

Land West of Ashington, Pulborough

Shadow
Habitats Regulations Assessment
(including an Appropriate Assessment)

February 2023

Quality Management	
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1. Introduction and Background

- 1.1.1. Aspect Ecology is advising Bellway Homes in respect of ecological issues relating to Land West of Ashington, Pulborough, hereafter referred to as 'the site' (see Site location Plan at Appendix 1). The site is proposed for a new residential development.
- 1.1.2. The following report sets out a Shadow Habitats Regulation Assessment (including an Appropriate Assessment) of the proposed development, identifying whether the specific proposals for the site are likely to result in an adverse effect on integrity of any international designations.

1.2. Proposed Site Characteristics, proposals for development and planning context

- 1.2.1. The site is located to the west of the town of Ashington in an urban edge context. The site is bound to the east by Ashington Church of England First School and the village of Ashington, to the south by woodland and arable land, to the west by arable land and to the north by a open fields and existing development, beyond which lies further arable land.
- 1.2.2. The site itself is dominated by arable and improved grassland fields, bound by hedgerows and treelines. In addition, other habitats at the site include woodland, scattered trees, ponds, and dry / wet ditches.
- 1.2.3. Given the locality of the site within the the Sussex North Water Supply Zone, there is potential for the proposed development to adversely affect Arun valley Special Protection Area (SPA)/ Special Area of Conservation (SAC)/Ramsar site, a nature conservation designation of international importance. Under the Habitats Regulations it is therefore necessary to screen whether any future development within the site has the potential to result in a likely significant effect on the interest features of any European designation(s) and if so examine these via Appropriate Assessment.

1.3. Purpose of this report

- 1.3.1. The following report sets out information to inform an assessment under the Habitat Regulations of the proposed development at the site, identifying whether the specific proposals for the site are likely to result in an adverse effect on integrity of any international designations to inform the competent authority in undertaking its HRA/AA.

2. Legislation and Assessment Methodology

2.1. Legislation

2.1.1. All areas in England classified as Special Areas of Conservation (SACs) or Special Protection Areas (SPAs), collectively known as European sites, receive statutory protection under the Conservation of Habitats and Species Regulations 2017 (the Regulations). These Regulations transpose into UK legislation the 'Habitats Directive' 1992 (92/43/EEC) and the 'Birds Directive' 2009 (2009/147/EC). National planning policy in the form of the National Planning Policy Framework (NPPF) explicitly sets out that listed Ramsar sites should be considered in the same way, as if they had been classified or designated as SACs or SPAs.

2.1.2. The Regulations impose a duty on Local Planning Authorities (competent authorities) to carefully consider whether any proposals may have a significant effect on a European designation, either alone or in combination with other plans or projects. In most circumstances, permission may only be granted for a plan or project to proceed if it has been ascertained that it will not have an adverse effect on the integrity of any such designation.

2.1.3. The process for assessment is set out at regulation 63(1):

"A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which:

(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and

(b) is not directly connected with or necessary to the management of that site,

must make an appropriate assessment of the implications of the plan or project for that site in view of that site's conservation objectives".

2.1.4. Following this assessment, regulation 70(3) outlines when planning permission can be granted:

"... outline planning permission must not be granted unless the competent authority is satisfied (whether by reason of the conditions and limitations to which the outline planning permission is to be made subject, or otherwise) that no development likely adversely to affect the integrity of a European site or a European offshore marine site could be carried out under the permission, whether before or after obtaining approval of any reserved matters."

2.2. Assessment Methodology

2.2.1. Guidance on the process and procedures for assessment are contained in a number of documents, principally:

- Habitats Regulations Assessments: Protecting a European site (Gov.uk)¹ – government standing advice on HRA;

¹ Habitats Regulations Assessments: Protecting a European site. February 2021
<https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site>

- National Planning Policy Framework (NPPF) and the accompanying ODPM/DEFRA Circular (ODPM 06/2005, DEFRA 01/2005);
- Managing Natura 2000 sites 'The Provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. European Commission. Nov 2018;
- Assessment of plans and projects significantly affecting Natura 2000 sites. European Commission November 2001.

2.2.2. As set out within government standing advice and as laid out within the flow chart (Figure 1) within ODPM circular 06/2005, the procedure for assessment is an ordered process following a number of key stages as discussed below.

Stage 1 :Screening

- 2.2.3. Box 1 of the flow chart is not of relevance to development proposals and hence the first stage is to identify whether the proposals will result in any 'likely significant effect' on the internationally important features of the European sites, either alone or in combination with other plans or projects (box 2 of the flow chart).
- 2.2.4. In line with the Court of Justice of the European Union (CJEU) ruling (People over Wind, Peter Sweetman v Coillte Teoranta, Case C-323/17, dated 12 April 2018), mitigation measures intended to avoid or reduce the harmful effects of a plan or project on a European site should not be taken into account at this screening stage, and instead these must be considered as part of an Appropriate Assessment (Stage 2).
- 2.2.5. Where it is considered that a plan or project will result in no such 'likely significant effects', no further assessment is necessary and permission should not be refused under the assessment.
- 2.2.6. If any 'likely significant effects' are identified or where it remains unclear whether effects will be significant, the assessment procedure should follow on to Stage 2 (box 3 of the flow chart).
- 2.2.7. In reaching this decision, the plan or project should be considered 'likely' to have an effect if the competent authority is unable on the basis of objective information to exclude the possibility that it could have significant effects on any European designation, either alone or in combination with other plans or projects. The test of significance is therefore set at a relatively low bar, with significant effects considered as any negative effects, i.e. effects that are neither negligible nor inconsequential, but which are capable of having an adverse effect².
- 2.2.8. If the proposal can be screened out for effects from it alone, it should then be screened for any potential for it to combine with any other proposal planned or underway. If, in combination the proposal could have a significant effect on a European designation, it is necessary to progress to Stage 2.

Stage 2: Appropriate Assessment

- 2.2.9. Should it be determined that a plan or project could result in 'likely significant effects' on a European site, as set out on the flow chart, the Competent Authority

² Case C-258/11: Judgment of the Court (Third Chamber) of 11 April 2013 and Opinion of the Advocate General dated 22nd November 2012. Peter Sweetman and Others v An Bord Pleanála. Reference for a preliminary ruling: Supreme Court - Ireland

should proceed to the next stage within flow chart boxes 3 and 4 onwards. This requires an 'Appropriate Assessment' of the likely effects of the plan or project to be undertaken by the Competent Authority.

- 2.2.10. Under Appropriate Assessment, it is necessary to determine whether the proposals, either alone or in combination with other projects or plans, will result in any adverse effects on the integrity of the European designation as defined by the conservation objectives and status of the relevant SAC/SPA. The precautionary principle should be applied, and the focus should be on objectively demonstrating, with supporting evidence, that there will be no adverse effects on the integrity of the European site. Where this is not the case, adverse effects must be assumed.
- 2.2.11. It is the policy of the government that Ramsar sites should be treated in the same way as European designations.
- 2.2.12. If it is considered that the proposal will not adversely affect the integrity of the designation, either alone or in combination with other projects, permission can be granted. If this cannot be ascertained, or there is uncertainty, the assessment procedure should follow on to Stage 3.

Stage 3: Derogations: allow exceptions

- 2.2.13. Should a proposal fail the integrity test, in certain circumstances, a project may still be able to proceed under a derogation.
- 2.2.14. Under Stage 3, it is necessary to assess if there are alternative solutions and whether there are imperative reasons of overriding public interest. If these tests are passed, authorisation may be granted subject to compensation measures being secured.
- 2.2.15. Further details on the above process can be found in Government Guidance on Habitats Regulations Assessments³.

2.3. Case Law

- 2.3.1. The approach to undertaking Habitats Regulation Assessment has been informed and distilled through a number of court rulings. Accordingly, this assessment takes into account all such case law, and in particular highlights the following as being pertinent:

The need for no reasonable scientific doubt

- 2.3.2. It has been established that the competent authority may grant permission for a project following an appropriate assessment *"only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects"*⁴ (our emphasis). In addition, case law advises that the decision maker should be 'certain

³ Habitats regulations assessments: protecting a European site. Government Guidance.
<https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site>

⁴ C-127/02 Landjelijke Vereniging tot Behoud van de Waddenzee & Another v Staatssecretaris van Landbouw ("Waddenzee") [2005] 2 CMLR 31 at [59]

beyond reasonable scientific doubt'⁵ that no adverse effects will arise on the integrity of the designation.

- 2.3.3. The application of this test is further clarified by case law which advises that in reaching a conclusion, what is required is 'reasonable certainty' rather than 'absolute certainty'⁶ and that the risk should be 'real' (identifiable) rather than 'hypothetical' or 'fanciful'⁷.

The need for no lacunae

- 2.3.4. It has been established that the *assessment "cannot have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the effects of the works proposed on the protected site concerned"*⁸ and that the assessment must *"unequivocally demonstrate why the protected habitat types and species are not adversely affected"*⁹.

