No, located more than 12km from the SAC. There are no realistic linking	No, located more than 12km from the SAC. There are no realistic linking

	catchment. There are no linking impact pathways present.	present. the allocation itself is screened out in-isolation.	designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	impact pathways present	impact pathways present
HNF3: Land South of Bowls Club, off Furners Mead	Likely to use Henfield STW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
HNF4: Land South & East of Parsonage Farm	Likely to use Henfield STW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
HNF5: Sandgate Nursery, Henfield	Likely to use Henfield STW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
SMD1: Land at Oxcroft Farm	Likely to use Small Dole WwTW which discharges into the	Only an in-combination potential linking	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is	No, located more than 12km from the SAC. There are no	No, located more than 12km from the SAC. There are no

	River Adur catchment. There are no linking impact pathways present.	impact pathway is present. the allocation itself is screened out in-isolation.	located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	realistic linking impact pathways present	realistic linking impact pathways present
SMD2: Land West of Shoreham Road, Small Dole	Likely to use Small Dole WwTW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
ASN1: Land at Church Farm Cluster, Ashington	Likely to use Ashington, London Road STW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	9.4ha in size, it is located within 6.5km of the Arun Valley SPA/ Ramsar site and lager than 2ha in site. From review of online imagery, the site includes woodland, caravan storage and approximately 3.4ha of arable land which could potentially be suitable to provide functionally linked land. However, this arable land is surrounded by mature woodland and mature hedgerows, thus limiting sight lines into the site. It is not considered suitable to act as functionally linked land for Bewick's Swan	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present

ASN2: Land South of Rectory Lane, Ashington	Likely to use Ashington, London Road STW which discharges into the River Adur catchment. There are no linking impact pathways present.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site and larger than 2ha in size (2.2ha). From review of freely available online imagery, this site appears to contain tussocky habitats and scrub. It is located with residential development located to both the east and west, with woodland to the south and arable land to the north. It is located in a disturbed area with poor sight lines. It is not considered suitable to act as functionally linked land for Bewick's Swan.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
RD1: Land North of Guildford Road, Bucks Green	Likely to use Rudgwick STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	Yes, located within 12km of the SAC and located within a greenfield site. Potential linking impact pathways present
RD2: The former Pig Farm, Bucks Green	Likely to use Rudgwick STW which discharges into the River Arun catchment. Thus, potential in	Only an in-combination potential linking impact pathway is present. the allocation itself is	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	Yes, located within 12km of the SAC and located within a greenfield site. Potential linking impact pathways present

	combination linking impact pathways.	screened out in-isolation.	land. There are no linking impact pathways present.		
CH1: Land at The Warren	Likely to use Horsham STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
STO1 Land to the north of Melton Drive, Storrington	Likely to use Storrington STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site and larger than 2ha in size (5.4ha). From review of freely available online imagery, this site has residential development along its southern boundary (thus within a semi disturbed area) and it appears to be cropped by cereal. The field is surrounded by well-established hedgerows, thus limiting sight lines to the wider countryside. The smallest field is c. 1.5ha in size. It borders industrial land to the east, with a residential property to the north. The smaller field is well enclosed by hedgerows and woodland, thus limiting sight lines, making it unsuitable to support a significant population of Bewick's swan. The	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present

			larger filed is also surrounded by well-established hedgerows, thus limiting sight lines to the wider countryside. From review of aerial imagery, both fields contain many tracks. That link up to a public right of way, Northlands Lane and Downsview Avenue and as such it is possible that this site is subject to high levels of disturbance. However, it is not possible to conclude that this site could not potentially providing functionally linked land for Bewick's swan		
STO2: Land at Rock Road (Thakeham Parish)	Likely to use Storrington STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site and larger than 2ha in size (3.6ha). From review of freely available online imagery, this site is split into 2 smaller fields (each less than 2ha in size). It also appears to be subject to disturbance as it appears to be grazed by horses. In addition, the site has residential development to the east and west, and residential and industrial development to the south. The site appears to be enclosed by dense hedgerows, thus offering limited to no sight lines into the wider countryside.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present

			This site is considered unsuitable to support a significant population of Bewick's swan. It is not considered suitable to act as functionally linked land for Bewick's Swan.		
TH1: Land North of High Bar Lane	Likely to use Storrington STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site but less than 2ha in size (1.0ha). As such it is not considered suitable to act as functionally linked land for Bewick's swan.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
TH2: Land West of Stream House	Likely to use Storrington STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site but less than 2ha in size (1.9ha). As such it is not considered suitable to act as functionally linked land for Bewick's swan.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
WRN1: Land south of Bell Road	Likely to use Warnham WwTW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present

WCH1: Land at Hatches Estate	Likely to use Storrington STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site but less than 2ha in size (0.9ha). As such it is not considered suitable to act as functionally linked land for Bewick's swan.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
WCH2: Land West of Smock Alley, S of Little Haglands	Likely to use Storrington STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site and larger than 2ha in size (2.5ha). From review of freely available online imagery, this site is split into 2 smaller fields (each less than 1ha in size). To the east and the south the site neighbours residential properties with woodland to the west and additional residential development and arable an filed to the north. Due to the small field size, enclosed nature with a lack of site lines and being located in a semi disturbed area (due to the residential development), this site is considered unsuitable to support a significant population of Bewick's swan. It is not considered suitable to act as functionally linked land for Bewick's Swan.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present

WCH3: Land East of Hatches House	Likely to use Storrington STW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	Located within 6.5km of the Arun Valley SPA/ Ramsar site but less than 2ha in size (0.5ha). As such it is not considered suitable to act as functionally linked land for Bewick's swan.	Yes, located between 6.5km and 12km of the SAC and located within a greenfield site. Potential linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
HOR2: Land Around Mercer Road, Warnham Station	Likely to use Warnham WwTW which discharges into the River Arun catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present
FAY1: Land West of Kilnwood Vale	Likely to use FayGate WwTW which discharges into the River Arun Catchment. Thus, potential in combination linking impact pathways.	Only an in-combination potential linking impact pathway is present. the allocation itself is screened out in-isolation.	This site is located more than 6.5km from the Arun Valley SPA / Ramsar site, and as such it is located too far from the designated site to be considered to provide functionally linked land. There are no linking impact pathways present.	No, located more than 12km from the SAC. There are no realistic linking impact pathways present	No, located more than 12km from the SAC. There are no realistic linking impact pathways present

Table C3: Employment Site Allocation Screening

Where a column is identified in green, this impact pathway does not contain any potential linking impact pathways to an international site. Where a column is identified in Orange, potential linking impact pathways exist between the allocation and an international site and the site will be subject to further discussions and appropriate assessment.

Site Allocation	HRA Screening Implications				
	Water Quality (Arun Valley SPA / Ramsar)	Water Quantity, Level and Flow (Arun Valley SPA / Ramsar)	Loss of Functionally Linked Land (Arun Valley SPA / Ramsar)	Loss of Functionally Linked Land (The Mens SAC)	Loss of Functionally Linked Land (Ebernoe Common SAC)
Site EM9 - Land at Hilland Farm	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	Yes, located within 6.5km of the SAC and located within a greenfield site. Potential linking impact pathways present	Yes, located within 12km of the SAC and located within a greenfield site. Potential linking impact pathways present
Site EM7 - Land South of Hillier Garden Centre	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	No, located more than 12km from the SAC	No, located more than 12km from the SAC

Site EM3 - North of Mercer Road, Warnham Station	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	No, located more than 12km from the SAC	No, located more than 12km from the SAC
Site EM4 - Land to the West of Graylands Estate, Langhurstwood Road, Horsham	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	No, located more than 12km from the SAC	No, located more than 12km from the SAC
EM1: Land at Lower Broadbridge Farm, Broadbridge Heath	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	No, located more than 12km from the SAC	No, located more than 12km from the SAC
Site EM6 - Land South of Broomers Hill Park, Pulborough	Not Applicable as does not provide for overnight	Not Applicable	Located within 6.5km of the Arun Valley SPA/ Ramsar site and larger than 2ha in size (4.7ha). From review of freely available	Yes, located within 6.5km of the SAC and located within a greenfield site.	Yes, located within 12km of the SAC and located within a greenfield site.

	accommodation. There are no linking impact pathways present.		online imagery, this site appears that about half of this site comprises buildings, car park and woodland. The site is split into 4 additional grassland fields separated by hedgerows. As such this site is considered to have poor sight lines, and the small grassland fields are considered unsuitable to support a significant population of Bewick's swan. It is not considered suitable to act as functionally linked land for Bewick's Swan.	Potential linking impact pathways present	Potential linking impact pathways present
Site EM2 - Land South of Star Road Industrial Estate, Partridge Green	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	No, located more than 12km from the SAC	No, located more than 12km from the SAC
Site EM8 - Land South West of Hop Oast Roundabout	Not Applicable as does not provide for overnight accommodation. There are no linking impact	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's	No, located more than 12km from the SAC	No, located more than 12km from the SAC

	pathways present.		Swan. There are no linking impact pathways present.		
SA644 - Land North of Buck Barn Services	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	No, located more than 12km from the SAC	No, located more than 12km from the SAC
SA645 - Land South of Buck Barn Services	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	No, located more than 12km from the SAC	No, located more than 12km from the SAC
SA325 - Land at Westons Farm, Warnham	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located more than 6.5km from the Arun Valley SPA / Ramsar site, as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	No, located more than 12km from the SAC	No, located more than 12km from the SAC

SA830 - Land Opposite Broomers Hill Park	Not Applicable as does not provide for overnight accommodation. There are no linking impact pathways present.	Not Applicable	Located within 6km (2.3km) of the Arun Valley SPA / Ramsar site and larger than 2ha in size (2.06 Ha). However, the site is surrounded by full hedgerows and mature trees, so offers poor sight lines into the wider landscape, and as such this land parcel is not considered suitable to support functionally linked land for the designated Bewick's Swan. There are no linking impact pathways present.	Yes, located within 6.5km (3.7km) of the SAC and located within a greenfield site. Potential linking impact pathways present	Yes, located within 12km (9.2km) of the SAC and located within a greenfield site. Potential linking impact pathways present

Appendix D Horizon Scanning: Nutrient Neutrality for the Arun Valley – Phosphates

Background to Nutrient Neutrality at the Arun Valley

7.1 Natural England have not specifically raised nutrient neutrality for the Arun Valley as a key issue for consideration with the Habitats Regulations Assessment of the Horsham Local Plan. However, Natural England have identified that the issue of nutrient neutrality (specifically phosphates) *may* require consideration in the future once the condition assessment review of the Arun Valley designated sites has been completed.

7.2 At the time of writing (May 2021) nutrient neutrality relating to the Local Plan is screened out on the basis that the wastewater treatment standards of the relevant Sewage Treatment Works are currently considered sufficient to protect the Arun Valley European sites. This is based on the fact that the Environment Agency undertook a Review of Consent Process that examined whether consents needed to be tightened to protect the European sites and where necessary required the water company to make improvements (called sustainability reductions). However, once the Natural England condition assessment investigations are updated (potentially during 2021) it may be that this issue will require further assessment either before plan adoption or as part of the first five-year Local Plan Review. This is because the 2019 Water Framework Directive (WFD) assessments, which post-dates the Review of Consents process, identify that both the Arun and the Stor (a tributary that enters the Arun along the northern boundary of Pulborough Brooks SSSI/ Arun Valley internationally designated site) are failing suitable water phosphate levels (WFD Status 'Poor'[93]). Pulborough Brooks another tributary to the Arun, that enters the River Arun along the southern boundary of Pulborough Brooks SSSI/ the boundary of the Arun Valley international site, whilst it is not failing its for phosphate levels, has a WFD status of 'Moderate' for phosphate rather than 'Good'[94].

7.3 As a result, to support the HRA of the Local Plan, this horizon-scanning note has been provided.

7.4 The River Arun's geological and habitat diversity sustains some of the most important floral and faunal assemblages in England, many of which have adapted to the abiotic conditions of the river system. However, as identified in Natural England's Site Improvement Plan (SIP)[95], features of the SPA and SAC are under growing threat from water pollution, stemming from point source pollution from water treatment works upstream of the international site and diffuse water pollution (from agricultural runoff) entering the water course. Vulnerable species identified in the SIP are Bewick's swan, and the little ramshorn whirlpool snail *Anisus vorticulus.* The SIP identifies that the little ramshorn whirlpool snail requires good water quality, and that *Potamogeton ssp* (pond weed), an important food source for the Bewick's swan, also requires good water quality. In addition to those vulnerable features identified in the SIP for the SAC and SPA, many of the aquatic plants species for which the Ramsar site is designated

[93] https://environment.data.gov.uk/catchment-planning/WaterBody/GB107041012100 [accessed 03/12/2020]
[94] https://environment.data.gov.uk/catchment-planning/WaterBody/GB107041013040 [10/12/2020]
[95] http://publications.naturalengland.org.uk/file/5185212862431232 [accessed 27/11/2020]

(*Lemna* species, *Rorippa* species, *Myriophyllum* species, *Oenanthe* species, and *Potamogeton* species) and also the swollen spire snail *Pseudamnicola confusa* are likely to be vulnerable to reductions in water quality. All aquatic plant species present will provide essential supporting habitat for the little ramshorn whirlpool snail and swollen spire snail. Additionally, phosphate enrichment can lead to an increased likelihood of certain diseases and sustained nutrient enrichment can result in changes to plant communities that both the snail, other invertebrates and Bewick's swan may depend upon.

Background to the Phosphorous Nutrient Neutrality Calculations

7.5 The main contribution to phosphorus release into surface water is provided by the effluent discharge, and as such increased residential development should not be ignored. In comparison, diffuse pollution from agricultural runoff is likely to provide a small contribution to phosphate levels and this issue is managed via Catchment Sensitive Farming). As described by Jarvie *et al.*[96], new residential units within the hydrological catchment for the Arun Valley are likely (through increased sewage production) to add phosphates to a site via wastewater treatment effluent.