The need to take into account conservation objectives

- 2.3.5. It has been established that that *"where such a plan or project is likely to undermine the conservation objectives of the site concerned, it must necessarily be considered likely to have a significant effect on the site"*¹⁰

Any mitigation measures must be sufficiently certain

- 2.3.6. It has been established that where mitigation measures are proposed (under an Appropriate Assessment), *"it is only when it is sufficiently certain that a measure will make an effective contribution to avoiding harm, guaranteeing beyond all reasonable doubt that the project will not adversely affect the integrity of the area, that such a measure may be taken into consideration when the appropriate assessment is carried out."*¹¹

The need to assess cumulative effects

- 2.3.7. It has been established that not only does the project or plan in question need to be considered, but cumulative effects from other relevant projects have to be assessed. It has been established that *"MN2000 makes clear that the phrase "in combination with other plans or projects" in Article 3 (3) refers to cumulative effects caused by the projects or plans that are currently under consideration together with the effects of any existing or proposed projects or plans. When impacts are assessed in combination in this way it can be established whether or not there may be, overall,*

⁵ T.C. Briels & others v Minister van Infrastructuur en Milieu C-521/12 [2014]

⁶ WWF UK Ltd And RSPB V SoS for Scotland

⁷ Boggis V Natural England & Waveney District Council [2009] Ewca Civ 1061 and R (Morge) v Hampshire County Council (2011)

⁸ C-258/11 Sweetman v An Bord Plenala [2014] PTSR 1092 at [44]

⁹ C-461/17 Holohan v An Bord Plenala [2019] Env LR 16 per AG Kokott at [30]

¹⁰ Judgment of the Court (Grand Chamber) of 7 September 2004, Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Case C-127/02

¹¹ C-164/17 Grace & Sweetman v An Bord Plenala at [51]

*an impact which may have significant effects on a Natura 2000 site or which may adversely affect the integrity of a site”.*¹²

The Assessment should be commensurate with the stage of planning

2.3.8. Appropriate Assessments can be required at every stage of the planning process, from the allocation stage to the detailed or Reserved Matters stage. At each planning stage very different levels of detail are available, and it has been established that *‘each appropriate assessment must be commensurate to the relative precision of the plans at any particular stage and no more’*¹³ (our emphasis).

2.3.9. These principles are well established. An example, is the case of Commission v UK C-6/04 (2005) and the opinion of Advocate General Kokott¹⁴, which related to a complaint from the Commission that the United Kingdom had failed to transpose adequately various provisions of the Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (‘the Habitats Directive’). It discusses the detail required within an Appropriate Assessment at paragraph 49:

“The United Kingdom Government is admittedly right in raising the objection that an assessment of the implications of the preceding plans cannot take account of all the effects of a measure. Many details are regularly not settled until the time of the final permission. It would hardly be proper to require a greater level of detail in preceding plans or the abolition of multi-stage planning and approval procedures so that the assessment of implications can be concentrated on one point in the procedure. Rather, adverse effects on areas of conservation must be assessed at every relevant stage of the procedure to the extent possible on the basis of the precision of the plan. This assessment is to be updated with increasing specificity in subsequent stages of the procedure”.

2.3.10. In line with the judgement of R (Barker) v Secretary of State & Bromley LBC (2006-7) (European Court and House of Lords) [2007]¹⁵ 1 A.C. 470 and Wingfield, R v Canterbury City Council [2019] EWHC 1974 (Admin)¹⁶, AA can be required at the Reserved Matters and discharge of conditions stages.

2.4. Other Relevant guidance and opinions of weight

2.4.1. In addition to the interpretation of legislation that has emerged through the above case law, relevant guidance is also available from a number of other sources, as outlined below:

¹² European Commission DG Environment (November 2001) ‘Assessing Projects Under the Habitats Directive: Guidance for Competent Authorities, September 2011’

¹³ Feeney v Secretary of State for Transport & Ors [2013] EWHC 1238 (Admin)

¹⁴ Opinion of Advocate General Kokott June 2005. Case C-6/04
<https://curia.europa.eu/juris/liste.jsf?language=en&num=C-6/04>

¹⁵ <https://publications.parliament.uk/pa/ld200607/ldjudgmt/jd061206/barker-1.htm>

¹⁶ <http://www.bailii.org/ew/cases/EWHC/Admin/2019/1974.html>

The Precautionary Principle

- 2.4.2. The precautionary principle is a core principle of EU environmental law. The European Commission¹⁷ sets out that *“the classic definition of ‘a precautionary approach’ comes from the 1992 Rio Declaration on Environment and Development, which states that: “Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (UNEP 1992).”*
- 2.4.3. Following on from the above definition, guidance sets out that *“Non-discrimination means that comparable situations should not be treated differently, and that different situations should not be treated in the same way, unless there are objective grounds for doing so” and “Consistency means that measures should be of comparable scope and nature to those already taken in equivalent areas in which all scientific data are available”¹⁸.*
- 2.4.4. In addition, this guidance also sets out that *“Proportionality means tailoring measures to the chosen level of protection. Risk can rarely be reduced to zero”. And “It is also necessary to clarify a misunderstanding as regards the distinction between reliance on the precautionary principle and the search for zero risk, which in reality is rarely to be found”¹⁹.*
- 2.4.5. Finally, this guidance also further clarifies that *“measures based on the precautionary principle must not be disproportionate to the desired level of protection and must not aim at zero risk, something which rarely exists.”²⁰*

Re-use of an existing HRA

- 2.4.6. If a project has already been assessed by the competent authority or a different competent authority, then there may be no need to repeat the assessment. In this regard guidance²¹ is provided as to when it is appropriate to adopt this approach, namely when:
- there’s no new information or evidence that may lead to a different conclusion
 - the assessments already done are relevant, thorough and correct
 - the conclusions are rigorous and robust
 - there’s no new case law that changes the way an HRA should be carried out or interpreted

Duties of the Environment Agency

- 2.4.7. For the purposes of ground water abstraction, under its powers at section 52 of the Water Resources Act 1981, the Environment Agency is the Competent Authority. In the exercise of its function, the Agency is subject to the general obligations of Regulation 9(3) of the Habitats Regulations:

¹⁷ European Commission Science for Environment Policy (September 2017) ‘Future Brief: The Precautionary Principle: decision-making under uncertainty

¹⁸ Commission of the European Communities (2.2.200) ‘Communication from the Commission on the precautionary principle’

¹⁹ Ibid footnote 13

²⁰ Ibid footnote 13

²¹ Habitats Regulations Assessments: protecting a European site. Gov.uk. <https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site>

“Without prejudice to the preceding provisions, a competent authority, in exercising any of its functions, must have regard to the requirements of the Directives so far as they may be affected by the exercise of those functions”.

- 2.4.8. This is in addition to its obligations under Regulation 63(1) as described at paragraph 2.1.3 above.

3. Stage 1 - Screening for Likely Significant Effects

3.1. Arun Valley SAC/SPA/Ramsar – Screening

Designation information

3.1.1. Information of relevance in relation to the SAC/SPA designations is set out below:

European site interest features	Arun Valley SAC is designated on the basis of the following features: • Lesser Ram's-horn snail <i>Aniscus vorticulus</i> Arun Valley SPA is designated: a) under Article 4.1 of the Birds Directive (79/409/EEC) as it is regularly used by more than 1% of the Great Britain population of a species listed on Annex 1 in any season: • Bewick Swan <i>Cygnus columbianus</i> (1.6% of GB population) b) Qualifying assemblage of species (Article 4.2). The site is used by over 20,000 waterfowl (as defined by the Ramsar Convention) • Mean peak 27,241 waders and wildfowl (1992/93 – 1996/97)
Conservation objectives of the European site	The conservation objectives for the SAC 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 the habitats of qualifying species • The structure and function of the habitats of qualifying species • The supporting processes on which the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site The conservation objectives for the SPA are to: 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
Condition of European site	The most recent condition assessments for the Sites of Special Scientific Interest (SSSIs) which underpin the European designation state that for: • Waltham Brooks SSSI – all units are in 'unfavourable recovering' condition; • Amberley Wild Brooks SSSI – the majority of units are in 'unfavourable

	recovering condition’; Pulborough Brooks SSSI – all units are in ‘favourable condition’
Threats	A Site Improvement Plan (SIP) has been produced by Natural England in relation to Arun Valley SAC and SPA (dated 22/10/2104). This identifies prioritised issues (pressures or threats) affecting the designation: - Inappropriate water levels - Water pollution - Inappropriate ditch management

3.1.2. Information of relevance in relation to the Ramsar designation is set out below:

Ramsar qualifying features	Arun Valley Ramsar is designated on the basis of qualification under the following Ramsar Criteria: - Criterion 1 - The site shows a greater range of habitats than any other chalk river in Britain, including fen, mire, lowland wet grassland and small areas of woodland - Criterion 2 - The site supports a diverse assemblage of wetland flora and fauna including several nationally-rare species, including - Cyperus fuscus (IUCN – Vulnerable; Nationally Rare; Wildlife & Countryside Act 1981, Schedule 8; RDB); - Pulicaria vulgaris (IUCN – Vulnerable; Nationally Rare, Wildlife & Countryside Act 1981, Schedule 8; RDB) - Criterion 6 – Species / populations occurring at levels of international importance (Gadwall <i>Anas strepera strepera</i>; Northern pintail, <i>Anas acuta</i>; Black-tailed godwit, <i>Limosa limosa islandica</i>)
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Potential impact pathways

3.1.3. In order to assess potential effects on the designation it is necessary to identify potential impact pathways.

Identification of potential impact pathways	Based on a review of the Natural England position statement²², a single potential impact pathway has been identified in relation the above designations, namely: Hydrology / water supply
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Screening of likely significant effects

3.1.4. The potential effect of hydrology / water supply is reviewed below.

Hydrology / water supply	The site is located approximately 6.2km west of the SAC/SPA/Ramsar at its nearest point and within the Sussex North Water Supply Zone (see Appendix 2). Natural England issued a position statement dated September 2021²³ setting out that “<i>The Sussex North Water Supply Zone includes supplies from a groundwater abstraction which cannot, with certainty, conclude no adverse effect on the integrity of</i>
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²² Natural England (September 2021), ‘Natural England’s Position Statement for Applications within the Sussex North Water Supply Zone’

²³ Ibid footnote 22

	• <i>Arun Valley Special Area Conservation (SAC)</i> • <i>Arun Valley Special Protection Area (SPA)</i> • <i>Arun Valley Ramsar Site</i>".
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Conclusion of screening for Arun Valley SAC

- 3.1.5. The information provided in Natural England's position statement suggests a likely significant effect on the designations is possible. Accordingly, it is necessary to progress to the next step, namely Appropriate Assessment.

3.2. Appropriate Assessment

- 3.2.1. In light of the above conclusions, the following designations are taken forward for further consideration at Stage 2 via Appropriate Assessment.

- Arun Valley SAC/SPA/Ramsar

4. Stage 2: Appropriate Assessment – Arun Valley SAC / SPA / Ramsar

4.1.1. As set out in the Stage 1 Screening, the potential has been identified for effects on:

- Arun Valley SAC / SPA / Ramsar

4.1.2. Without mitigation, it is considered that Arun Valley SAC / SPA / Ramsar could be (in combination with other development) adversely affected through reduction in water supply, potentially resulting in reduced water levels within the designation. This would be contrary to Natural England's Site Improvement Plan, and could potentially adversely affect Lesser Ram's-horn snail, for which the SAC is designated.

4.1.3. As such, a number of mitigation/avoidance measures will be implemented as part of the proposed scheme at the site. These are summarised below.

4.2. Mitigation Measures

4.2.1. The proposed development within the site is anticipated to result in a total annual water consumption of 12,515,485 litres per year. To ensure water neutrality for a site of this size, a multi-layered approach is proposed to offset water consumption. This will include;

- **Discounting existing users;** The development site benefits from an existing water use associated with the car valeting service currently offered at the site, as well as arable land used for farming crops. This existing water can be offset from the proposed new residential use;
- **Rainwater harvesting;** Rainwater will be collected for uses such as toilet flushing, laundry use, watering of landscape planting and car washing.
- **Grey-water recycling;** Grey water recycling will be provided in all 180 units which will reduce water demand by 32.50% alone; and
- **Borehole mitigation strategy:** Managed Aquifer Recharge (MAR) will be employed to enable the intentional recharge of water to suitable aquifers for subsequent recovery or to achieve environmental benefits.

4.2.2. The above sets out mitigation measures (which are set out in detail at Appendix 6455/3) which demonstrate that it is possible for the proposed new residential development to be constructed and occupied, without exerting an adverse effect on Arun Valley SAC / SPA / Ramsar via water extraction.

Conclusion

4.2.3. The multi-layered strategy to offset water consumption within the proposed development will ensure, beyond reasonable scientific doubt, that there will be no adverse effects on the integrity of Arun Valley SAC / SPA / Ramsar site as a result of the permitted development

4.3. In-combination effects

4.3.1. As part of the assessment of potential effects on European designations arising from the proposed development, consideration has been given to potential for cumulative effects, arising in combination with other plans or projects.

4.3.2. In this respect, guidance (Assessing Projects Under the Habitats Directive: Guidance for Competent Authorities²⁴) states that:

A project with a potential effect, which is insignificant on its own, is not free from the provisions of the Habitats Regulations until it has been checked in combination with the effects of other plans and projects. The in combination check must consider whether:

- a) the effects of the plans and projects, in combination, would make effects more likely to occur, or more likely to occur at significant levels, that alone would be unlikely to either occur or be significant;*
- b) the effects of the plans and projects, in combination, would make insignificant effects significant;*
- c) the effects of the plans and projects, in combination, would generate new or different effects that would not occur if the plans and projects proceeded alone.*

4.3.3. In light of the above, it is considered that following implementation of the embedded mitigation set out, namely the multi-layered strategy to offset water consumption, that potential adverse effects on the integrity of the designations are fully avoided, such that no residual effects remain.

4.3.4. Absent the presence of residual effects, there is no potential for these to combine with effects from other proposals, such that it can be concluded that no cumulative effects would arise in combination with other plans or projects.

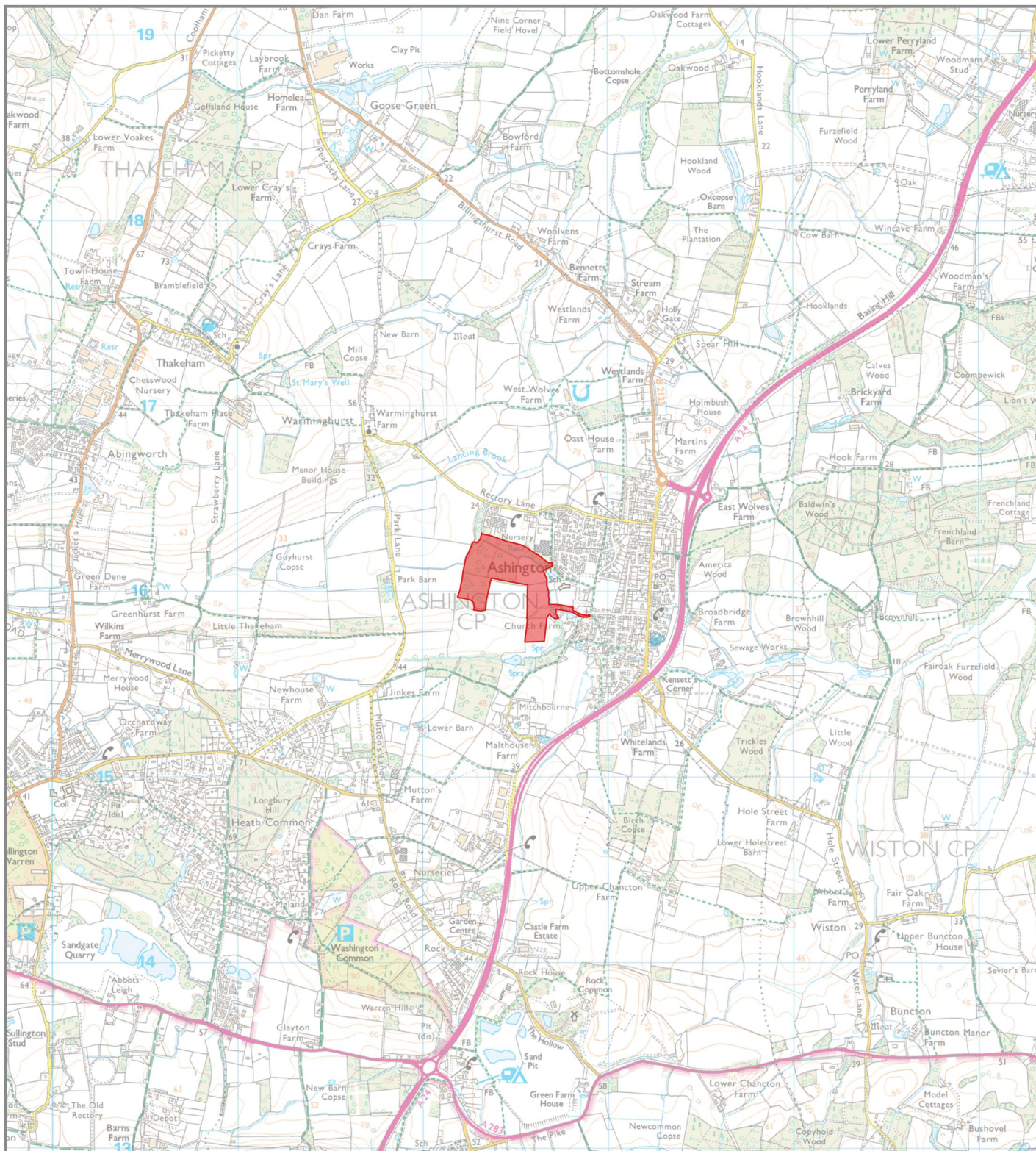
²⁴ Assessing Projects Under the Habitats Directive: Guidance for Competent Authorities. David Tyldesley and Associates for Countryside Council for Wales. Revised September 2011

5. Summary and Conclusions

- 5.1.1. This document provides information to inform a Habitats Regulations Assessment of the proposed development, given the presence of a European designations within the site surrounds.
- 5.1.2. The proposals are for a Reserved Matters application at Storrington for the erection of up to 180 residential units.
- 5.1.3. Arun Valley SAC / SPA / Ramsar has been identified as being potentially susceptible to alterations in hydrology through changes in volume of water reaching the designation due to extraction.
- 5.1.4. To ensure water neutrality the proposed development, a multi-layered approach is proposed to offset water consumption. This will include acknowledging the existing water use within the site (a car valeting service and farmland) and discounting such existing uses, the use of rainwater capture, grey-water recycling to increase water use efficiency and a borehole mitigation strategy to achieve water neutrality. The multi-layered strategy to offset water consumption within the proposed development will ensure, beyond reasonable scientific doubt, that there will be no adverse effects on the integrity of Arun Valley SAC / SPA / Ramsar site as a result of the permitted development
- 5.1.5. No residual effects remain which may affect Arun Valley SAC/SPA/Ramsar such that these cannot combine with other schemes.
- 5.1.6. Accordingly, it can be concluded, with certainty, that in view of the designations' conservation objects, that no adverse effect will arise on the integrity of Arun Valley SAC/SPA/Ramsar.

Appendix 6455/1:

Site location plan



Key:

Site Location

aspect ecology

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Land West of Ashington,
Pulborough
Site Location

6455/ECO1

B/BG

December 2022

PROJECT

TITLE

DRAWING NO.

REV

DATE



Appendix 6455/2:

Sussex North Water Supply Zone

Appendix 6455/3:

Water Offsetting Report



**LAND WEST OF ASHINGTON,
CHURCH LANE,
ASHINGTON,
HORSHAM,
WEST SUSSEX,
RH20 3JX**

Water Neutrality & Offsetting Report

Ref: 5782043

Date: 3rd February, 2023

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1.0 Existing Site Description

The site consists of existing farm land, measuring approximately 36 acres and forms an irregular L-shape and is situated immediately west of the Ashington in Horsham.

Access to the property is directly off Church Lane which runs into the from the eastern boundary. Further east Church Lane leads into the existing properties of Ashington.