7.6 Since the issue remains under investigation at this stage Natural England has not yet devised a nutrient neutrality calculation methodology for the Arun Valley European sites. However, a methodology for calculating the phosphate release of new development (through both changes in land use and, particularly, release of treated sewage effluent) has been developed for Stodmarsh SAC, SPA and Ramsar site in Kent and the calculation methodology would be essentially identical if Natural England did determine that development in the Arun catchment also needed to achieve nutrient neutrality. Nutrient neutrality calculations have therefore been undertaken for the residential site allocations provided within the Local Plan using the phosphorus calculation method developed for Stodmarsh.

Appropriate Assessment

7.7 New residential development provided by Horsham Local Plan will be serviced by Wastewater Treatment Works (WwTW), that discharge into watercourses that ultimately drain to the River Arun (and the Arun Valley designated site). At this stage it has not been confirmed which WwTW will service a particular site allocation. This will generally not occur until a water company has a planning application to consider. For the purposes of this assessment, the WwTW closest to the allocation has been selected. A more detailed and accurate Nutrient Neutrality calculation may therefore need to be provided by the applicant at the individual planning application stage.

7.8 Achieving nutrient neutrality is one way to address the existing uncertainty surrounding the impact of new development on designated sites. Natural England advises that a phosphate budget (referred to as Total Phosphorus (TP)) can be calculated for new developments and has provided a guidance document to enable this to be calculated[97]. That document was specifically prepared for the Stour catchment in Kent. However, the basic phosphate calculation methodology is transferable to other European sites. The main reason for this is that both systems are freshwater systems that are likely to

[96] Jarvie, H. P., Neal, C., & Withers, P. J. (2006) *Sewage-effluent phosphorus: a greater risk to river eutrophication than agricultural phosphorus?* Science of the total environment, *360*(1-3), 246-253.
[97] Natural England (July 2020). Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites - For Local Planning Authorities.

have similar sensitivities to phosphorus, the primary growth-limiting nutrient in freshwater ecosystems. This HRA uses the methodology for the Stour Valley catchment to estimate the nutrient balance for the Horsham Local Plan. The results are summarised in **Table 1** below; with full detail provided in Appendix A.

Phosphorus Balance within the Horsham Local Plan

7.9 The phosphorus nutrient neutrality calculation undertaken for the Horsham Local Plan indicates whether development would avoid harm to protected sites (the Arun Valley) from phosphate discharge (generally by resulting in a net reduction in phosphorus entering the catchment), or whether mitigation would be required (in the event that a formal nutrient neutrality requirement was introduced by Natural England) to ensure that there is no adverse effect from phosphorus discharge.

7.10 The nutrient budget calculation for the Horsham Local Plan residential site allocations involved four stages:

- Stage 1: Future phosphorus load in treated wastewater effluent
- Stage 2: Phosphorus loss due to conversion of existing land uses
- Stage 3: Phosphorus leachate from future land uses
- Stage 4: Overall phosphorus budget for the site

7.11 Existing land use was determined at this high-level by assessing satellite imagery on Google Maps. Where data was inconclusive, a site visit was undertaken where possible to verify existing land use. This was undertaken from publicly accessible land only. Future land uses (e.g. the extent of the urban fabric and any open space) were identified either by using masterplans where available, or by calculating the broad area that would be taken up by residential development using a standard housing density of 40 dwellings per hectare and defining the resulting area as the ‘urban’ land on the developed site. All collected information fed into the nutrient calculation described below. Each type of broad land use (urban, park/SANG, cereal, lowland grazing etc.) has a P load assigned to it in the nutrient neutrality calculation methodology. Therefore, converting land from (for example) cereal cropping to urban land considerably reduces the P load. However, whether this is enough to offset the increased P load due to treated sewage effluent is dependent on the types of habitat involved and the area of land involved.

7.12 Note that the calculations make a series of broad assumptions about a) the existing habitats on site (and thus the amount of phosphorus they currently release into the catchment) and b) how each site is to be developed (the areas to be altered) and thus the future balance between areas of housing and areas of retained greenspace. Therefore, the calculations undertaken for this report would need to be re-run by the applicants for each housing scheme and planning application as each scheme is developed and a detailed masterplan became available.

7.13 These calculations are based on a worst-case assumption that all phosphorus discharged from these sites will reach the Arun Valley sites.

7.14 The below table (Error! Reference source not found.) identifies which Horsham Local Plan site allocations discharge to WwTWs that ultimately discharge to the Arun Valley international site and the amount of phosphorus each allocation is predicted to produce as a result of the changed land use and residential development. Those site allocations identified in red in the final column (Allocation P Budget with 20% buffer) are calculated

to result in a Phosphorous surplus. Those identified in grey are not calculated to result in a phosphorous surplus.

Table 7: Site Allocations That Are Likely to Ultimately Discharge to the Arun Valley Designated Site, and Associated WwTW.

Site Allocation	Site Name	Number of Residential Dwellings	Likely Wastewater Treatment Works (WwTW)	Allocation P Budget with 20% buffer
CW1	Brook Hill Cluster, Cowfold	35	Cowfold WwTW	18.60
CW2	Field West of Cowfold, North of A272	35	Cowfold WwTW	17.98
CW3	Fields West of Cowfold, South of A272/Field W of Cowfold, S of A272, W of Little Potters	35	Cowfold WwTW	27.60
HOR1	Land at Hornbrook Farm	100	Horsham STW	2.63
BGR1	Land South of Smugglers Lane	50	Barns Green WwTW	37.16
BGR2	Land South of Muntham Drive	25	Barns Green WwTW	12.67
BGR3	Land at Slaughterford Farm (Sumners Pond)	30	Barns Green WwTW	23.37
BRH1	Land at Lower Broadbridge Farm	150	Horsham STW	5.15
BRH2	Land at Wellcross	140	Horsham STW	2.28
PLB1	Stane Street and Green Dene Nurseries, Pulborough	60	Pulborough STW	45.31
PLB2	Land at New Place Farm, Pulborough	170	Pulborough STW	87.27

Site Allocation	Site Name	Number of Residential Dwellings	Likely Wastewater Treatment Works (WwTW)	Allocation P Budget with 20% buffer
PLB3	Land at Highfields, Codmore Hill	25	Pulborough STW	19.40
RD1	Land North of Guildford Road, Bucks Green	60	Rudgwick STW	1.30
RD2	The former Pig Farm, Bucks Green	6	Rudgwick STW	0.27
CH1	Land at Christ's Hospital, The Warren	20	Horsham STW	-0.26
STO1	Land to the North of Melton Drive Storiington	70	Storrington STW	2.47
STO2	Land at Rock Road, Storrington	75	Storrington STW	4.64
TH1	Land North of High Bar Lane, Thakeham	25	Storrington STW	1.63
TH2	Land West of Stream House, Thakeham	40	Storrington STW	2.66
WRN1	Land south of Bell Road, Warnham	20	Warnham WwTW	1.23
WCH1	Land at Hatches Estate, West Chiltington	15	Storrington STW	0.86
WCH2	Land West of Smock Alley,West Chiltington	15	Storrington STW	0.57
WCH3	Land at Hatches House, West Chiltington	6	Storrington STW	0.21
HOR2	Land Around Mercer Road, Warnham Station	300	Warnham WwTW	18.95

Site Allocation	Site Name	Number of Residential Dwellings	Likely Wastewater Treatment Works (WwTW)	Allocation P Budget with 20% buffer
HA2	Land at Buck Barn, West Grinstead (Weald Cross)	2100	Horsham STW	51.54
HA3	Land East of Billingshurst with school	650	Billingshurst STW	32.79
HA6	Land West of Southwater	1200	Horsham STW	38.47
FAY1	Land West of Kilnwood Vale	350	Faygate WwTW	40.08

7.15 The Plan Level nutrient neutrality assessment of the above site allocations (provided in Error! Reference source not found.) identified that all site allocations with the exception of five (RD2 The former Pig Farm, Bucks Green, CH1: Land at Christ's Hospital, The Warren, WCH1: Land at Hatches Estate, West Chiltington, WCH2: Land West of Smock Alley, West Chiltington, and WCH3: Land at Hatches House, West Chiltington) are likely to result in a net increase in phosphate levels within the River Arun in comparison to current land use. As such, these are the development allocations for which phosphorus offsetting would need to be identified before planning consent could be granted if Natural England does introduce a nutrient neutrality requirement for the Arun catchment.

7.16 In the long-term it is acknowledged that the issue of nutrient neutrality is difficult to address purely at the Local Plan level and will likely require cross working with the wastewater company and the Environment Agency and their permitting teams. None the less, it may be necessary for the Council to address the potential need for avoidance measures and / or mitigation for phosphate discharge from the site allocations within the Local Plan identified to ultimately discharge to the Arun Valley.

7.17 The below table outlines the current or already planned future phosphorus discharge permits for each relevant WwTW, and the expected phosphorus discharge resulting from the Local Plan. Detail of the surplus from each residential site allocation is provided in **Appendix A**

Table 8 Summary of Calculation of Increased WwTW / STW Phosphorous Output Due to the Local Plan.

Likely Wastewater Treatment Works (WwTW)	Number of Residential Dwellings	Current or Future Planned Phosphorus Environmental Permit per WwTW (mg/l) TP	Surplus phosphate discharge resulting from the Local Plan (kg/P/yr)
Barnes Green WwTW	105	8	73.19
Billingshurst STW	650	0.9	32.79
Cowfold WwTW	105	8	64.19
Faygate WwTW	350	1	40.08
Horsham STW	4440 (excludes 20 dwellings at CH1)	0.25	119.56
Pulborough STW	255	8	151.98
Rudgwick WwTW	60 (excludes 6 dwellings at RD2)	0.40	1.3
Storrington STW	210 (excludes 36 dwellings at WCH1, WCH2 and WCH3)	0.5	11.41
Warnham WwTW	320	0.5	20.18
All Allocations	**6495**	**N/A**	**514.68**

7.18 The current Environmental Permit for Total Phosphorous (TP) at Horsham WwTW is 1mg/l, with a planned tightening to 0.25mg/l[98]. It should be noted that it is not currently technically possible to tighten any TP limit beyond 0.25mg/l.

7.19 Error! Reference source not found. indicates that the new residential development located within each of the above WwTW catchments (as identified in red in Error! Reference source not found.) will result in an exceedance of the existing permitted phosphate discharge limits when compared to a 'no change' in existing land use scenario.

7.20 Based on the calculation described above, there will be an increase in phosphorous output into the hydrological catchment of the Arun Valley designated site as a result of new housing proposed within the Horsham Local Plan. Therefore, nutrient neutrality would not be met in the absence of mitigation.

7.21 It should be noted that the above calculations have only been undertaken on site allocations identified within the Horsham Local Plan. By their nature, any windfall development has not been included within the above calculation since it is not known where these would be located, how they would change existing land use or how many dwellings would be delivered on each site. Should nutrient neutrality require further consideration following Natural England's review of the Arun Valley's Condition

[98] https://data.gov.uk/dataset/a1b25bcb-9d42-4227-9b3a-34782763f0c0/water-industry-national-environment-programme [accessed 10/12/2020]

Assessment, this would require consideration at the individual planning application stage once the location, and extent of that windfall development has been identified.

Potential Avoidance Strategies / Solutions to Explore

7.22 Assuming the developer's nutrient neutrality calculation confirms that mitigation is required, and this is agreed with the competent authority, it is likely that some or all of the following may need to be undertaken.

7.23 If mitigation is required, the following should be explored:

i. Removing additional land from agricultural production – While agriculture does not contribute as much phosphorus to watercourses as treated sewage effluent, it does contribute some phosphorus. For example, each hectare of mixed farmland generally contributes approximately 0.27 kilograms of phosphorus per year. Therefore, removing additional land from agricultural production and putting it down to parkland (which has a relatively low phosphorus loss rate) instead would offset the phosphorus released in treated wastewater from the new housing. Initial calculations for this HRA indicate that approximately 3960ha[99] of farmed land (similar to the land use being lost) would need to be removed from agricultural production (over and above that which would be lost to the development footprints themselves) within the Arun catchment to offset the phosphorus produced by the new housing. Clearly this is not feasible as a solution in itself for all the planned growth within the catchment, but it could play a part of the solution if, for example, Horsham District Council is planning a new country park or similar which involves turning agricultural land to unfertilised habitats;

ii. Securing further improvement to Wastewater Treatment Works (WwTW) Infrastructure – Current Environment Agency (EA) guidance suggests that the use of conventional on-site treatment methods can produce effluent with phosphorus concentrations as low as 0.25mg/l. Many WwTW have treatment thresholds above this level. However, any further improvements to the infrastructure at WwTW would need to be secured through a formal agreement with the water company. As there is currently no EA requirement for reducing to a 0.25 mg/l phosphorus consent for works that are not already doing so, any request to improve effluent quality would require external investment in a new Tertiary treatment plant (at a likely cost of £1 million+). Moreover, Horsham WwTW is already committed to a treatment standard of 0.25 mg/l which can't be further tightened;

iii. Identifying an alternative wastewater discharge location - Discharging to ground would 'bypass' surface waterbodies, ultimately contributing to groundwater. It is considered that this would reduce the phosphorus loading in surface water and help in protecting the Arun Valley Sites. This is because adsorption and metal complex formation retain most of the potentially mobile phosphorus and thus reduce mobilisation from groundwater into surface waters;

iv. Utilising local packaged WwTW - A local packaged WwTW associated specifically with the development could be used to provide a removal route for the additional phosphorus. However, treatment would require the use of a

[99] Assuming converting mixed (phosphorus loss rate of 0.27 kg/ha/yr) to unfertilised semi-natural habitat (phosphorus loss rate of 0.14 kg/ha/yr), 1ha of conversion will offset 0.13 kilograms of phosphorus (0.27-0.14 = 0.13). To offset the 514.68kg of phosphorus produced by the planned residential development would therefore require c. 4200ha of dairy land to be removed from agricultural production (514.68/0.13 = 3959.08).

chemical dosing system which would still only achieve a 1mg/l phosphorus concentration. The only method to achieve a lower concentration through packaged treatment would be to include a further tertiary treatment method such as reedbeds and similar. However, this requires increased operational effort and eventually will require a Water Authority to adopt and operate it for its asset life;

v. Utilising downstream wetlands - A wetland/reedbed filtration system that was not linked to a WwTW would be unlikely to be effective in removing phosphorus from sewage effluent (although it would contribute to removal of phosphorus from surface runoff). The UKWIR Chemical Investigations Programme (CIP)[100] identified a relatively poor phosphate (as opposed to nitrogen) removal performance. In the UK, such wetlands are rarely used for wastewater treatment because on their own they are not expected to achieve a lower phosphate concentration than 2mg/l. Therefore, they are most suitable as a tertiary sewage treatment method following initial treatment stages at a WwTW or packaged treatment plans.

vi. Develop wetlands to intercept runoff from development sites and surrounding agricultural land to offset the new phosphorus being added by housing development. Current studies indicate that new wetlands of 2ha in size or greater can result in a net reduction in P and N entering the system and thus if appropriately designed and delivered may be an effective solution for development sites.