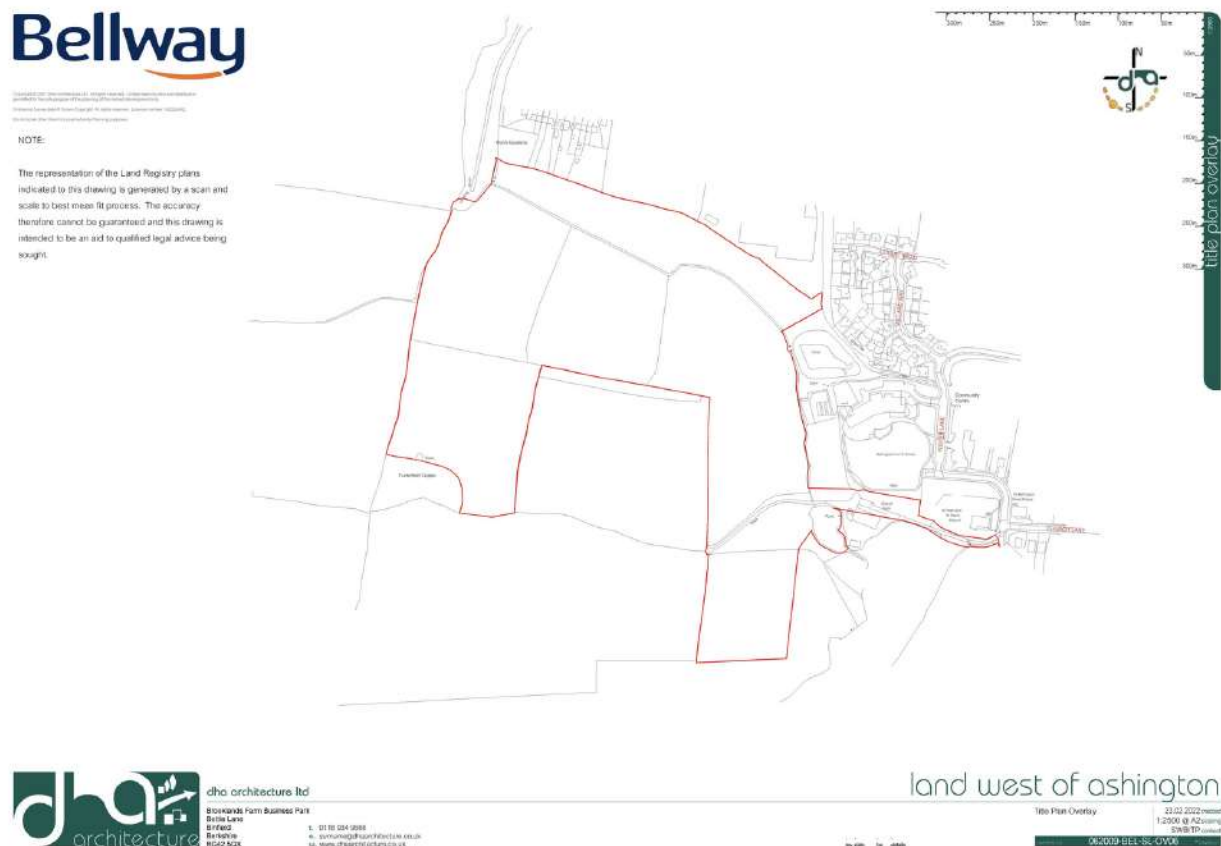


Figure 1.1 - Existing Site

1.1 Proposed Development Site

It is proposed to develop 180 residential dwellings comprising 117 private houses, 11 shared ownership apartments and 8 shared ownership homes at this location. In addition, 22 affordable rent apartments and 22 affordable rent houses are proposed at this location. The details of the proposed development can be found in Appendix A.



Figure 1.2 - Proposed Masterplan

Table 1.1: Accommodation Schedule - Proposed New Home

<u>Type of Accommodation</u>	<u>Beds</u>	<u>Maximum Capacity</u>	<u>No. of Units</u>	<u>Total Cumulative Number of Residents</u>
<u>PRIVATE HOUSES</u>				
SA	2	1.88	4	7.52
CN	2	1.88	14	26.32
TE	3	2.47	2	4.94
BM	3	2.47	7	17.29
HA	3	2.47	16	39.52
HI	3	2.47	7	17.29
FM	3	2.47	4	9.88
LA	3	2.47	16	39.52
RE	4	2.86	9	25.74
PG	4	2.86	13	37.18
AR	4	2.86	12	34.32
WE	4	2.86	10	28.6
WA	5	3.09	3	9.27
<u>Sub Total</u>			117	297.39
<u>SHARED APARTMENT</u>				
1 BF	1	1.32	2	2.64
1 BF	1	1.32	6	7.92
2 BF	2	1.88	2	3.76
2 BWCF	2	1.88	1	1.88
<u>Sub Total</u>			11	16.20
<u>SHARED HOUSES</u>				

BA	2	1.88	2	3.76
TI	3	2.47	3	7.41
PW	3	2.47	1	2.47
CT	4	2.86	2	5.72
Sub Total			8	19.36
<u>AFFORDABLE RENT APARTMENT</u>	BLOCK 1			
1 BF	1	1.32	2	2.64
1 BF	1	1.32	9	11.88
2 BF	2	1.88	4	7.52
2BWCF	2	1.88	1	1.88
	BLOCK 2			
1 BF	1	1.32	3	3.96
2 BF	2	1.88	3	5.64
Sub Total			22	33.52
<u>AFFORDABLE RENT HOUSES</u>				
SA	2	1.88	1	1.88
BA	2	1.88	6	11.28
TI	3	2.47	13	32.11
CT	4	2.86	2	5.72
Sub Total			22	50.99
Total Units & Maximum Number of Residents			180	417.46

(Note: Occupancy Rates based on 2011 Census data that has been adopted by Horsham District Council

<https://www.horsham.gov.uk/planning/water-neutrality-in-horsham-district/water-neutrality-and-planning-applications>)

1.2 Natural England Water Neutrality

The proposed new homes development site falls within the Sussex North Water Resource Supply Zone. A recent directive from Natural England states that all new residential and commercial accommodation, with high-water uses, in this area will need to meet the new Habitat Regulations Assessment (HRA) requirement to demonstrate water neutrality. This measure has been stipulated in order to protect ecological flows and reduce the demand for increased water abstraction from the wells at Hardham. As this could potentially adversely impact the integrity of the Arun Valley which has the following protected designations; Sites of Special Scientific Interest, Special Protected Area, Special Area of Conservation and Ramsar.

Water neutrality needs to be demonstrated by the applicant through the submission of a statement or water budget (including calculations) including all/some of the following measures:

- *Limiting water usage to 85 litres per person per day.*
- *Incorporating low water usage wcs, showers etc – these would be subject to a condition requiring a verification report to demonstrate the completion of the works prior to first occupation.*
- *Incorporating rainwater harvesting.*
- *Incorporating greywater recycling.*
- *Offset the remainder of any budget.*

The HRA requirement for water neutrality covers both quantity and quality objectives. The protocol takes a catchment-wide approach highlighting that greenfield sites will be required to offset additional water demand in order to achieve neutrality. We have established that the site lies outside of the Solent Catchment, where there is an additional water nutrient neutrality requirement. Therefore, the only requirement that is applicable to the new homes development site is that of water quantity.

2.0 Existing Site Water Use

The site is an existing farmland in which wheat and sweetcorn has been farmed over the last 5 to 10 years. These crops are rainfed crops as there is no irrigation system installed at the farm. Rainfall records for the past year have been obtained from the Center for Ecology and Hydrology and Met Office which indicate that between February 2021 and January 2022 this area received 1,133 mm of rainfall; representing 91% of typical rainfall for the south west of England according to office records.

Rainfall . . . Rainfall . . .



Rainfall accumulations and return period estimates

Percentages are from the 1991-2020 average.

Region	Rainfall	Jan 2022	Nov21 – Jan22	Aug21 – Jan22	May21 – Jan22	Feb21 – Jan22
			RP	RP	RP	RP
United Kingdom	mm	61	251	558	793	1000
	%	51	68	83	88	87
England	mm	32	159	389	627	761
	%	38	60	79	92	89
Scotland	mm	110	384	792	1007	1319
	%	62	75	86	84	85
Wales	mm	69	322	723	1045	1313
	%	45	66	84	93	92
Northern Ireland	mm	53	259	578	777	983
	%	47	73	88	86	85
England & Wales	mm	37	182	435	684	836
	%	40	62	80	92	89
North West	mm	61	288	675	928	1197
	%	49	72	91	93	95
Northumbria	mm	26	187	407	603	781
	%	32	70	80	85	87
Severn-Trent	mm	29	151	349	573	689
	%	40	66	80	91	87
Yorkshire	mm	33	165	375	614	764
	%	42	64	78	91	89
Anglian	mm	17	109	253	443	527
	%	31	64	73	88	84
Thames	mm	20	102	312	553	643
	%	28	46	76	97	89
Southern	mm	27	125	359	622	716
	%	31	45	73	96	88
Wessex	mm	34	137	392	646	773
	%	36	46	74	91	86
South West	mm	65	257	602	954	1133
	%	47	60	81	98	91
Welsh	mm	64	301	691	1009	1264
	%	43	65	84	93	92
Highland	mm	172	528	953	1171	1536
	%	79	85	87	84	83
North East	mm	45	225	525	781	964
	%	45	72	87	95	92
Tay	mm	62	265	624	902	1209
	%	38	58	77	84	88
Forth	mm	56	230	592	807	1059
	%	41	59	83	84	86
Tweed	mm	36	204	533	733	959
	%	33	62	86	87	89
Solway	mm	70	319	812	1009	1336
	%	42	63	89	84	86
Clyde	mm	134	441	928	1114	1489
	%	62	71	83	77	79

% = percentage of 1991-2020 average

RP = Return period

Further details on the rainfall data are contained in Appendix B. In addition, the site also has existing structures from where a car valeting service has been provided to local residents. Therefore, the current water use at the site based on the current existing use farming and car valeting use can be calculated as follows:

Existing Farming Water Use:

Water demand and growing figures information obtained from the Food and Agriculture Organisation guidance included in Appendix B.

Sweet Corn

- *Growing period* - 80 - 110 days
- *Water needs* - 500 - 800mm
- *Average water needs* - 650mm per season/annual

Wheat

- *Growing period* - 120 - 150 days
- *Water needs* - 450 - 650mm
- *Average water needs* - 550mm per season/annual

1) Rainfed winter and summer crops

- a) *Annual Rainfall* - 1,133 mm
- b) *Annual Crop Water Demand* - 550 mm
- c) *Area of Farm* - 70,000 m²
- d) *Annual of Water Consumed* - 38,500 m³
- e) *Annual crop water consumption* - 38,500,000 litres

Existing Car Valeting Water Use:

2) Water use for car valeting

- a) *Water use per car washed* - 60 litres per car
- b) *Cars washed per day* - 30
- c) *Daily car wash water use* - 1,800 litres per day
- d) *Annual of Water Consumed* - 657,000 litres

The water use that can be offset from the proposed use is associated with the car valeting as the farmed crops are only rainfed and does not benefit from an irrigation system where water is abstracted from an aquifer, reservoir or river.

2.1 Water Supply - Rainwater

The only source of water supply to the residential estate for potable water is from the Southern Water via the distribution mains. Naturally, rainwater waters the gardens when it rains, but this is not a reliable source of non-potable water supply (toilet flushing/washing machine) owing to erratic weather patterns and climate change. Below we will analyze the variance of the rainwater over the last couple of years, and demonstrate that it is only suitable for low water demand uses like garden irrigation and car washing.

2.1.1 2017, 2018 and 201 Annual Rainfall Patterns

During 2017 and 2018 significant areas of the UK experienced below-average rainfall, compounded by a very dry summer which resulted in rainfall being lost to high evaporation, evapotranspiration rates, and runoff resulting in reducing the groundwater recharge rates. This is highlighted in Figure 2.1 on the following page.

However, the annual rainfall in 2019 was significantly above the 1981 - 2010 average. This extreme variability in rainfall weather patterns owing to climate change makes rainwater a very unreliable source of potable water supply for the proposed development. The major consideration is that when it is dry the aquifers become very susceptible to overmining which threatens the aquatic environment and protected habitats that are dependent on natural water supply.

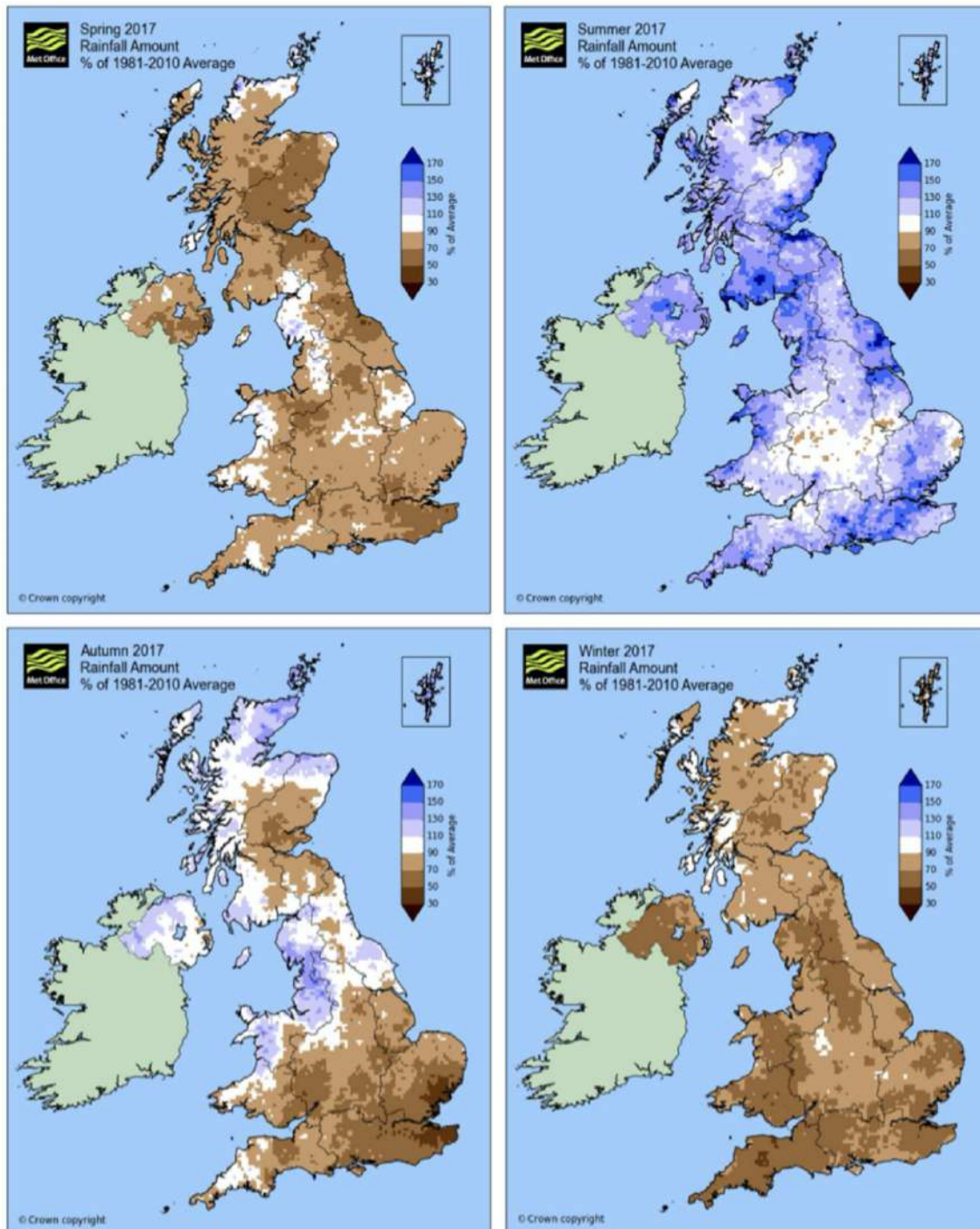


Figure 2.1 - 2017 Rainfall Maps

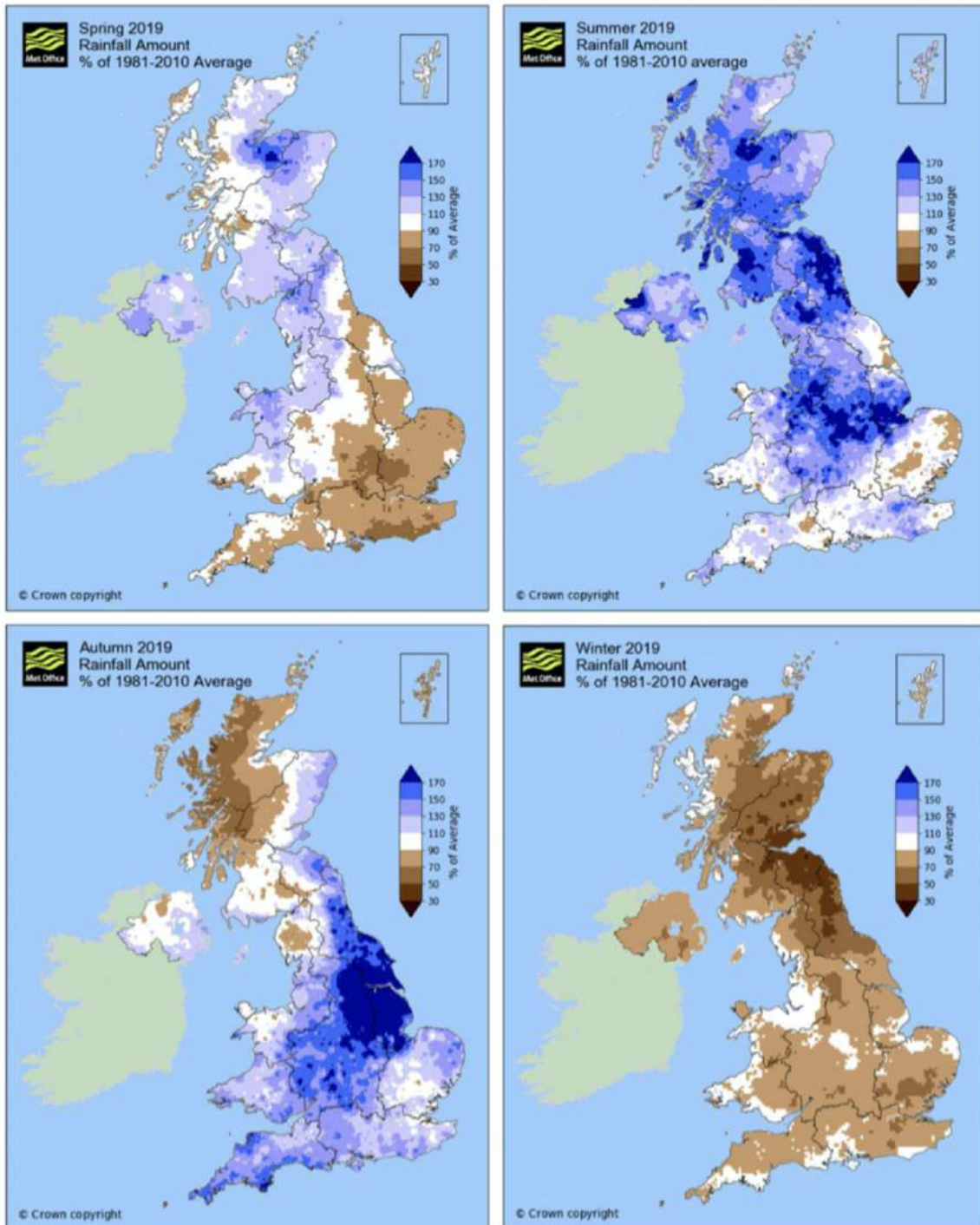


Figure 2.2 - 2019 Rainfall Maps

2.2 Rainwater Harvesting System

Changes to our weather patterns, owing to global warming, have resulted in more intense rainfall events in some seasons and hotter and drier summers in other seasons as evidenced in the previous section. Therefore, in dry periods, it is not possible to “effectively” protect the ecological flows that have led to the enactment of the Water Neutrality directive. The implication is that this element of risk needs to be factored into the rainwater harvesting strategy that is going to be implemented on the development site. Therefore, in considering the Water Neutrality strategy for this site it is considered prudent to at least double the drought storage stated in BS 8515 from 18 to 36 days to increase the resilience of rainwater harvesting for non-potable water supply to the proposed new development.