7.24 It is advisable that as part of future-proofing the Local Plan, its allocations and windfall provision, the Council explores potential solutions to phosphorous nutrient neutrality issues should this be identified as a requirement by Natural England. As a minimum it would be advisable to identify mitigation solutions to allow the first 5 years of Local Plan growth to come forward, acknowledging that all Local Plans must be reviewed every 5 years in any event and that allocations or housing growth levels may change at that time.

[100] Available at: https://ukwir.org/the-chemicals-investigation-programme-phase-2,-2015-2020 [Accessed 13/10/2020].

Phosphorous Nutrient Neutrality Calculations

The following Tables show the workings for the phosphorous nutrient neutrality calculations for the Horsham Local Plan following the methodology set out in Natural England's Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites[101]

Stage 1 – WwTW Effluent

A	B	C	D	E	F	G	H	I	J	K	L	M
		Step 1 - Additional Population		Step 2 - Wastewater Generation by Development		Step 3 - Receiving WwTW permit limit				Step 4 - TP discharged after WwTW		
Site Allocation	Site Name	Number of Residential Dwellings	Number of new residents assuming 2.4 residents/ dwelling occupancy	Water consumption person / day (litres)	Total wastewater generated by development (litres / day)	Likely Wastewater Treatment Works (WwTW)	TP Environmental permit for WwTW (mg/l TP)	90% of consent limit	Deduct 0 mg/l to allow for natural P load	TP Discharge after WwTW treatment (mg/TP/day)	TP Discharge after WwTW treatment (kg/TP/day)	TP Discharge after WwTW treatment (kg/TP/year)
CW1	Brook Hill Cluster, Cowfold	35	84	100	8400	Cowfold WwTW	8	7.2	7.2	60480	0.06048	22.0752
CW2	Field West of Cowfold, North of A272	35	84	100	8400	Cowfold WwTW	8	7.2	7.2	60480	0.06048	22.0752
CW3	Fields West of Cowfold, South of A272/Field W of Cowfold, S of A272, W of Little Potters	35	84	100	8400	Cowfold WwTW	8	7.2	7.2	60480	0.06048	22.0752
HOR1	Land at Hornbrook Farm	100	240	100	24000	Horsham STW	0.25	0.225	0.225	5400	0.0054	1.971

[101] Natural England (July 2020). Advice on Nutrient Neutrality for New Development in the Stour Catchment in Relation to Stodmarsh Designated Sites - For Local Planning Authorities.

A	B	C	D	E	F	G	H	I	J	K	L	M
		Step 1 - Additional Population		Step 2 - Wastewater Generation by Development		Step 3 - Receiving WwTW permit limit				Step 4 - TP discharged after WwTW		
Site Allocation	Site Name	Number of Residential Dwellings	Number of new residents assuming 2.4 residents/ dwelling occupancy	Water consumption person / day (litres)	Total wastewater generated by development (litres / day)	Likely Wastewater Treatment Works (WwTW)	TP Environmental permit for WwTW (mg/l TP)	90% of consent limit	Deduct 0 mg/l to allow for natural P load	TP Discharge after WwTW treatment (mg/TP/day)	TP Discharge after WwTW treatment (kg/TP/day)	TP Discharge after WwTW treatment (kg/TP/year)
BGR1	Land South of Smugglers Lane	50	120	100	12000	Barns Green WwTW	8	7.2	7.2	86400	0.0864	31.536
BGR2	Land South of Muntham Drive	25	60	100	6000	Barns Green WwTW	8	7.2	7.2	43200	0.0432	15.768
BGR3	Land at Slaughterford Farm (Sumners Pond)	30	72	100	7200	Barns Green WwTW	8	7.2	7.2	51840	0.05184	18.9216
BRH1	Land at Lower Broadbridge Farm	150	360	100	36000	Horsham STW	0.25	0.225	0.225	8100	0.0081	2.9565
BRH2	Land at Wellcross	140	336	100	33600	Horsham STW	0.025	0.0225	0.0225	756	0.000756	0.27594
PLB1	Stane Street and Green Dene Nurseries, Pulborough	60	144	100	14400	Pulborough STW	8	7.2	7.2	103680	0.10368	37.8432
PLB2	Land at New Place Farm, Pulborough	170	408	100	40800	Pulborough STW	8	7.2	7.2	293760	0.29376	107.2224
PLB3	Land at Highfields, Codmore Hill	25	60	100	6000	Pulborough STW	8	7.2	7.2	43200	0.0432	15.768
RD1	Land North of Guildford Road, Bucks Green	60	144	100	14400	Rudgwick STW	0.4	0.36	0.36	5184	0.005184	1.89216

A	B	C	D	E	F	G	H	I	J	K	L	M
		Step 1 - Additional Population		Step 2 - Wastewater Generation by Development		Step 3 - Receiving WwTW permit limit				Step 4 - TP discharged after WwTW		
Site Allocation	Site Name	Number of Residential Dwellings	Number of new residents assuming 2.4 residents/ dwelling occupancy	Water consumption person / day (litres)	Total wastewater generated by development (litres / day)	Likely Wastewater Treatment Works (WwTW)	TP Environmental permit for WwTW (mg/l TP)	90% of consent limit	Deduct 0 mg/l to allow for natural P load	TP Discharge after WwTW treatment (mg/TP/day)	TP Discharge after WwTW treatment (kg/TP/day)	TP Discharge after WwTW treatment (kg/TP/year)
RD2	The former Pig Farm, Bucks Green	6	14.4	100	1440	Rudgwick STW	0.4	0.36	0.36	518.4	0.0005184	0.189216
CH1	Land at Christ's Hospital, The Warren	20	48	100	4800	Horsham STW	0.25	0.225	0.225	1080	0.00108	0.3942
STO1	Land to the North of Melton Drive Storiington	70	168	100	16800	Storrington STW	0.5	0.45	0.45	7560	0.00756	2.7594
STO2	Land at Rock Road, Storrington	75	180	100	18000	Storrington STW	0.5	0.45	0.45	8100	0.0081	2.9565
TH1	Land North of High Bar Lane, Thakeham	25	60	100	6000	Storrington STW	0.5	0.45	0.45	2700	0.0027	0.9855
TH2	Land West of Stream House, Thakeham	40	96	100	9600	Storrington STW	0.5	0.45	0.45	4320	0.00432	1.5768
WRN1	Land south of Bell Road, Warnham	20	48	100	4800	Warnham WwTW	0.5	0.45	0.45	2160	0.00216	0.7884
WCH1	Land at Hatches Estate, West Chiltington	15	36	100	3600	Storrington STW	0.5	0.45	0.45	1620	0.00162	0.5913
WCH2	Land West of Smock	15	36	100	3600	Storrington STW	0.5	0.45	0.45	1620	0.00162	0.5913

A	B	C	D	E	F	G	H	I	J	K	L	M
		Step 1 - Additional Population		Step 2 - Wastewater Generation by Development		Step 3 - Receiving WwTW permit limit				Step 4 - TP discharged after WwTW		
Site Allocation	Site Name	Number of Residential Dwellings	Number of new residents assuming 2.4 residents/ dwelling occupancy	Water consumption person / day (litres)	Total wastewater generated by development (litres / day)	Likely Wastewater Treatment Works (WwTW)	TP Environmental permit for WwTW (mg/l TP)	90% of consent limit	Deduct 0 mg/l to allow for natural P load	TP Discharge after WwTW treatment (mg/TP/day)	TP Discharge after WwTW treatment (kg/TP/day)	TP Discharge after WwTW treatment (kg/TP/year)
	Alley,West Chiltington											
WCH3	Land at Hatches House, West Chiltington	6	6	100	600	Storrington STW	0.5	0.45	0.45	270	0.00027	0.09855
HOR2	Land Around Mercer Road, Warnham Station	300	720	100	72000	Warnham WwTW	0.5	0.45	0.45	32400	0.0324	11.826
HA2	Land at Buck Barn, West Grinstead (Weald Cross)	2100	5040	80	403200	Horsham STW	0.5	0.45	0.45	181440	0.18144	66.2256
HA3	Land East of Billingshurst with school	650	1560	80	124800	Billingshurst STW	0.9	0.81	0.81	101088	0.101088	36.89712
HA6	Land West of Southwater	1200	2880	80	230400	Horsham STW	0.25	0.225	0.225	51840	0.05184	18.9216
FAY1	Land West of Kilnwood Vale	350	840	110	92400	Faygate WwTW	1	0.9	0.9	83160	0.08316	30.3534

Stage 2 – Loss from Farm Types

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
CW1	Brook Hill Cluster, Cowfold	1.92	0	1.92	Lowland Grazing	Nothing in field at the time of site visit - possible cattle. Google Earth shows ponies in 2007, but looks to be fallow/ hay meadow?	No	Yes	No	0.24	0.4608
CW2	Field West of Cowfold, North of A272	1.99	0	1.99	Lowland Grazing	Nothing in field at the time of site visit - possible cattle. Google Earth shows ponies in 2007, but looks to be a hay meadow?	No	Yes	No	0.24	0.4776

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
CW3	Fields West of Cowfold, South of A272/Field W of Cowfold, S of A272, W of Little Potters	2.02	0	2.02	Lowland Grazing	Sheep grazing.	No	Yes	Yes	0.24	0.4848
HOR1	Land at Hornbrook Farm	7.86	1.24	6.62	Average for catchment area	Nothing in field - not clear - looks like a mix if cereal & cattle grazing / hay meadow	No	Yes	Yes	0.28	1.8536
BGR1	Land South of Smugglers Lane	3.285	0	3.285	Dairy	Possible cattle or sheep - nothing in field at time - Google earth shows cattle grazing	No	Yes	Yes	0.49	1.60965

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
BGR2	Land South of Muntham Drive	1.88	0.00	1.88	Lowland Grazing	Possible cattle or sheep - nothing in field at time - google earth shows sheep grazing	No	Yes	Yes	0.24	0.450528
BGR3	Land at Slaughterford Farm (Sumners Pond)	1.88	1.39	0.50	SANG	Appears cut- more likley associated with the adjacent camping site than grazed by livestock (Amenity grassland)	No	Yes	Yes	0.14	0.069678
BRH1	Land at Lower Broadbridge Farm	6.78	0.42	6.36	general cropping	Arable general	Yes	Yes	Yes	0.28	1.779904
BRH2	Land at Wellcross	7.81	2.48	5.33	Lowland Grazing	Horse grazing	No	Yes	Yes	0.24	1.278072
PLB1	Stane Street and Green Dene	3.89	1.17	2.72	Dairy	Cattle	No	Yes	Yes	0.49	1.333045

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
	Nurseries, Pulborough										
PLB2	Land at New Place Farm, Pulborough	10.16	0.90	9.26	Horticulture	Plant nursery - limited view - tree nursery	No	Yes	Yes	0.18	1.6668
PLB3	Land at Highfields, Codmore Hill	1.24	0.40	0.84	Baseline	Unsure of historical use. Google earth shows history of long grassland - maybe hay meadow? (site visit: access limited - looks to be amenity grassland)	No	Yes	No	0.14	0.1176
RD1	Land North of Guildford Road, Bucks Green	3.47	0.39	3.08	Dairy	cattle grazzed	No	Yes	Yes	0.49	1.5092
RD2	The former Pig Farm,	0.26	0.00	0.26	Pig	Not in current	Yes	No	NA	0.34	0.089046

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
	Bucks Green					use, but apears o have been used for pigs. Last image on Google Earth of pigs in 2013. No subsequent images until 2018, so unsure when (between 2013-2018) it ceased to be used for pigs and became derelict .					
CH1	Land at Christ's Hospital, The Warren	2.15	0.06	2.09	Dairy	Cattle	No	Yes	Yes	0.49	1.0241
STO1	Land to the North of Melton Drive Storiington	5.44	1.29	4.15	Mixed	Part cereals, part	No	Yes	Yes	0.27	1.1205

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
						SANG type land					
STO2	Land at Rock Road, Storrington	3.63	0.93	2.70	Lowland Grazing	Cattle grazed	No	Yes	Yes	0.24	0.647448
TH1	Land North of High Bar Lane, Thakeham	1.04	0.03	1.01	baseline	Fallow - google earth shows buildings on the site in 2001 - site is thus brownfield.	No	Yes	Yes	0.14	0.141806
TH2	Land West of Stream House, Thakeham	1.90	0.57	1.33	Baseline	Appears to be recently abandoned, so a little overgrown (Fallow) Google Earth shows it has been fallow/ scrub since at least 2009	No	Yes	Yes	0.14	0.186144