Rainwater harvesting will be utilised and targeted for use in non-potable water uses such as:

- Aquifer recharge.
- Landscape.
- Car washing.
- Laundry use.
- Toilet flushing.

For the internal non-potable uses like toilet flushing and laundry. The rainwater harvesting system will be backed up utilising the proposed greywater recycling system. In addition, the carefully designed Suds Strategy with the appropriate suds attenuation features are capable of capturing rainwater making it available for landscaping and car washing uses.

3.0 Proposed Development Site

It is proposed to develop 180 residential dwellings comprising 117 private houses, 11 shared ownership apartments, 8 shared ownership houses at this location. In addition, 22 affordable rent apartments and 22 affordable rent houses are also proposed at this location.

3.1 New Water Demand

The proposed development will consist of 180 new homes, and this study considers how the initial phase of the development may be serviced. It is anticipated that all the new homes will be serviced with washing machines. The allowable daily water demand for the residents of 85l/p/day will be achieved by utilizing a mixture of water-efficient fittings, spray taps, showers together with greywater recycling units.

Annual Water Demand - Residential Units

- *No. of properties* - 180 units
- *Water Demand Per Person* - 85 litres/per person/day
- *Total Cumulative Number of residents* - 417.46
- *Total Daily Water Consumption* - 35,484 litres/per day
- *Total Annual Water Consumption* - 12,951,660 litres per year

Table 3.1: Potable Water Demand - Accommodation Schedule

<u>Type of Accommodation</u>	<u>No. of Units</u>	<u>Total Cumulative Number of Residents</u>	<u>Daily Water Demand Per Resident</u>	<u>Daily Potable Water Demand (l/d)</u>
<u>HOUSES</u>				
SA, CN, BA, SA (2 BED)	27	50.76	85	4,323.10
TE, BM, HA, HI, FM, LA, TI (3 BED)	69	170.43	85	14,486.55
RE, PG, AR, WE, CT (4 BED)	48	137.28	85	11,668.80
WA (5 BED)	3	9.27	85	787.95
Sub-Total		367.74		31,284.40
<u>APARTMENTS</u>				
1BF	22	29.04	85	2,468.40
2BF	11	20.68	85	1,757.80
Sub-Total		49.72		4,226.20
Total Daily Water Consumption (litres)		417.46		35,510
Total Annual Water Consumption (litres)				12,961,150

3.2 Water Demand Reduction – Greywater Recycling

The developer is pursuing a very sustainable and holistic development strategy for the site and will thus install a greywater recycling system in all the proposed 180 new residential units. This will significantly reduce the amount of potable water required to service the site. The following section uses Building Regulations Part G - Water Efficiency calculator in order to assess the impact of utilising greywater recycling. The potable water demand is reduced by 32.50% per each individual person/unit resulting in

an effective daily water demand of 68.78 litres/person/day. The recycled greywater is used for toilet flushing and washing machine supply.

Table 3.2 - Building Regulation Part G - Water Efficiency Calculator

WATER EFFICIENCY CALCULATOR - BATH SPECIFICATION

Installation Type	Unit of Measure	Capacity/Flow Rate	Use Factor	Fixed Use (l/p/d)	Litres/person /day
WC (single flush)	Flush volume (l)	0.00	4.42	0.00	0.00
WC (dual flush)	Full flush volume (l)	4.00	1.46	0.00	5.84
	Part flush volume (l)	2.60	2.96	0.00	7.70
WCs (multiple fittings)	Ave. effective flush volume (l)	0.00	4.42	0.00	0.00
Taps (excluding kitchen/utility room taps)	Flow Rate (l/min)	2.00	1.58	1.58	4.74
Bath (where shower also present)	Capacity to Overflow (l)	120.00	0.11	0.00	13.20
Shower (where bath also present)	Flow Rate (l/min)	8.50	4.37	0.00	37.15
Bath Only	Capacity to Overflow (l)	0.00	0.50	0.00	0.00
Shower Only	Flow Rate (l/min)	0.00	5.60	0.00	0.00
Kitchen/Utility Room Sink Taps	Flow Rate (l/min)	5.00	0.44	10.36	12.56
Washing Machine	Litres/kg Dry Load	5.63	2.10	0.00	11.82
Dishwasher	Litres/ Place Setting	0.68	3.60	0.00	2.45
Waste Disposal Unit	Litres/Use	0.00	3.08	0.00	0.00
Water Softner	Litres/pers/day	0.00	1.00	0.00	0.00
Total Internal Calculated Use					95.45
Contribution from Greywater					25.36
Contribution from Rainwater					
					70.09
Normalisation Factor					0.91
Total Internal Water Consumption					63.78
External Water Use					5.00
Effective Daily Water Demand l/p/d					68.78

GREYWATER YIELD - BATH SPECIFICATION

Installation Type	Unit of Measure	Capacity/Flow Rate	Use Factor	Fixed Use (l/p/d)	Litres/person /day
WC (single flush)	Flush volume (l)	0.00	4.42	0.00	0.00
WC (dual flush)	Full flush volume (l)	4.00	1.46	0.00	5.84
	Part flush volume (l)	2.60	2.96	0.00	7.70
WCs (multiple fittings)	Ave. effective flush volume (l)	0.00	4.42	0.00	0.00
Taps (excluding kitchen/utility room taps)	Flow Rate (l/min)	2.00	1.58	1.58	4.74
Bath (where shower also present)	Capacity to Overflow (l)	120.00	0.11	0.00	13.20
Shower (where bath also present)	Flow Rate (l/min)	8.50	4.37	0.00	37.15
Bath Only	Capacity to Overflow (l)	0.00	0.50	0.00	0.00
Shower Only	Flow Rate (l/min)	0.00	5.60	0.00	0.00
Kitchen/Utility Room Sink Taps	Flow Rate (l/min)	5.00	0.44	10.36	12.56
Washing Machine	Litres/kg Dry Load	5.63	2.10	0.00	5.91
Dishwasher	Litres/ Place Setting	0.68	3.60	0.00	2.45
Waste Disposal Unit	Litres/Use	0.00	3.08	0.00	0.00
Water Softner	Litres/pers/day	0.00	1.00	0.00	0.00
Total Internal Calculated Use l/p/d					89.54
Contribution towards Greywater					61.00
% Greywater Contribution					46.66%

Annual Water Demand - Residential Units (Using Greywater Recycling)

- *No. of properties* - 180 units
- *Water Demand Per Person* - 68.78 litres/person/day
- *Total Cumulative Number of residents* - 417.46
- *Total Daily Water Consumption* - 28,712 litres/day
- ***Total Annual Water Consumption*** - **10,479,880 litres per year**

4.0 Water Offsetting Opportunity

Owing to the size of the proposed development it is proposed to have a multi-layered water offsetting strategy in order to achieve water neutrality. It is considered that this will give the development the most robust water security, reduce water use, and facilitate the development whilst also protecting the environment. The proposed water offsetting strategies are as follows:

- *Water Offsetting Item 1 - Borehole Installation*
- *Water Offsetting Item 2 - Discounting Existing Uses*
- *Water Offsetting Item 3 - theWaterBank*

4.1 Water Offsetting Item 1 – Borehole Installation

The daily water consumption for the 180 units at this site requires 28,712 litres/day. Under the Water Abstraction and Impounding (Exemptions) Regulations 2017, sites abstracting up to 20,000 litres per day are exempt from applying for a groundwater abstraction licence. It is therefore proposed to install a borehole to supply potable water to this development. The abstracted groundwater will be treated to WHO drinking water standards. A hydrogeological report has been undertaken for the site indicates that it has a potential borehole yield of 150,000 litres/day. With the benefit of greywater recycling it is proposed to supply borehole water for 180 new residential homes.

Annual Water Demand - 109 Residential Units (With Borehole Water Supply)

- *No. of properties* - 180 units
- *Water Demand Per Person* - 68.78 litres/person/day
- *Total Cumulative Number of residents* - 417.46????
- *Total Daily Water Consumption* - 28,712 litres/day
- *Total Annual Water Consumption* - 10,479,880 litres per year

A site water dowsing exercise has established that the following yields could be achieved on the development site subject to the formal yield testing on the boreholes have been drilled:

- Location 1: 144m³/day at an approximate depth of 58.2m.
- Location 2: 118m³/day at an approximate depth of 58.2m.
- Location 3: 105m³/day at an approximate depth of 58.5m.

These potential yields indicate that the site has the capacity to supply the water demand of the site which has been established to be 36m³/day based on 85l/p/d. Therefore subject to site drilling it is anticipated that a water neutral development can be installed

based on a borehole water supply strategy.

Borehole Mitigation Strategy

Managed Aquifer Recharge (MAR) is the intentional recharge of water to suitable aquifers for subsequent recovery or to achieve environmental benefits. The concept is to flood an area to allow water to infiltrate naturally or take excess water and deliberately introduce water into the aquifer via a well/borehole. MAR can play an important role as a measure to control over-abstraction and to restore the groundwater balance. It can be used to recharge aquifers subject to declining yields, to sustain or improve the functioning of ecosystems and the quality of groundwater. 8% of Thames Water's public supply comes from MAR. It is proposed to use MAR to increase and sustain the yield of the proposed borehole.