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
WRN1	Land south of Bell Road, Warnham	0.74	0.00	0.74	Lowland Grazing	SI grassland & woodland - no fencing to suggest recent use by livestock - google earth suggests hay meadow	No	Yes	No	0.24	0.1776
WCH1	Land at Hatches Estate, West Chiltington	0.88	0.11	0.77	Lowland Grazing	Looks to be ungrazed for a time (Not accessible during site visit- road closed) : Google earth shows sheep grazed in 2012. Looks to have been	No	Yes	No	0.24	0.184632

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
						cut rather than grazed more recently.					
WCH2	Land West of Smock Alley,West Chiltington	2.47	0.69	1.78	Lowland Grazing	Access limited - pressumed horse grazing - Gogle Earth shows fallow/ hay cropping	No	Yes	Yes	0.24	0.426576
WCH3	Land at Hatches House, West Chiltington	0.51	0.15	0.36	Baseline	Looks to be ungrazed for a time (fallow following site visit) Google earth shows it has been fallow for 10+ years - maybe occasionally mown, but it	No	Yes	Yes	0.14	0.050078

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
						appears to be used for a little storage of farm machinery and ocntains a large bonfire heap that appears to be frequently visited (tracks).					
HOR2	Land Around Mercer Road, Warnham Station	10.71	1.30	9.41	Lowland Grazing	online imagery shows horses grazing	Yes	No	Yes	0.24	2.2584
HA2	Land at Buck Barn, West Grinstead (Weald Cross)	243.82	68.99	174.83	Mixed	Cereal, sheep and horses	Yes	No	Yes	0.27	47.204019
HA3	Land East of Billingshurst with school	46.06	7.09	38.97	Mixed	Cereal, horses	Yes	No	Yes	0.27	10.5219

A	B	C	D	E	F	G	H	I	J	K	L
Step 1 - Total area of existing (agricultural) land					Step 2 - Identify current land use in site allocations						Step 3 - Determine phosphorus loss from current land use
Site Allocation	Site Name	Site area (ha)	Discounted land use (ha)	Site area discounting non-agricultural uses (ha)	Current Land Use	Comments	Confident (Y/N)	Site Visit (Yes/No)	Confidence after site visit (Y/N)	Estimated Total P Loss (kg/ha/yr)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Column E * Column K)
HA6	Land West of Southwater	140.59	93.28	47.31	Mixed	Mixed cropping, dairy, horses, cereal	Yes	No	Yes	0.27	12.7737
FAY1	Land West of Kilnwood Vale	15.65417865	0.05	15.60417865	Mixed	Mixed cropping, dairy, horses, cereal	No	No	NA	0.27	4.213128236

Stage 3 – Future Land Use

A	B	C	D	E	F	G	H	I	J	K	L	M
				Steps 1 + 2 New urban area and associated leachate				Steps 3 + 4 New open space area and associated leachate				Step 5 Combined P leachate from future land uses
Site Allocation	Site Name	Number of new residents (from Stage 1 Column D)	Total Site area (ha) (from Stage 2 Column E)	Type of development (urban, open spaces, food growing)	Total urban surface area (ha)	Urban P leachate standard (kg P/ha/yr)	Total urban P leachate for site allocation (Column E * Column F)	Public Open Space (Y/N)	Total open space area (ha)	Greenspace P leachate standard (kg P/ha/yr)	Total greenspace P leachate for site allocation (Column I * Column J)	Overall leachate from all surfaces (kg P/ha/yr)(Column H + Column N)
CW1	Brook Hill Cluster, Cowfold	84	1.9	Urban	1.6	0.83	1.328	Y	2.2	0.14	0.308	1.636
CW2	Field West of Cowfold, North of A272	84	2.0	Urban	0.875	0.83	0.72625	No	1.1	0.14	0.1561	0.88235
CW3	Fields West of Cowfold, South of A272/Field W of Cowfold, S of A272, W of Little Potters	84	2.0	Urban	1.7	0.83	1.411	No	0.0	0.14	0	1.411
HOR1	Land at Hornbrook Farm	240	6.6	Urban	2.5	0.83	2.075	No	0.0	0.14	0	2.075
BGR1	Land South of Smugglers Lane	120	3.3	Urban	1.25	0.83	1.0375	No	0.0	0.14	0	1.0375
BGR2	Land South of Muntham Drive	60	1.9	Urban	0.625	0.83	0.51875	No	0.0	0.14	0	0.51875
BGR3	Land at Slaughterf	72	0.5	Urban	0.75	0.83	0.6225	None - the rest of the	0.0	0.14	0	0.6225

A	B	C	D	E	F	G	H	I	J	K	L	M
				Steps 1 + 2 New urban area and associated leachate				Steps 3 + 4 New open space area and associated leachate				Step 5 Combined P leachate from future land uses
Site Allocation	Site Name	Number of new residents (from Stage 1 Column D)	Total Site area (ha) (from Stage 2 Column E)	Type of development (urban, open spaces, food growing)	Total urban surface area (ha)	Urban P leachate standard (kg P/ha/yr)	Total urban P leachate for site allocation (Column E * Column F)	Public Open Space (Y/N)	Total open space area (ha)	Greenspace P leachate standard (kg P/ha/yr)	Total greenspace P leachate for site allocation (Column I * Column J)	Overall leachate from all surfaces (kg P/ha/yr)(Column H + Column N)
	ord Farm (Sumners Pond)							land will remain as light industrial / commercial units				
BRH1	Land at Lower Broadbridge Farm	360	6.4	Urban	3.75	0.83	3.1125	No	0.0	0.14	0	3.1125
BRH2	Land at Wellcross	336	5.3	Urban	3.5	0.83	2.905	No	0.0	0.14	0	2.905
PLB1	Stane Street and Green Dene Nurseries, Pulborough	144	2.7	Urban	1.5	0.83	1.245	No	0.0	0.14	0	1.245
PLB2	Land at New Place Farm, Pulborough	408	9.3	Urban	4.25	0.83	3.5275	No	0.0	0.14	0	3.5275
PLB3	Land at Highfields, Codmore Hill	60	0.8	Urban	0.625	0.83	0.51875	No	0.0	0.14	0	0.51875
RD1	Land North of Guildford	144	3.1	Urban	1.5	0.83	1.245	No	0.0	0.14	0	1.245

A	B	C	D	E	F	G	H	I	J	K	L	M
				Steps 1 + 2 New urban area and associated leachate				Steps 3 + 4 New open space area and associated leachate				Step 5 Combined P leachate from future land uses
Site Allocation	Site Name	Number of new residents (from Stage 1 Column D)	Total Site area (ha) (from Stage 2 Column E)	Type of development (urban, open spaces, food growing)	Total urban surface area (ha)	Urban P leachate standard (kg P/ha/yr)	Total urban P leachate for site allocation (Column E * Column F)	Public Open Space (Y/N)	Total open space area (ha)	Greenspace P leachate standard (kg P/ha/yr)	Total greenspace P leachate for site allocation (Column I * Column J)	Overall leachate from all surfaces (kg P/ha/yr)(Column H + Column N)
	Road, Bucks Green											
RD2	The former Pig Farm, Bucks Green	14.4	0.3	Urban	0.15	0.83	0.1245	No	0.0	0.14	0	0.1245
CH1	Land at Christ's Hospital, The Warren	48	2.1	Urban	0.5	0.83	0.415	No	0.0	0.14	0	0.415
STO1	Land to the North of Melton Drive Storiington	168	4.2	Urban	1.75	0.83	1.4525	No	0.0	0.14	0	1.4525
STO2	Land at Rock Road, Storrington	180	2.7	Urban	1.875	0.83	1.55625	No	0.0	0.14	0	1.55625
TH1	Land North of High Bar Lane, Thakeham	60	1.0	Urban	0.625	0.83	0.51875	No	0.0	0.14	0	0.51875
TH2	Land West of Stream House, Thakeham	96	1.3	Urban	1	0.83	0.83	No	0.0	0.14	0	0.83
WRN1	Land south of Bell	48	0.7	Urban	0.5	0.83	0.415	No	0.0	0.14	0	0.415

A	B	C	D	E	F	G	H	I	J	K	L	M
				Steps 1 + 2 New urban area and associated leachate				Steps 3 + 4 New open space area and associated leachate				Step 5 Combined P leachate from future land uses
Site Allocation	Site Name	Number of new residents (from Stage 1 Column D)	Total Site area (ha) (from Stage 2 Column E)	Type of development (urban, open spaces, food growing)	Total urban surface area (ha)	Urban P leachate standard (kg P/ha/yr)	Total urban P leachate for site allocation (Column E * Column F)	Public Open Space (Y/N)	Total open space area (ha)	Greenspace P leachate standard (kg P/ha/yr)	Total greenspace P leachate for site allocation (Column I * Column J)	Overall leachate from all surfaces (kg P/ha/yr)(Column H + Column N)
	Road, Warnham											
SA066	Land at Hatches Estate	36	0.8	Urban	0.375	0.83	0.31125	No	0.0	0.14	0	0.31125
SA429	Land West of Smock Alley, S of Little Haglands	36	1.8	Urban	0.375	0.83	0.31125	No	0.0	0.14	0	0.31125
SA500	Land East of Hatches House	6	0.4	Urban	0.15	0.83	0.1245	No	0.0	0.14	0	0.1245
HOR2	Land Around Mercer Road, Warnham Station	720	9.4	Urban	7.5	0.83	6.225	No	0.0	0.14	0	6.225
HA2	Land at Buck Barn, West Grinstead (Weald Cross)	5040	174.8	Urban	52.5	0.83	43.575	Yes	13.0	0.14	1.8228	45.3978
HA3	Land East of Billingshurst with school	1560	39.0	Urban	16.25	0.83	13.4875	Yes	8.0	0.14	1.1242	14.6117

A	B	C	D	E	F	G	H	I	J	K	L	M
				Steps 1 + 2 New urban area and associated leachate				Steps 3 + 4 New open space area and associated leachate				Step 5 Combined P leachate from future land uses
Site Allocation	Site Name	Number of new residents (from Stage 1 Column D)	Total Site area (ha) (from Stage 2 Column E)	Type of development (urban, open spaces, food growing)	Total urban surface area (ha)	Urban P leachate standard (kg P/ha/yr)	Total urban P leachate for site allocation (Column E * Column F)	Public Open Space (Y/N)	Total open space area (ha)	Greenspace P leachate standard (kg P/ha/yr)	Total greenspace P leachate for site allocation (Column I * Column J)	Overall leachate from all surfaces (kg P/ha/yr)(Column H + Column N)
HA6	Land West of Southwater	2880	47.3	Urban	30	0.83	24.9	Yes	7.2	0.14	1.0108	25.9108
FAY1	Land West of Kilnwood Vale	840	15.6	Urban	8.75	0.83	7.2625	No	0.0	0.14	0	7.2625

Stage 4 – Site Budget

A	B	C	D	E	F	G	H	I
Potential site allocations		**Stage 1 - Treated WwTW Effluent**	**Stage 3 - Future land use**	**Stage 2 - Loss of P from current farm types**	**Stage 4 - Total P budget**			
Site Allocation	Site Name	TP Discharge after WwTW treatment (kg/TP/year) (Stage 1, Column M)	Overall leachate from all surfaces (kg P/ha/yr)(Stage 3, Column M)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Stage 2, Column L)	P Balance Present and Future Land Uses (Column D - Column E)	Overall P Budget (Column C + Column F)	20% Buffer (from values in Column G)	Allocation P Budget with 20% buffer
CW1	Brook Hill Cluster, Cowfold	22.0752	1.636	0.4608	1.1752	23.2504	-4.65008	18.60
CW2	Field West of Cowfold, North of A272	22.0752	0.88235	0.4776	0.40475	22.47995	-4.49599	17.98
CW3	Fields West of Cowfold, South of A272/Field W of Cowfold, S of A272, W of Little Potters	22.0752	1.411	0.4848	0.9262	23.0014	4.60028	27.60
HOR1	Land at Hornbrook Farm	1.971	2.075	1.8536	0.2214	2.1924	0.43848	2.63
BGR1	Land South of Smugglers Lane	31.536	1.0375	1.60965	-0.57215	30.96385	6.19277	37.16
BGR2	Land South of Muntham Drive	15.768	0.51875	0.450528	0.068222	15.836222	-3.1672444	12.67
BGR3	Land at Slaughterford Farm (Sumners Pond)	18.9216	0.6225	0.069678	0.552822	19.474422	3.8948844	23.37
BRH1	Land at Lower Broadbridge Farm	2.9565	3.1125	1.779904	1.332596	4.289096	0.8578192	5.15
BRH2	Land at Wellcross	0.27594	2.905	1.278072	1.626928	1.902868	0.3805736	2.28
PLB1	Stane Street and Green Dene Nurseries, Pulborough	37.8432	1.245	1.333045	-0.088045	37.755155	7.551031	45.31
PLB2	Land at New Place Farm, Pulborough	107.2224	3.5275	1.6668	1.8607	109.0831	-21.81662	87.27
PLB3	Land at Highfields, Codmore Hill	15.768	0.51875	0.1176	0.40115	16.16915	3.23383	19.40
RD1	Land North of Guildford Road, Bucks Green	1.89216	1.245	1.5092	-0.2642	1.62796	-0.325592	1.30
RD2	The former Pig Farm, Bucks Green	0.189216	0.1245	0.089046	0.035454	0.22467	0.044934	0.27
CH1	Land at Christ's Hospital, The Warren	0.3942	0.415	1.0241	-0.6091	-0.2149	-0.04298	-0.26
STO1	Land to the North of Melton Drive Storiington	2.7594	1.4525	1.1205	0.332	3.0914	-0.61828	2.47
STO2	Land at Rock Road, Storrington	2.9565	1.55625	0.647448	0.908802	3.865302	0.7730604	4.64

A	B	C	D	E	F	G	H	I
Potential site allocations		**Stage 1 - Treated WwTW Effluent**	**Stage 3 - Future land use**	**Stage 2 - Loss of P from current farm types**	**Stage 4 - Total P budget**			
Site Allocation	Site Name	TP Discharge after WwTW treatment (kg/TP/year) (Stage 1, Column M)	Overall leachate from all surfaces (kg P/ha/yr)(Stage 3, Column M)	Estimated Total P Loss (kg/ha/yr) for whole allocation (Stage 2, Column L)	P Balance Present and Future Land Uses (Column D - Column E)	Overall P Budget (Column C + Column F)	20% Buffer (from values in Column G)	Allocation P Budget with 20% buffer
TH1	Land North of High Bar Lane, Thakeham	0.9855	0.51875	0.141806	0.376944	1.362444	0.2724888	1.63
TH2	Land West of Stream House, Thakeham	1.5768	0.83	0.186144	0.643856	2.220656	0.4441312	2.66
WRN1	Land south of Bell Road, Warnham	0.7884	0.415	0.1776	0.2374	1.0258	0.20516	1.23
WCH1	Land at Hatches Estate, West Chiltington	0.5913	0.31125	0.184632	0.126618	0.717918	0.1435836	0.86
WCH2	Land West of Smock Alley,West Chiltington	0.5913	0.31125	0.426576	-0.115326	0.475974	0.0951948	0.57
WCH3	Land at Hatches House, West Chiltington	0.09855	0.1245	0.050078	0.074422	0.172972	0.0345944	0.21
HOR2	Land Around Mercer Road, Warnham Station	11.826	6.225	2.2584	3.9666	15.7926	3.15852	18.95
HA2	Land at Buck Barn, West Grinstead (Weald Cross)	66.2256	45.3978	47.204019	-1.806219	64.419381	-12.8838762	51.54
HA3	Land East of Billingshurst with school	36.89712	14.6117	10.5219	4.0898	40.98692	-8.197384	32.79
HA6	Land West of Southwater	18.9216	25.9108	12.7737	13.1371	32.0587	6.41174	38.47
FAY1	Land West of Kilnwood Vale	30.3534	7.2625	4.213128236	3.049371764	33.40277176	6.680554353	40.08

Appendix E Horsham Local Plan Water Neutrality Technical Note

Technical Note

Project name	Horsham Local Plan HRA	**AECOM project no.**	60640455
Client	Horsham District Council	**Date:**	23 March 2021
Prepared by	Bernadine Maguire		
Checked by	Carl Pelling		

Introduction

7.25 Development of the Habitats Regulations Assessment (HRA) to support the Horsham Local Plan (2019-2036) is currently underway. As part of the HRA screening assessment, Natural England raised concerns about the Hardham groundwater abstraction (a key part of the Southern Water supply strategy for Horsham during certain conditions) and the effect they think it has on water levels/flows in the Arun Valley Special Area of Conservation (SAC) and Ramsar site. As such, they have advised Horsham District Council that they should implement the requirement to target water neutrality in order for sufficient water to be available to the district.

7.26 A water neutrality assessment has been undertaken to identify the requirements and supporting measures that would need to be implemented in order to achieve different levels of water efficiency working towards neutrality. This technical note provides an overview of the methodology and results of the water neutrality assessment.

Water Resource Planning

7.27 Water companies undertake medium to long term planning of water resources in order to demonstrate that a there is a long-term plan for delivering sustainable water supply within its operational area to meet existing and future demand. This is reported via a statutory Water Resource Management Plan (WRMP) produced every five years to coincide with each of the water companies' five-yearly asset management (or business) plans.

7.28 WRMPs set out how demand for water from growth within a water company's supply area can be met, taking into account the need to for the environment to be protected. During development of WRMPs, water companies liaise with the Local Planning Authorities in their supply area to understand and account for growth planned within the Local Plans. As part of the statutory process, WRMPs must be approved by both the Environment Agency and Natural England (as well as other regulators) and hence the outcomes of the plans can be used directly to inform whether growth levels being assessed within a WCS can be supplied with a sustainable source of water supply.

7.29 Water companies manage available water resources within key zones, called Water Resource Zones (WRZ). These zones share the same raw resources for supply and are interconnected by supply pipes, treatment works and pumping stations. As such the customers within these zones share the same available 'surplus of supply' of water when there is more available water than demand; but also share the same risk of supply when demand for water is greater than the available supply (i.e. deficit of supply). Water companies undertake resource modelling to calculate if there is likely to be a surplus of available water or a deficit in each WRZ by the end of their WRMP plan period, once additional demand from growth and other factors such as climate change are taken into account.

Planned Water Availability

Horsham District lies within the North Sussex WRZ, which is within the Central sub-regional Southern Water supply area. It is identified within the Southern Water WRMP (2019) that water supply within the North Sussex WRZ is supplied from a number of sources, including:

- 35% groundwater;
- 51% river;
- 8% reservoir; and
- 6% inter-company transfer.

7.30 Southern Water's assessment of available water in their baseline predictions (without any measures) identifies that the Central area, which includes the North Sussex WRZ, does not have sufficient water for the whole of the planning period (to 2030) to meet its customers' need.

7.31 Southern Water has therefore identified a number of schemes that will benefit the WRZ. This strategy ensures that Southern Water maintains a headroom surplus throughout the planning period. The key measures identified within the Southern Water WRMP for the central area, which includes the North Sussex WRZ, are outlined in Table 1 below.

Table 1: Southern Water WRMP Preferred Schemes for the Central area which includes the North Sussex WRZ

Period	Preferred Schemes
2020 - 2025 (all WRZs in the Central area)	**Demand management** • Target 100 water efficiency activity[102] • Leakage reduction (15% reduction by 2025; 50% by 2050) • Extension of Universal Metering Programme Period **Resource development** • Catchment management and infrastructure solutions to address rising nitrates and increase resilience at the Long Furlong B source, and for pesticides at the River Arun, Weir Wood reservoir, and Pulborough surface water sources • Improve the existing infrastructure to bring the West Chiltington source back into service • Apply for a licence variation at the Pulborough groundwater source • Apply for Drought Permits or Orders in severe or extreme droughts for the Pulborough surface and groundwater sources, Weir Wood reservoir, East Worthing and North Arundel sources
2025-2030 (all WRZs in the Central area)	**Demand management** • Target 100 water efficiency activity • Leakage reduction (15% reduction by 2025; 50% by 2050) **Resource development** • Improve treatment and/or rehabilitate a borehole at Petersfield • Implement catchment management and infrastructure solutions against nitrates at the North Falmer A and B sources • Apply for a Drought Permit / Order in extreme droughts for the East Worthing source
2027 (all WRZs in the Central area)	**Resource development** • Indirect potable water reuse scheme from Littlehampton Wastewater Treatments Works • Aquifer storage and recovery scheme north of Worthing • A potential desalination plant at Shoreham • Improvements to the existing mains between Shoreham and Brighton

[102] This is an initiative to target a usage of 100 litres per person per day in properties within the Southern Water supply area

- Apply for a Drought Permit / Order for the East Worthing and Pulborough surface water sources in an extreme drought event.

The key factor driving the strategy for the Central area is the potential for significant, but as yet unconfirmed sustainability reductions (licence changes). These sustainability reductions will be confirmed by the Environment Agency following the conclusion of the investigations the company is proposing to undertake early in the AMP7 period (by 2022-23). If licence changes are confirmed, then significant new infrastructure will be required to provide new water resources to offset the water that is effectively "lost".

In order to ensure water efficiency in the future, Southern Water have included proposals for leakage reduction and demand management measures for the Central area, along with the development of a shared new non direct potable water reuse resource with South East Water, together with up to two desalination plants, a storage reservoir, and other measures. It is hoped that by reducing the long-term demand for water, the supply of water can be controlled to aid in ensuring that water is available in the future.

Recent correspondence from Natural England to Southern Water in December 2019 identified that an adverse effect on the integrity of the Arun Valley SAC, SPA and Ramsar features could not be excluded with certainty following an evidence review of the Hardham groundwater abstraction[103]. Natural England state that '*this abstraction supplies Horsham and has clear implications for plans and projects in this area. The Environment Agency and Natural England are working with Southern Water to try to identify a long term more sustainable water supply. In the meantime, whilst the adverse effect remains or is uncertain, development in Horsham must be certain not to add to this adverse effect. We therefore advise that water quantity is screened in for appropriate assessment in the HRA. We advise that your authority consults studies such as the Gatwick Sub Regional water cycle study regarding this issue. For example the study cites the requirement to demonstrate water neutrality in order for sufficient water to be available to the district*'.

Water Neutrality

Water neutrality is a concept whereby the total demand for potable mains water supply within a planning area after development has taken place is the same (or less) than it was before development took place. If this can be achieved, the overall balance for water demand is 'neutral', and there is considered to be no net increase in demand as a result of development. In order to achieve this, new development needs to be subject to planning policy which aims to ensure that where possible, houses and businesses are built to high standards of water efficiency through the use of water efficient fixtures and fittings, and in some cases rainwater harvesting and greywater recycling.

It is theoretically possible that neutrality can be achieved within a new development area, through the complete management of the water cycle within that development area. In addition to water demand being limited to a minimum, it requires:

- all wastewater to be treated and re-used for potable consumption rather than discharged to the environment;
- maximisation of rainwater harvesting (in some cases complete capture of rainfall falling within the development) for use in the home; and
- abstraction of local groundwater or river flow storage for treatment and potable supply.

Achieving 'total' water neutrality within a development remains an aspirational concept due to the requirement for specific catchment conditions to supply raw water for treatment and significant capital expenditure. It also requires specialist operational input to maintain the systems such as blackwater re-use on a community scale.

For the majority of new development, in order for the water neutrality concept to work, the additional demand created by new development needs to be offset in part by reducing the demand from existing population and employment. Therefore, a 'planning area' needs to be considered where measures are

[103] Correspondence in relation to the Horsham Local plan Regulation 18 Consultation and Habitats Regulations Screening Assessment (Natural England, 30 March 2020, Ref: 308448).

taken to reduce existing or current water demand from the current housing and employment stock. The planning area in this case is considered to be the Horsham District Council administrative area as a whole.

Methodology

Metering Assumptions

Installing water meters within existing residential properties is an important element of the Southern Water WRMP to manage their customers' demand for water. The existing level of metering within the North Sussex WRZ is already high at 88% which limits the potential for further metering to contribute to neutrality. Southern Water's future target for meter penetration on domestic water supplies is 92% by 2025.

Demand in new homes

Likely increases in demand in the study area have been calculated using three different water demand projections based on different rates of water use for new homes that could be implemented through proposed and potential future policy.

The projections were derived as follows:

- Average metered consumption – New homes in the district would use 133.24 l/h/d;
- Local plan requirements – New homes would conform to (and not use more than) the proposed Local Plan requirement where *"New residential development to limit water use to achieve a water efficiency of 100 litres/person/day, all strategic development is to achieve 80 litres/person/day; and all to incorporate measures which promote the conservation of water and / or grey water recycling*";
- Best case re-use – New homes would include both greywater recycling and rainwater harvesting reducing water use to a minimum of 62 l/h/d.

Using these projections, the increase in demand for water has been calculated for the proposed housing growth of 20,757 homes over the plan period (2020 – 2036) and a target of 111,700m^2 of employment space. For the housing growth it was assumed that 8,425 homes would be delivered on sites identified as strategic development with the remainder to be delivered on non-strategic development sites. The projections are shown in Figure 1.

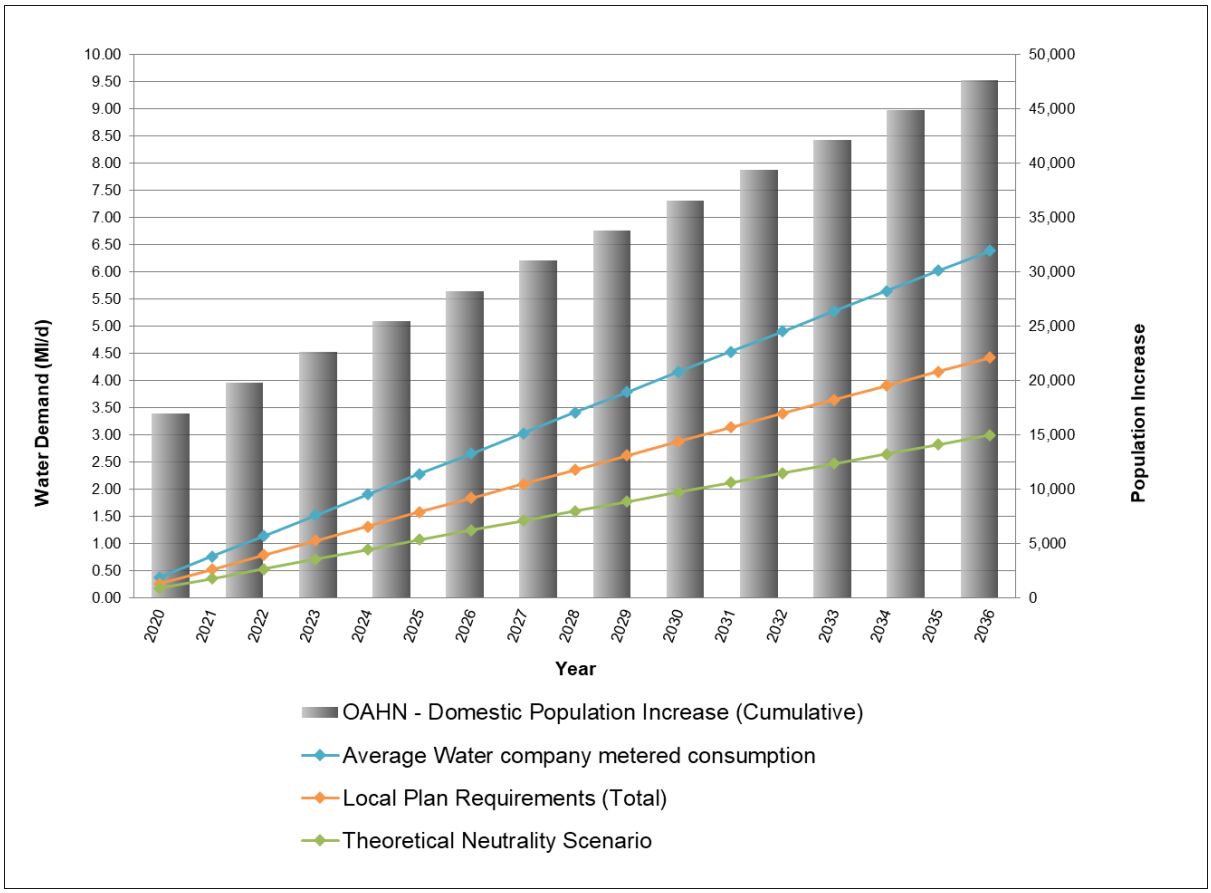

Figure 1: Range of water demands across the plan period in the study area depending on efficiency levels of new homes

Water Neutrality Scenarios

In order to reduce water consumption and manage demand for the limited water resources within the study area, a number of measures and devices are available[104]. Generally, these measures fall into two categories due to cost and space constraints, as those that should be installed in new developments and those which could be retrofitted. Waterwise in conjunction with the Environment Agency, DEFRA, OFWAT and the Department of Communities and Local Government published a best practice guide to water efficiency and retrofitting in 2009. This guide provides case studies and advice on how water companies, local authorities and housing providers can manage retrofitting strategies under different scenarios[105]. These have been used to develop a number of 'scenarios' which have been used to demonstrate the different levels of water neutrality that could be achieved with the implementation of different measures.