UK Examples:

<https://ggis.un-igrac.org/view/marportal#/>

1. Rainwater & Runoff Harvesting - Queen Elizabeth Olympic Park
2. Aquifer Storage, Transfer & Recovery - Horton Corby
3. Lake Infiltration North London Artificial Recharge Scheme
4. Lake Infiltration - Gatehampton
5. Deep Bore Soakaway - Lytchet Minster

In order to mitigate the proposed abstraction from the proposed Boreholes, it is proposed to undertake the following measures:

- The site will benefit from a daily discharge of recycled greywater treated to World Health Organisation drinking standards. The treated greywater is clear of smell or any solids.
- The treated greywater will undergo a secondary treatment process through a tertiary reed bed treatment prior to discharge into deep bore soakaways or discharge into the local ditches.
- The residential units will be able to discharge between 14 to 19 litres a day per person. Whilst the commercial greywater discharge will be confirmed once the accommodation schedule has been confirmed.
- Managed aquifer recharge via deep bore soakaways and or lined soakaways subject to the results of the borehole prognosis report.
- It is also proposed that part of the treated greywater will be discharged daily into the local streams/ditches in order to sustain the ecological flows. This will help avoid drying up downstream important hydrological features and sustaining ecological flows.
- The final strategy is subject to the borehole and MAR prognosis report.
- Studies by NERC indicate that the period of natural recharge is getting shorter owing

to warmer weather caused by climate change. Our aquifer recharge strategy addresses this matter as the aquifer will be recharged on a daily basis as the residents use water in their homes.

<https://www.gov.uk/government/publications/national-groundwater-recharge-assessment-under-climate-change/national-groundwater-recharge-assessment-under-climate-change-summary>

Table 4.1: Potable Water Demand - Accommodation Schedule (Greywater Recycling)

<u>Type of Accommodation</u>	<u>No. of Units</u>	<u>Total Cumulative Number of Residents</u>	<u>Daily Water Demand Per Resident</u>	<u>Daily Potable Water Demand (l/d)</u>
<u>HOUSES</u>				
SA, CN, BA, SA (2 BED)	27	50.76	68.78	3,491.27
TE, BM, HA, HI, FM, LA, TI (3 BED)	69	170.43	68.78	11,722.17
RE, PG, AR, WE, CT (4 BED)	48	137.28	68.78	9,442.11
WA (5 BED)	3	9.27	68.78	637.59
Sub-Total		367.74		25,293.14
<u>APARTMENTS</u>				
1BF	22	29.04	68.78	1,997.37
2BF	11	20.68	68.78	1,422.37
Sub-Total		49.72		3,419.74
Total Daily Water Consumption (litres)		417.46		28,712
Total Annual Water Consumption (litres)				10,479,880

It is considered that by utilising this strategy 180 new residential units will have their water demand offset.

• Rainwater Harvesting

The site will benefit from a comprehensive SuDS drainage system. It is proposed to install a series of wetlands. These will be used to cleanse the rainwater that will come from the development before discharge into the deep bore soakaways. It is proposed to dedicate 15% of the harvested rainwater to be dedicated aquifer recharge. The total impermeable area of the development is 192,573m² and the annual average rainfall is 1133mm. BS 8515 states that a 5% collection of rainwater would result in drought storage of 18 days. In this development, we are proposing to us 25% which represents a 90 days drought storage period.

Both BS 8515 and BS 16941-1 provide a methodology for annual water yield. This is used to assess the amount of rainwater that would be used to facilitate aquifer recharge.

$$Yr = A \times h \times e \times n$$

- A - rainfall collection area (192,573m²)
- h - total annual rainfall (608mm)
- e - surface yield coefficient (0.8)
- n - hydraulic treatment efficiency (0.9)

$$Yr = 15\% \times 608\text{mm} \times 192,573\text{m}^2 \times 0.8 \times 0.9 = 12,645,113.50 \text{ litres/year.}$$

Table 4.2 - Surplus Greywater Available for Aquifer Recharge

SURPLUS GREYWATER FOR AQUIFER RECHARGE

<i>Installation type</i>	<i>Greywater Recycled (litres/day)</i>	<i>Domestic requirement (litre/day)</i>	<i>Surplus Greywater (litre/day)</i>	<i>Total Cumulative Residents</i>	<i>Daily Surplus greywater (litres/day)</i>	<i>Annual Surplus Greywater (litres/day)</i>
<i>Bath Specification (Table 3.1)</i>	61	25.36	35.64	417.46	14878.2744	5430570.16
		Total			14878.2744	5430570.16

4.2 Water Offsetting Item 2 – Existing Car Valeting Water Use:

The development site benefits from an existing water connection associated with the car valeting service currently offered at the site. This existing water can be offset from the proposed new residential use.

- 1) *Water use for car valeting*
 - a) *Water use per car washed* - 60 litres per car
 - b) *Cars washed per day* - 25
 - c) *Daily car wash water use* - 1,500 litres per day
 - d) **Annual of Water Consumed** - **375,000 litres per year**

The existing water use associated with the car valeting use can be deducted from the remaining water demand of 4,133,625 litres/year; resulting in an annual water demand of **3,758,625 litres/year** that would need to be further offset.

5.0 Greywater Recycling

Greywater recycling facilitates utilising the same source of potable water twice by collecting, cleaning and re-using the “greywater” from showers, baths, washing machines, hand basins and air conditioning units. The cleaned and disinfected water could then be re-used for non-potable uses such as toilet flushing, washing machines, garden irrigation and topping up of swimming pools. Figure 3.1 below illustrates the various components of the Hydraloop greywater recycling system.

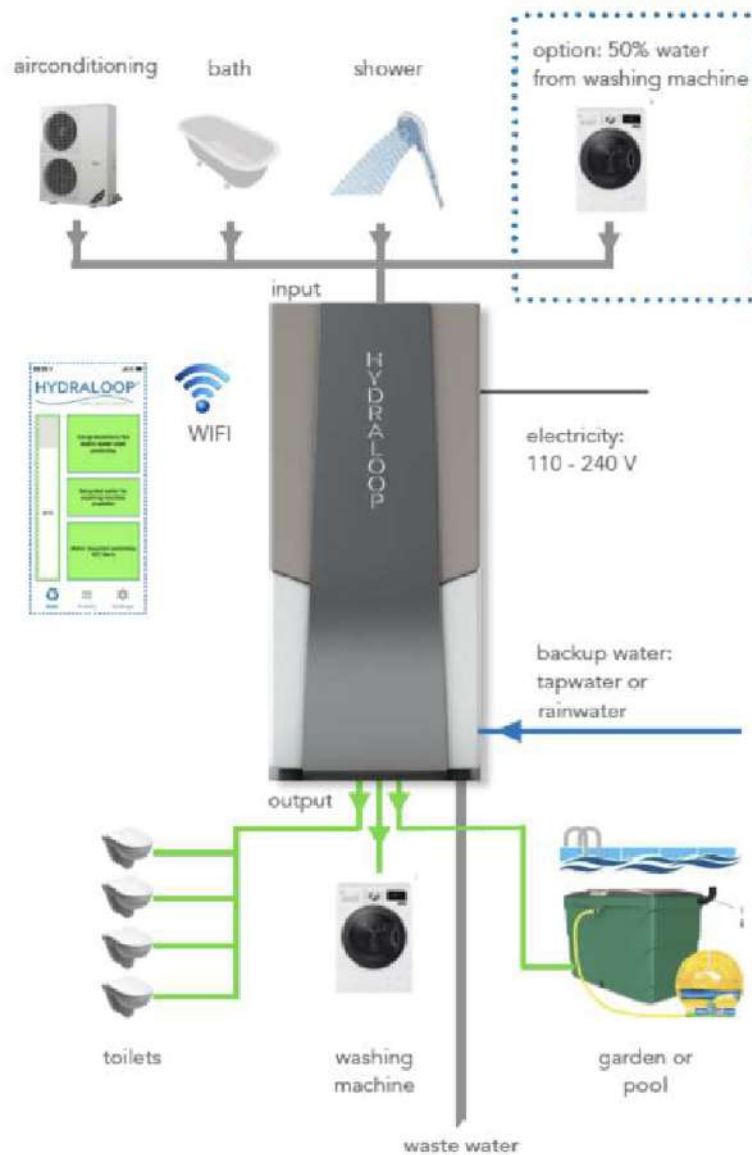


Figure 5.1 Greywater Recycling System

The proposed development is better suited with a decentralised greywater recycling units owing to the sparse distribution of the residential units throughout the development estate. The proposed Hydraloop greywater recycling system facilitates the saving of up to 45% of tap water, by recycling water from taps, showers, washing machines and baths which will be used for toilet flushing, the washing machine, car-washing, and garden irrigation. Subject to the final configuration of the proposed development one H300 Hydraloop could supply greywater for all of the proposed residential units.

5.1 Types of Hydraloop Systems

The most efficient, affordable, and energy-efficient way of recycling water is at the source where it is used. The proposed Hydraloop system facilitates the recycling of greywater within the individual premises of the development. The Hydraloop system is a convenient and integrated system that looks and functions just like any ordinary standard kitchen appliance. The Hydraloop system has an app that will empower residents to save water and energy by using the operational prompts recommended by the system.



Figure 5.2 Hydraloop Domestic System (H300 &H600)

5.2 Hydraloop Greywater Recycling Specification and costs

The Hydraloop greywater recycling system provides the following two options for domestic use:

- H600 - Which has a volume of 600 litres and a cleaning capacity of up to 1,000 litres per day.
- H300 - Which has a volume of 300 litres and a cleaning capacity of up to 530 litres per day.

The detailed specifications for the Hydraloop H300 and H600 systems are contained in Appendix B. Both systems would facilitate the demand for potable water to be reduced by up to 45% for each residential home.

6.0 Conclusion

The proposed water strategy will reduce the potable water demand for the development by 30%, utilizing greywater recycling and rainwater harvesting, which will lead to significant environmental and economic benefits. In addition, the premises will also significantly reduce the cost of water bills. The Water Neutrality report demonstrates that the new development can be installed by utilizing borehole water.

A key driver for this development is to deliver much-needed homes in a sustainable location. This report demonstrates how the water neutrality requirement stipulated by the Natural England directive has been met.

APPENDIX A - PROPOSED DEVELOPMENT



APPENDIX B - GREYWATER RECYCLING SYSTEM



FACT SHEET - Residential Water Recycling

With a Hydraloop system, you can recycle up to 95% of shower & bath water and optionally 50% of washing machine water – which enables you to reuse up to 85% of the total in-house domestic water. Due to its innovative and breakthrough technology, Hydraloop water is clean, clear, safe and certified and for toilet flushing, washing machine, garden irrigation and/or to top-up a swimming pool.