1. High Scenario (Theoretical neutrality)

This scenario has been developed as a context to demonstrate what is required to achieve the full aspiration of water neutrality. In reality, achieving 100% meter penetration across the study area is unlikely, due to a proportion of existing properties which either have complicated plumbing or whose water is supplied by bulk (i.e. flats), making it difficult for meter installation.

The key assumptions for this scenario are that water neutrality is achieved; however, it is considered as aspirational only as it is unlikely to be feasible based on:

- Existing research into financial viability of such high levels of water efficiency measures in new homes; and

[104] Water Efficiency in the South East of England, Environment Agency, April 2007.
[105] Water Efficiency Retrofitting: A Best Practice Guide. Waterwise 2009. Available at: http://www.waterwise.org.uk/resources.php/30/water-efficiency-retrofitting-a-best-practice-guide

- Uptake of retrofitting water efficiency measures required (65.5%) is considered to exceed the maximum achievable in the study area.

It would require:

- Meter installation into all existing residential properties (100% meter penetration);
- A significant funding pool and a specific joint partnership 'delivery plan' to deliver the extremely high percentage of retrofitting measures required;
- Strong local policy within the Local Plan on restriction of water use in new homes which is currently unprecedented in the UK; and
- All new development to include water recycling facilities across the study area which is currently limited to small scale development in the UK.

2. Medium Scenario

The key assumptions for this scenario are that the water neutrality percentage achieved is at least 50% of the total neutrality target and would require funding and partnership working, and adoption of draft local policy.

It would require:

a. Meter installation as per Southern Water's WRMP by 2025 (92% meter penetration within their supply area);

b. Uptake of retrofitting water efficiency measures to be considerably high (50%) in the study area; and

c. A significant funding pool and a specific joint partnership 'delivery plan' to deliver the high percentage of retrofitting measures required.

3. Low Scenario

The key assumptions for this scenario are that the water neutrality percentage achieved is low but would require small scale level of funding and partnership working, and adoption of draft local policy.

It would require:

a. Meter installation as per Southern Water's WRMP by 2025 (92% meter penetration within their supply area);

b. Uptake of retrofitting water efficiency measures to be fairly high (20%); and

c. A relatively small funding pool and a partnership working not moving too far beyond 'business as usual' for stakeholders.

It is considered that it is technically and politically straightforward to obtain this level with a funded joint partnership approach and with new developers contributing water efficient homes with a relative low capital expenditure.

Results

To achieve total water neutrality, the demand post growth must be the same as, or less than existing demand. Based on estimates of population size, current demand in the Borough was calculated to be 19.35 Ml/d.

For each neutrality scenario, total demand was calculated at three separate stages for housing as follows:

- Stage 1 – total demand post growth without any assumed water efficiency retrofitting of existing housing stock for the differing levels of water efficiency in new homes;
- Stage 2 – total demand post growth with effect of metering applied to the existing housing stock for the differing levels of water efficiency in new homes; and,

- Stage 3 – total demand post growth (additional household and non-household use) with metering and water efficient retrofitting applied to existing homes for the differing levels of water efficiency in new homes.

The results are provided in Table 2 below. If neutrality is achieved, the result is displayed as green, otherwise the result is displayed as red. The percentage of total neutrality achieved per scenario is also provided.

Table 2: Results of the Water Neutrality Scenario Assessment

Neutrality Scenario	New Homes demand projections	New homes consumption rate (l/h/d)	% of existing properties to be retrofitted	Demand from Growth (Ml/d)	Total demand post growth* (Ml/d)	Total demand after metering (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
Baseline	Baseline Projection: Average Southern Water metered consumption	133	0	6.39	**25.75**	**25.66**	**25.66**	0%
	Local Plan requirements	80 - Strategic development 100 – Non-strategic development	0	4.42	**23.77**	**23.69**	**23.69**	32%
Low	Local Plan requirements + 20% retrofit		20	4.42	**23.77**	**23.69**	**22.86**	45%
Medium	Local Plan requirements + 50% retrofit		50	4.42	**23.77**	**23.69**	**21.61**	65%
High	Theoretical neutrality + 65.5% retrofit	62	65.5	3.00	**22.35**	**22.10**	**19.37**	100%

* prior to demand management for existing housing stock

The results show that total neutrality is only achieved by applying the High Scenario, requiring new homes to use water at a rate of 62 l/h/d with retrofitting a minimum of 65.5% of the existing housing stock with water efficiency fittings equivalent to the Southern Water ‘Target 100’ standard. The Medium Scenario would give a minimum of 65% neutrality which would require new homes to be designed to use water at a rate of 80 l/h/d for strategic development or 100 l/h/d for non-strategic development (as required by the proposed Local Plan policy) and retrofitting 50% of the existing housing stock with water efficiency fittings equivalent to the Southern Water ‘Target 100’ standard, which would be difficult to achieve. In the situation where only new homes are designed to use water

at a rate required by the proposed Local Plan policy, i.e. without any retrofitting of the existing housing stock with water efficiency fittings, a water neutrality of 32% could be achieved.

Delivery Requirements

To achieve any level of neutrality, a series of policies, partnership approaches and funding sources would need to be developed. For example, the Low Scenario is considered to require a funding pool and a specific joint partnership 'delivery plan' to deliver the required percentage of retrofitting measures, as well as the implementation of the draft Local Plan policy restriction of water use in new homes. It would require:

- New housing development to adhere to the requirements of the proposed Horsham Local Plan Policy 38, being designed to limit water use to 80 l/h/d on strategic development sites or 100 l/h/d on non-strategic development sites (more stringent than the optional Building Regulations requirements);
- Uptake of retrofitting water efficiency measures to be relatively high (20%) in the District; and
- A considerable funding pool and a specific joint partnership 'delivery plan' to deliver the relatively high percentage of retrofitting measures required.

Policy

Horsham District Council is already proposing a requirement in the Local Plan (2019 – 2036) (Policy 38) that new homes delivered on strategic developments incorporate water efficiency measures and/or water recycling in order to limit water use to 80 l/h/d or 100 l/h/d on non-strategic developments; therefore, this policy element of the delivery requirements is already in place. It is recommended that the Council consider ways to support developer implementation of this policy via information sources on their website. Measures can include (but not necessarily limited to) garden water butts, low flush toilets, low volume baths, aerated taps, water efficient appliances and water recycling (greywater and/or rainwater).

Partnership Approaches

Housing association partners should be targeted with a programme of retrofitting water efficient devices, to showcase the policy and promote the benefits. This should be a collaborative scheme between Horsham District Council, Southern Water and Waterwise. In addition, rainwater harvesting and/or greywater recycling schemes could be implemented into larger council owned and maintained buildings, such as schools or community centres. Rainwater harvesting could be introduced to public toilets.

The retrofitting scheme should then be extended to non-Council owned properties, via the promotion and education programme.

A programme of water audits should be carried out in existing domestic and non-domestic buildings, again showcased by council owned properties, to establish water usage and to make recommendations for improving water efficiency measures. The water audits should be followed up by retrofitting water efficient measures in these buildings, as discussed above. In private non-domestic buildings water audits and retrofitting should be funded by the asset owner, the cost of this could be offset by the financial savings resulting from the implementation of water efficient measures.

In order to ensure the uptake of retrofitting water efficient devices for non-council properties, the council should implement an awareness and education campaign, which could include the following:

- working with Southern Water to help with its water efficiency initiative ('Target 100'), which has seen leaflets distributed directly to customers and at events across the region each year;
- a media campaign, with adverts/articles in local papers and features on a local news programme;
- a media campaign could be supplemented by promotional material, ranging from those that directly affect water use e.g. free cistern displacement devices, to products which will raise awareness e.g. fridge magnets with a water saving message;

- encouraging developers to provide new residents with ‘welcome packs’, explaining the importance of water efficiency and the steps that they can take to reduce water use;
- working with retailers to promote water efficient products;
- carrying out educational visits to schools and colleges, to raise awareness of water efficiency amongst children and young adults;
- working with neighbourhood trusts, community groups and local interest groups to raise awareness of water efficiency; and,
- carrying out home visits to householders to explain the benefits of saving water, this may not be possible for the general population of the Borough, but rather should be used to support a targeted scheme aimed at a specific residential group.

Relationships

The recommendations above are targeted at Horsham District Council and Southern Water as these are the major stakeholders, although the Environment Agency and other statutory consultees can also influence future development to ensure the water neutrality target is achieved. It is therefore suggested that responsibility for implementing water efficiency policies be shared as detailed in Table 3.

Table 3: Responsibility for implementing water efficiency

Responsibility	Responsible stakeholder
Ensure planning applications are compliant with Local Plan Policy 38	Horsham District Council
Fitting water efficient devices in accordance with policy	Developers
Provide guidance and if necessary, enforce the installation of water efficient devices through the planning application process	Horsham District Council
Ensure continuing increases in the level of water meter penetration	Southern Water
Continue with ‘Target 100’ campaign	Southern Water
Retrofit devices within council owned housing stock	Horsham District Council
Retrofit devices within privately owned housing stock (via section 106 agreements)	Developers
Promote water audits and set targets for the number of businesses that have water audits carried out. Allocate a specific individual or team to be responsible for promoting and undertaking water audits and ensuring the targets are met. The same team or individual could also act as a community liaison for households (council and privately owned) and businesses where water efficient devices are to be retrofitted, to ensure the occupants of the affected properties understand the need and mechanisms for water efficiency.	Horsham District Council
Educate and raise awareness of water efficiency	Horsham District Council and Southern Water

A major aim of the education and awareness programmes would be to change peoples’ attitude to water use and water saving and to make the general population understand that it is everybody’s responsibility to reduce water use. Studies have shown that the water efficiencies in existing housing stock achieved by behavioural changes, such as turning off the tap while brushing teeth or reducing shower time, can be as important as the installation of water efficient devices.

Conclusion

The assessment of water neutrality has been undertaken to demonstrate whether moving towards neutrality within the Horsham district is feasible and what the technological implications might be to

get as close to neutrality as possible. The results have shown a range of theoretical scenarios which achieve differing levels of progress towards water neutrality but which all include significant challenges. In order to achieve 100% water neutrality within the district a significant funding pool and associated ‘delivery plan’ would be required, along with more stringent local policy requirements within the Local Plan which would require developers to incorporate reuse technologies within all new homes, regardless of the size of the development.

Appendix F Horsham A272 Air Quality Modelling Technical Note

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Project name:
Horsham Air Quality - HRA

Project ref:
60640455

From:
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Overview

Horsham District Council has prepared a Local Plan setting out proposed development up to 2037. This project assesses the impact on air quality of the Local Plan on an internationally designated ecological site that requires a Habitats Regulation Assessment (HRA).

A272 Horsham Road runs through The Mens SAC connecting to Fittleworth Road and opposite The Livestock Partnership. This project considers the impact of changes in traffic flow on concentrations of nitrogen oxides (NOx), ammonia (NH_3) and nitrogen deposition at the closest ecological receptors, within The Mens Special Area of Conservation (SAC) due to the Local Plan. Figure 1 shows the traffic network, ecological receptors and SAC considered in this project.

Methodology

Traffic Data

The road network includes a single link along the A272 Horsham Road which is adjacent to the northern boundary of The Mens SAC. Traffic data in the form of 24-hour AADT (Annual Average Daily Traffic) based on 2019 data and forecast to 2037 are shown in Table 9. Baseline traffic data were calculated from local ATC (Automatic Traffic Counter) data from A272 Newbridge Road near River Arun bridge.

The traffic data provided AM and PM peak hour traffic flows for east and west bound traffic. This was combined to give an average peak hour to avoid extrapolating differences which may only occur in one peak hour, this was then used to estimate daily average speeds. The Base and Future Base scenarios (both without Local Plan) used 2019 traffic data. The future year without Local Plan (2037 Do-Minimum) traffic flows were calculated by applying a growth factor to the 2019 traffic to 2037 which increased 2019 traffic flows by 26% (1,427 AADT).

The heavy-duty vehicle (HDV) percentage was estimated by using the peak hour movements for east and west bound traffic derived from the ATC. In the absence of any additional data it is assumed that the percentage is consistent across all scenarios. The average speed (81kph) was calculated using this same method. A further scenario including a new junction arrangement on the A24 at Buck Barn, ‘Do Something 2’, has also been modelled.

Table 9 Traffic Data

Scenario	AADT	HDV %	Daily Mean Speed (kph)
Base 2019 (and Future Base (2037))	5,531	1.7	81
2037 Do Minimum	6,958	1.7	81
2037 Do Something 2 (with mitigation)	7,400	1.7	81

Receptors

Ecological receptors have been taken from the north of the SAC, which abuts the road, every 10 metres, up to 200m from the road. The ecological receptors relevant to this project are included in Table 10, and their locations presented in Figure 1.

Table 10 Receptor locations, height and distance from road

ID	X Coordinate	Y Coordinate	Height (m)	Distance from Road (m)	ID	X Coordinate	Y Coordinate	Height (m)	Distance from Road (m)
E1_0m	503208	124936	0	0	E1_110m	503227	124828	0	110
E1_10m	503210	124927	0	10	E1_120m	503229	124818	0	120
E1_20m	503211	124917	0	20	E1_130m	503230	124808	0	130
E1_30m	503213	124907	0	30	E1_140m	503232	124799	0	140
E1_40m	503215	124897	0	40	E1_150m	503234	124789	0	150
E1_50m	503217	124887	0	50	E1_160m	503236	124779	0	160
E1_60m	503218	124877	0	60	E1_170m	503237	124769	0	170
E1_70m	503220	124868	0	70	E1_180m	503239	124759	0	180
E1_80m	503222	124858	0	80	E1_190m	503241	124749	0	190
E1_90m	503223	124848	0	90	E1_200m	503243	124740	0	200
E1_100m	503225	124838	0	100					

Model Setup

Road traffic emissions of NOx were derived using Defra's current Emission Factor Toolkit (EFT v10.1) and associated tools[106]. Road traffic emissions of NH_3 were derived using Air Quality Consultants' Calculator for Road Emissions of Ammonia (CREAM) V1A)[107].

Detailed dispersion modelling was undertaken using ADMS-Roads v5.0 to model concentrations of NOx and NH_3 using the parameters in Table 11 for the following scenarios:

4. 2019 Baseline – 2019 AADT, emission factors and background concentrations;
5. 2037 Future Baseline – 2019 AADT, 2030 emission factors and background concentrations (the latest projected year available from Defra);
6. 2037 Do Minimum – 2037 AADT without Local Plan, 2030 emission factors and background concentrations;
7. 2037 Do Something 2 – 2037 AADT with Local Plan in place and added mitigation, 2030 emission factors and background concentrations.

Table 11 General ADMS-Roads Model Conditions

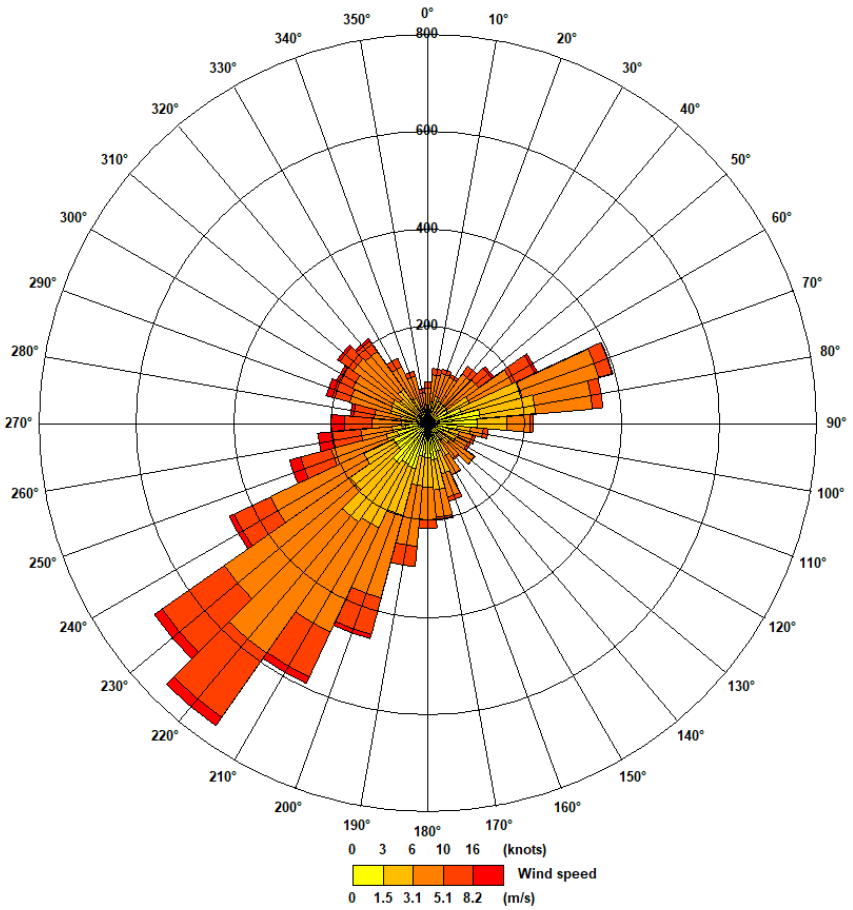
Variables	ADMS-Roads Model Input
Surface roughness at source	1m
Surface roughness at Metrological Site	0.5m
Minimum Monin-Obukhov length for stable conditions	10m
Terrain types	Flat
Receptor location	x, y coordinates determined by GIS, z = 0m for ecological receptors.
Emissions	NO_x – Defra's EFT v10.1. NH_3 – CREAM V1A
Meteorological data	1 year (2019) hourly sequential data from Gatwick Airport meteorological station.
Receptors	Ecological
Model output	Long-term (annual) mean NO_x and NH_3 concentrations.

Meteorological Data

One year (2019) of hourly sequential observation data from Gatwick Airport meteorological station has been used in this assessment to correspond with the baseline year. The station is located approximately 5km north-east of the SAC and experiences meteorological conditions that are representative of those experienced within the air quality study area. Figure 2 shows that the dominant direction of wind is from the south-west, as is typical for the UK. The wind speed ranges from 0-18 knots (0- ~9.3 m/s).

[106] https://laqm.defra.gov.uk/
[107] https://www.agconsultants.co.uk/resources/ammonia-emissions-from-roads-for-assessing-impacts

Figure 2 Wind Rose of Gatwick Met Data 2019



Background Data

Background mapped concentrations for NO_2 and NOx concentrations for 2019 and 2030 have been sourced from Defra's 2018-based background maps for receptors within the nearest 1km by 1km grid squares (Table 12). The data shows that the mapped background concentrations are predicted to decrease between 2019 and 2030.

Table 12 Defra Mapped Background Pollutant Concentrations (µg/m³)

Grid Square (X, Y)	Annual Mean Concentrations			
	2019 NOx	2030 NOx	2019 NO_2	2030 NO_2
503500,124500	9.1	6.7	7.1	5.3

Ecological Data

The annual mean critical levels of NOx and NH_3, concentrations above which adverse effects on ecosystems may occur based on present knowledge are summarised in Table 13.

Table 13 Annual Mean Critical Levels (NOx and NH_3)

Pollutant	Critical Level
Oxides of nitrogen (NOx)	30 µg/m³

Ammonia (NH_3)	3 µg/m^3 1 µg/m^3 for lichens and bryophytes

The Air Pollution Information System[108] (APIS) provides 'a searchable database and information on pollutants and their impacts on habitats and species'. The site interest features within The Mens SAC are beech forests and the barbastellus bat. The parameters for *Atlantic acidophilous beech forests* in The Mens SAC (grid square centred at 503500, 124500) were taken from APIS and are presented in Table 14. The habitat of the bat is broadleaved deciduous woodland which has the same critical load as the beech forest.

No change in the APIS concentrations of NH_3 or deposition rates of nitrogen and acid have been assumed from the APIS 2016-2018 values to 2019 nor to the future year.

Table 14 Air Pollution Information System (APIS) Data of the Ecological Receptors.

Receptor	Av. N Dep Rate kgN/ha/yr	Critical Load Av. N Dep Rate kgN/ha/yr	Total Av. Acid Dep Rate keq/ha/yr	Nitrogen Av. Acid Dep Rate keq/ha/yr	Critical Load Nitrogen Av. Acid Dep Rate keq/ha/yr	Ammonia µg/m^3	Habitat	APIS Data Year
E1 (Transect)	24.8	10 - 20	2	1.8	0.357-3.2	1.2	Atlantic acidophilous beech forests	2016 - 2018

Verification

There are no local air quality monitoring stations near Horsham Road with which to make a comparison between modelled and measured concentrations to enable the model results can be adjusted to bring the modelled concentrations in-line with measurements. Therefore, verification factors have been used based upon professional judgement and experience. A verification factor of 1.5 for NOx and 1.0 for NH_3 have been applied based on previous verification and validation of the EFT and CREAM tools.

Deposition velocities

Deposition of nitrogen from road traffic derived NH_3 and NO_2 to the forest are estimated using the AQTAG deposition velocities that are cited in the 2020 IAQM guidance[109], as shown in Table 15.

Table 15 Air Pollution Information System (APIS) Data of the Ecological Receptors.

Pollutant	Habitat	Nitrogen deposition conversion rates	Deposition velocity
NO_2	Forest	1 µg/m^3 NO_2= 0.29 kgN/ha/yr	0.003 m/s
NH_3	Forest	1 µg/m^3 NH_3 = 7.8 kgN/ha/yr	0.030 m/s

Limitations

The following limitations are recognised:

[108] http://www.apis.ac.uk/
[109] https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

- No local monitoring data was available within 200m of the road network used in the current study. Therefore verification factors have been used based upon professional judgement and experience of the EFT and CREAM tools.
- Without monitoring of concentrations at background sites to compare with the mapped concentrations, it is assumed that the Defra and APIS concentrations correctly represent the background NOx, NO_2 and NH_3 concentrations for the baseline year.

Results

Modelled Results

Table 16 shows the road contribution to annual mean NOx, and the corresponding contribution of NO_2 to annual nitrogen deposition and annual nitrogen acid deposition. In all cases, road contribution decreases the further away the receptor is from the road. Road contributions decrease between the 2019 base and the future year scenarios at each receptor.

Table 16 NOx Road Contribution

	Road Annual Mean NOx (µg/m^3)				Annual Mean N Dep from Road NO_2 (kg N/ha/yr.)				Annual Mean N Acid Dep from Road NO_2 (keq/ha/yr.)			
Receptor	Base 2019	Future Base 2037	DM 2037	DS2 2037	Base 2019	Future Base 2037	DM 2037	DS2 2037	Base 2019	Future Base 2037	DM 2037	DS2 2037
E1_0m	9.71	3.13	3.92	4.16	1.55	0.50	0.62	0.66	0.11	0.04	0.04	0.05
E1_10m	3.87	1.21	1.52	1.62	0.62	0.19	0.24	0.26	0.04	0.01	0.02	0.02
E1_20m	2.36	0.73	0.92	0.98	0.38	0.12	0.15	0.15	0.03	0.01	0.01	0.01
E1_30m	1.65	0.51	0.64	0.68	0.27	0.08	0.10	0.11	0.02	0.01	0.01	0.01
E1_40m	1.24	0.38	0.48	0.51	0.20	0.06	0.08	0.08	0.01	<0.01	0.01	0.01
E1_50m	0.98	0.30	0.38	0.40	0.16	0.05	0.06	0.06	0.01	<0.01	<0.01	<0.01
E1_60m	0.79	0.24	0.30	0.32	0.13	0.04	0.05	0.05	0.01	<0.01	<0.01	<0.01
E1_70m	0.65	0.20	0.25	0.27	0.11	0.03	0.04	0.04	0.01	<0.01	<0.01	<0.01
E1_80m	0.55	0.17	0.21	0.23	0.09	0.03	0.03	0.04	0.01	<0.01	<0.01	<0.01
E1_90m	0.47	0.14	0.18	0.19	0.08	0.02	0.03	0.03	0.01	<0.01	<0.01	<0.01
E1_100m	0.40	0.12	0.16	0.17	0.07	0.02	0.02	0.03	<0.01	<0.01	<0.01	<0.01
E1_110m	0.35	0.11	0.14	0.14	0.06	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01
E1_120m	0.31	0.09	0.12	0.13	0.05	0.02	0.02	0.02	<0.01	<0.01	<0.01	<0.01
E1_130m	0.27	0.08	0.11	0.11	0.04	0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01
E1_140m	0.24	0.07	0.09	0.10	0.04	0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01
E1_150m	0.22	0.07	0.08	0.09	0.03	0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01
E1_160m	0.20	0.06	0.08	0.08	0.03	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01
E1_170m	0.18	0.05	0.07	0.07	0.03	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01
E1_180m	0.16	0.05	0.06	0.07	0.03	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01
E1_190m	0.15	0.05	0.06	0.06	0.02	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01
E1_200m	0.13	0.04	0.05	0.06	0.02	0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01

Table 17 shows the road contribution to annual mean NH_3, and the corresponding contribution to annual mean nitrogen deposition and annual mean nitrogen acid deposition. In all cases, road contribution decreases the further away the receptor is from the road. Road contributions decrease between the 2019 base and the future year scenarios at each receptor.

Table 17 NH_3 Road Contribution

	Road Annual Mean NH_3 ($\mu g/m^3$)				Annual Mean N Dep from Road NH_3 (kg N/ha/yr.)				Annual Mean N Acid Dep from Road NH_3 (keq/ha/yr.)			
Receptor	Base 2019	Future Base 2037	DM 2037	DS2 2037	Base 2019	Future Base 2037	DM 2037	DS2 2037	Base 2019	Future Base 2037	DM 2037	DS2 2037
E1_0m	0.46	0.58	0.72	0.77	3.56	4.50	5.64	6.02	0.25	0.32	0.40	0.43
E1_10m	0.18	0.22	0.28	0.30	1.42	1.74	2.19	2.34	0.10	0.12	0.16	0.17
E1_20m	0.11	0.13	0.17	0.18	0.87	1.05	1.32	1.41	0.06	0.07	0.09	0.10
E1_30m	0.08	0.09	0.12	0.13	0.61	0.73	0.92	0.99	0.04	0.05	0.07	0.07
E1_40m	0.06	0.07	0.09	0.09	0.46	0.55	0.69	0.74	0.03	0.04	0.05	0.05
E1_50m	0.05	0.05	0.07	0.07	0.36	0.43	0.54	0.58	0.03	0.03	0.04	0.04
E1_60m	0.04	0.04	0.06	0.06	0.29	0.35	0.44	0.47	0.02	0.02	0.03	0.03
E1_70m	0.03	0.04	0.05	0.05	0.24	0.29	0.36	0.39	0.02	0.02	0.03	0.03
E1_80m	0.03	0.03	0.04	0.04	0.20	0.24	0.31	0.33	0.01	0.02	0.02	0.02
E1_90m	0.02	0.03	0.03	0.04	0.17	0.21	0.26	0.28	0.01	0.01	0.02	0.02
E1_100m	0.02	0.02	0.03	0.03	0.15	0.18	0.22	0.24	0.01	0.01	0.02	0.02
E1_110m	0.02	0.02	0.03	0.03	0.13	0.16	0.20	0.21	0.01	0.01	0.01	0.01
E1_120m	0.01	0.02	0.02	0.02	0.11	0.14	0.17	0.18	0.01	0.01	0.01	0.01
E1_130m	0.01	0.02	0.02	0.02	0.10	0.12	0.15	0.16	0.01	0.01	0.01	0.01
E1_140m	0.01	0.01	0.02	0.02	0.09	0.11	0.14	0.15	0.01	0.01	0.01	0.01
E1_150m	0.01	0.01	0.02	0.02	0.08	0.10	0.12	0.13	0.01	0.01	0.01	0.01
E1_160m	0.01	0.01	0.01	0.02	0.07	0.09	0.11	0.12	0.01	0.01	0.01	0.01
E1_170m	0.01	0.01	0.01	0.01	0.07	0.08	0.10	0.11	<0.01	0.01	0.01	0.01
E1_180m	0.01	0.01	0.01	0.01	0.06	0.07	0.09	0.10	<0.01	0.01	0.01	0.01
E1_190m	0.01	0.01	0.01	0.01	0.05	0.07	0.08	0.09	<0.01	<0.01	0.01	0.01
E1_200m	0.01	0.01	0.01	0.01	0.05	0.06	0.08	0.08	<0.01	<0.01	0.01	0.01

Table 18 shows the total annual mean concentrations of NOx and NH_3. Bold numbers highlight where critical levels are exceeded. Total annual mean NOx did not exceed the critical level of 30µg/m^3 at any receptor. However, the total annual mean NH_3 exceeded the critical level of 1µg/m^3 for lichens and bryophytes at all receptors in all scenarios, but remained below the critical level of 3µg/m^3. This is due to the NH_3 background concentration being 1.2 µg/m^3 which already exceeds the 1µg/m^3 critical level.

The overall trend is for a decrease between the base year (2019) and the future year (2037), whilst there are increases from the DM (without Local Plan) compared to the DS2 (with Local Plan).

Table 18 Total Annual Mean results NOx and NH_3

	Total Annual Mean NOx (µg/m^3)				Total Annual Mean NH_3 (µg/m^3)			
Receptor	**Base 2019**	**Future Base 2037**	**DM 2037**	**DS2 2037**	**Base 2019**	**Future Base 2037**	**DM 2037**	**DS2 2037**
E1_0m	18.80	9.86	10.65	10.89	**1.66**	**1.78**	**1.92**	**1.97**
E1_10m	12.96	7.94	8.25	8.34	**1.38**	**1.42**	**1.48**	**1.50**
E1_20m	11.45	7.46	7.65	7.70	**1.31**	**1.33**	**1.37**	**1.38**
E1_30m	10.75	7.23	7.37	7.41	**1.28**	**1.29**	**1.32**	**1.33**
E1_40m	10.34	7.11	7.21	7.24	**1.26**	**1.27**	**1.29**	**1.29**
E1_50m	10.07	7.03	7.10	7.13	**1.25**	**1.25**	**1.27**	**1.27**
E1_60m	9.89	6.97	7.03	7.05	**1.24**	**1.24**	**1.26**	**1.26**
E1_70m	9.75	6.93	6.98	7.00	**1.23**	**1.24**	**1.25**	**1.25**
E1_80m	9.65	6.89	6.94	6.95	**1.23**	**1.23**	**1.24**	**1.24**
E1_90m	9.56	6.87	6.91	6.92	**1.22**	**1.23**	**1.23**	**1.24**
E1_100m	9.50	6.85	6.88	6.89	**1.22**	**1.22**	**1.23**	**1.23**
E1_110m	9.45	6.83	6.86	6.87	**1.22**	**1.22**	**1.23**	**1.23**
E1_120m	9.40	6.82	6.85	6.85	**1.21**	**1.22**	**1.22**	**1.22**
E1_130m	9.37	6.81	6.83	6.84	**1.21**	**1.22**	**1.22**	**1.22**
E1_140m	9.34	6.80	6.82	6.83	**1.21**	**1.21**	**1.22**	**1.22**
E1_150m	9.31	6.79	6.81	6.82	**1.21**	**1.21**	**1.22**	**1.22**
E1_160m	9.29	6.79	6.80	6.81	**1.21**	**1.21**	**1.21**	**1.22**
E1_170m	9.27	6.78	6.80	6.80	**1.21**	**1.21**	**1.21**	**1.21**
E1_180m	9.26	6.78	6.79	6.79	**1.21**	**1.21**	**1.21**	**1.21**
E1_190m	9.24	6.77	6.78	6.79	**1.21**	**1.21**	**1.21**	**1.21**
E1_200m	9.23	6.77	6.78	6.78	**1.21**	**1.21**	**1.21**	**1.21**
Critical Level			**30 µg/m^3**				**1 or 3 µg/m^3**	

Table 19 shows the total annual mean nitrogen deposition and nitrogen acid deposition (background and contribution from road traffic NOx and NH_3). Bold numbers highlight where critical loads are exceeded. The total annual mean nitrogen deposition exceeds the upper boundary of the critical load (10-20 kg N/ha/yr) at all receptors for all scenarios. This is due to the background nitrogen deposition being 24.8 kg N/ha/yr which already exceeds the upper boundary of the critical load. The total annual mean nitrogen acid deposition lies between the lower and upper boundary of the critical load (0.357-3.2 keq/ha/yr.).

The overall trend is for an increase between the base year (2019) and the future year (2037), whilst there are increases from the DM (without Local Plan) compared to the DS2 (with Local Plan).

Table 19 Total Annual Mean results of combined NO_2 and NH_3

	Total Annual Mean N Dep (kg N/ha/yr)				Total Annual Mean N Acid Dep (keq/ha/yr)			
Receptor	Base 2019	Future Base 2037	DM 2037	DS2 2037	Base 2019	Future Base 2037	DM 2037	DS2 2037
E1_0m	**29.89**	**29.77**	**31.04**	**31.45**	**2.17**	**2.16**	**2.25**	**2.28**
E1_10m	**26.82**	**26.71**	**27.21**	**27.38**	**1.95**	**1.94**	**1.97**	**1.99**
E1_20m	**26.03**	**25.94**	**26.25**	**26.35**	**1.89**	**1.88**	**1.90**	**1.91**
E1_30m	**25.65**	**25.59**	**25.80**	**25.87**	**1.86**	**1.86**	**1.87**	**1.88**
E1_40m	**25.44**	**25.39**	**25.55**	**25.60**	**1.85**	**1.84**	**1.85**	**1.86**
E1_50m	**25.30**	**25.26**	**25.38**	**25.42**	**1.84**	**1.83**	**1.84**	**1.85**
E1_60m	**25.20**	**25.16**	**25.27**	**25.30**	**1.83**	**1.83**	**1.83**	**1.84**
E1_70m	**25.13**	**25.10**	**25.18**	**25.21**	**1.82**	**1.82**	**1.83**	**1.83**
E1_80m	**25.07**	**25.05**	**25.12**	**25.14**	**1.82**	**1.82**	**1.82**	**1.83**
E1_90m	**25.03**	**25.01**	**25.07**	**25.09**	**1.82**	**1.82**	**1.82**	**1.82**
E1_100m	**24.99**	**24.98**	**25.03**	**25.05**	**1.82**	**1.81**	**1.82**	**1.82**
E1_110m	**24.97**	**24.95**	**25.00**	**25.01**	**1.81**	**1.81**	**1.82**	**1.82**
E1_120m	**24.94**	**24.93**	**24.97**	**24.98**	**1.81**	**1.81**	**1.81**	**1.81**
E1_130m	**24.92**	**24.91**	**24.95**	**24.96**	**1.81**	**1.81**	**1.81**	**1.81**
E1_140m	**24.91**	**24.90**	**24.93**	**24.94**	**1.81**	**1.81**	**1.81**	**1.81**
E1_150m	**24.89**	**24.88**	**24.91**	**24.92**	**1.81**	**1.81**	**1.81**	**1.81**
E1_160m	**24.88**	**24.88**	**24.90**	**24.91**	**1.81**	**1.81**	**1.81**	**1.81**
E1_170m	**24.87**	**24.87**	**24.89**	**24.90**	**1.81**	**1.81**	**1.81**	**1.81**
E1_180m	**24.86**	**24.86**	**24.88**	**24.89**	**1.81**	**1.81**	**1.81**	**1.81**
E1_190m	**24.86**	**24.85**	**24.87**	**24.88**	**1.81**	**1.81**	**1.81**	**1.81**
E1_200m	**24.85**	**24.85**	**24.86**	**24.87**	**1.81**	**1.80**	**1.81**	**1.81**
Critical Load	**10 kgN/ha/yr**				**0.357 keq/ha/yr**			

Table 20 shows the changes between the Do Something 2 (with Local Plan and mitigation) and the Do Minimum (without Local Plan) for the annual mean concentrations of NOx and NH_3, combined nitrogen deposition and combined nitrogen acid deposition. Figures shown in **bold** indicate where the impact is greater than 1% of the critical level / load. The largest changes are seen closest to the road.

The impact of the Local Plan does not exceed 1% of the total annual mean NO_x threshold at any receptors. Impacts of the Local Plan exceed 1% of the annual mean nitrogen deposition threshold up to 10m from the roadside. At receptors up to 10m from the road, the impact of the Local Plan exceeds 1% of annual mean ammonia critical level. However, annual mean acid deposition exceeds 1% of the critical load up to 30m from the road. It is also important to note that concentrations at the roadside (0m) are not always appropriate for air quality assessments[110].

Table 20 Impact of Local Plan (DS2 – DM)

Receptor	Change in Total Annual Mean NO_x ($\mu g/m^3$)	Change in Total Annual Mean NH_3 ($\mu g/m^3$)	Change in Total Annual Mean N Dep (kg N/ha/yr.)	Change in Total Annual Mean N Acid Dep (keq/ha/yr.)
E1_0m	0.24	**0.05**	**0.41**	**0.029**
E1_10m	0.09	**0.02**	**0.17**	**0.012**
E1_20m	0.06	0.01	0.10	**0.007**
E1_30m	0.04	0.01	0.07	**0.005**
E1_40m	0.03	0.01	0.05	0.004
E1_50m	0.02	<0.01	0.04	0.003
E1_60m	0.02	<0.01	0.03	0.002
E1_70m	0.02	<0.01	0.02	0.002
E1_80m	0.01	<0.01	0.02	0.002
E1_90m	0.01	<0.01	0.02	0.001
E1_100m	0.01	<0.01	0.02	0.001
E1_110m	0.01	<0.01	0.02	0.001
E1_120m	0.01	<0.01	0.01	0.001
E1_130m	0.01	<0.01	0.01	0.001
E1_140m	0.01	<0.01	0.01	0.001
E1_150m	0.01	<0.01	0.01	0.001
E1_160m	<0.01	<0.01	0.01	0.001
E1_170m	<0.01	<0.01	0.01	<0.001
E1_180m	<0.01	<0.01	0.01	<0.001
E1_190m	<0.01	<0.01	0.01	<0.001
E1_200m	<0.01	<0.01	0.01	<0.001
1% of Critical Level/Load	**0.30**	**0.01/0.03**	**0.10**	**0.004**

[110] https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

Summary

Total annual mean NOx does not exceed the critical level of 30µg/m^3 at any receptors in any scenario, whereas total annual mean NH_3 exceeds the critical level of 1µg/m^3 for lichens and bryophytes at all receptors in all scenarios due to a background concentration of 1.2µg/m^3, but remains below the critical level of 3µg/m^3.

Total annual mean nitrogen deposition exceeds the maximum critical load (20 kg N/ha/yr) in all scenarios at all receptors due to the average nitrogen deposition in the area (24.8 kgN/ha/yr, Table 9). Total annual mean nitrogen acid deposition is between the minimum and maximum critical load (0.357-3.2 keq/ha/yr) at all receptors for all scenarios.

The change in annual mean NOx due to the Local Plan with mitigation (DS2) does not exceed 1% of the critical level (0.3µg/m^3), even at the roadside receptors, where the greatest increase of 0.24µg/m^3 is modelled. The change in annual mean NH_3 due to the Local Plan exceeds 1% of the 1µg/m^3 critical level for lichens and bryophytes up to 10m from the roadside. The change in annual mean nitrogen deposition and annual mean nitrogen acid deposition due to the Local Plan with mitigation (DS2) exceeds 1% of the respective critical loads (0.1 kgN/ha/yr and 0.00357 keq/ha/yr) up to 10m and 30m from the road respectively.