Hydraloop H300

H300	Input: Greywater from shower and bath Output: Two (2) valves for recycled water to the toilets and the washing machine Colour: Stone Front Plate: Stainless-steel front plate with white coloured logo and small status light
H300 Premium	Input: Greywater from shower and bath Output: Two (2) valves for recycled water to the toilets and the washing machine Choose from three colours: Dew, Chili and Stone Front Plate: Premium stainless-steel front plate with Hydraloop LED logo lights

Add-ons

Output Garden	One (1) extra valve for recycled water in the garden
Output Pool	One (1) extra valve for recycled water for the pool
Washing Machine Option	Option to recycle 50% of greywater from washing machine, including sanitary lift pump
Lift pumps *	DAB Novabox 30/300. This lift pump is submerged underneath the floor DAB Genix VT 030. This lift pump is on the floor

A lift pump is only necessary if the Hydraloop is positioned on the same floor or a storey higher as the shower/bathtub

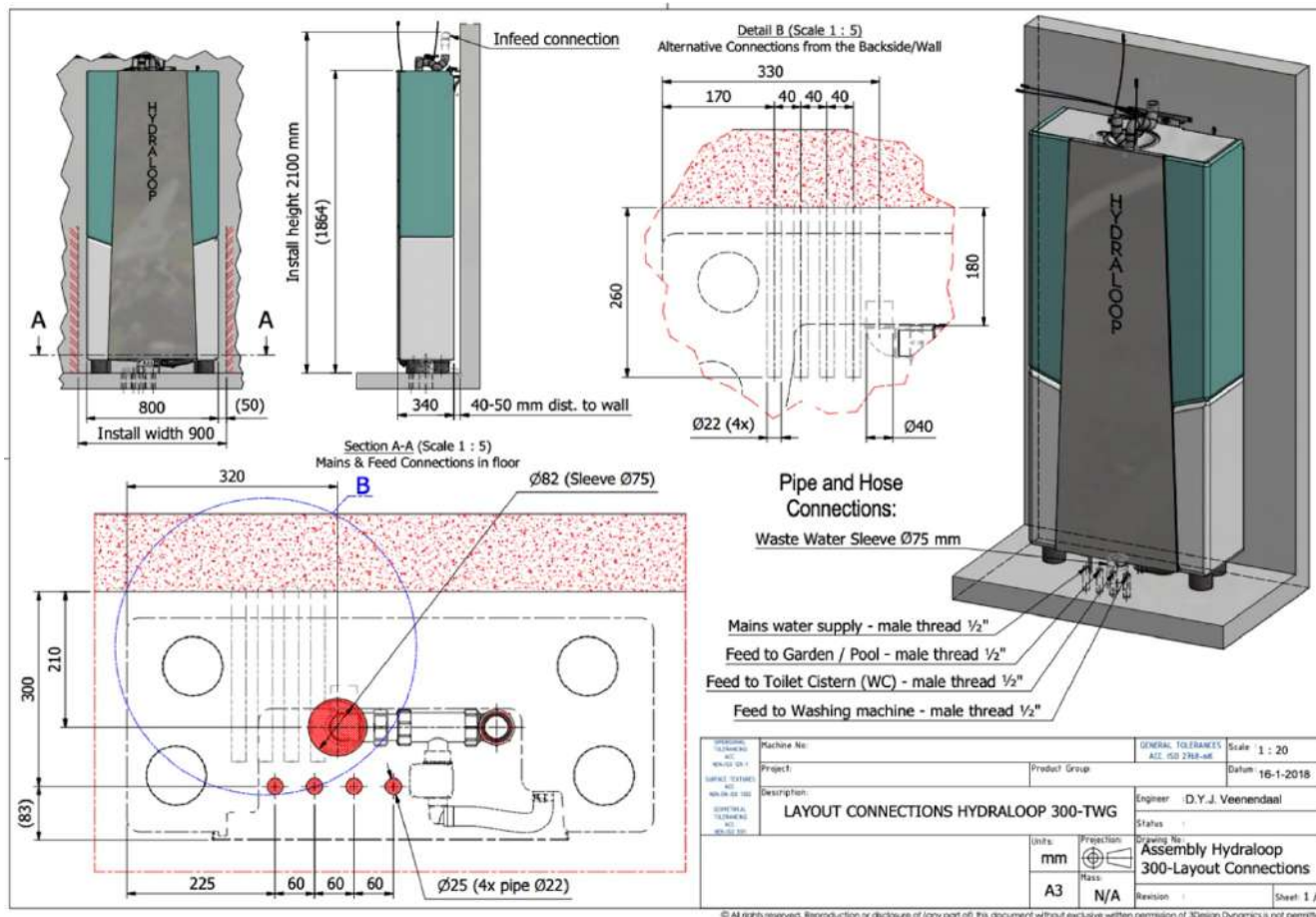
Hydraloop H300 Specifications

Volume	300 liters / 80 gallons
Cleaning capacity	530 liters / 140 gallons per day
Dimensions	80 cm wide, 34 cm deep, 187 cm high 31,5" wide, 13,4" deep, 74" high
Voltage	100/240 Volt, 24 Volt internal
Usage	20 watts during treatment. Average power consumption: 200kWh/year
WIFI	The Hydraloop unit needs to be connected with an internal WIFI-network
Average recycled water quality	non-potable water CBOD5 (mg/L) < 10 TSS (mg/L) < 10 Turbidity (NTU < 5) E. coli (MPN/100ml.) < 14 PH (SU) 6.0 – 9.0
Noise Level	± 44 dB.

LED Light Indications

White	Hydraloop provides recycled water.
Blue	Hydraloop provides mains water (until recycled water becomes available).
Purple	The washing machine mode is active.
Green	In self-cleaning mode.
Orange + two (2) short sound signals per minute	The UV disinfection lamp is not functioning properly.
Red + three (3) short sound signals/minute	The water distribution pump has switched itself off. Which might happen when water is leaking somewhere in-house.

Sizes

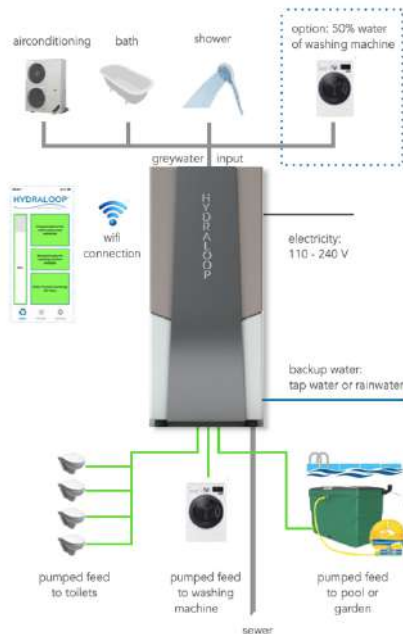




Certified to
NSF/ANSI
Standard 350

HYDRALOOP
USE WATER TWICE

Schematic overview



- Input from wastewater of bath & shower
- Output for toilet flushing, washing machine, garden irrigation and / or pool
- Wifi connected for Smartphone app, over the air updates and remote support
- 'Fit & Forget turnkey product
- No filters, membranes or chemicals
- Fully automatic, self-cleaning, low maintenance
- BREEAM and LEED certification points
- No compromise on hygiene and living comfort
- Contribute towards sustainable and off grid living

HYDRALOOP®
SMART WATER SAVING



The NSF/ANSI 350 standard verifies that all design and performance requirements of the standard have been met, and confirms through testing that effluent reuse water meets the stringent quality criteria. The NSF/ANSI 350 standard also sets water quality requirements for the reduction of chemical and microbiological contaminants for non-potable water use.

During the 26-week NSF/ANSI 350 testing period, the Hydraloop product was dosed daily with a greywater mix that contained raw wastewater, secondary effluent, body wash, shampoo, conditioner, soap, toothpaste, deodorant, bath cleaner, lactic acid, liquid handsoap, laundry detergent & softener, Na₂SO₄, NaHCO₃, Na₃PO₄ and test dust. The incoming greywater and the treated recycled water was lab tested for 26 weeks, typically 3 days a week.

Influent values of the incoming greywater used for the 26 week test

Parameters	Required range
TSS (mg/L)	50 - 160 mg/L
BOD5	130 - 210 mg/L
Temperature	25 - 35 Celcius
PH (SU)	6.0 - 8.5
Turbidity	30 - 100 NTU
Total phosphorous-P	1.0 - 3.0 mg/L
Total Kjeldahl -N	3.0 5.0 mg/L
COD	250 - 400 mg/L
Total coliforms	10 ³ - 10 ⁷ cfu/100 mL
E.coli	10 ² - 10 ⁶ cfu/100 mL

Effluent values NSF-350 requirements and Hydraloop treated water test results

NSF/ANSI 350 requirements	HYDRALOOP average results
CBOD5 (mg/L)	< 10 CBOD5 (mg/L) 6
TSS (mg/L)	< 10 TSS (mg/L) 3.3
Turbidity (NTU)	< 5 Turbidity (NTU) 2.3
E. coli (MPN/100mL)	< 14 E. coli (MPN/100mL) < 1
PH (SU)	6.0 - 9.0 PH (SU) 6.0 - 9.0



For more information, please visit www.hydraloop.com

FACT SHEET - Residential Water Recycling

With a Hydraloop system, you can recycle up to 95% of shower & bath water and optionally 50% of washing machine water – which enables you to reuse up to 85% of the total in-house domestic water. Due to its innovative and breakthrough technology, Hydraloop water is clean, clear, safe and certified and for toilet flushing, washing machine, garden irrigation and/or to top-up a swimming pool.

Hydraloop H600

H600	Input: Greywater from shower and bath Output: Two (2) valves for recycled water to the toilets and the washing machine Colour: Stone Front Plate: Stainless-steel front plate with white coloured logo and small status light
H600 Premium	Input: Greywater from shower and bath Output: Two (2) valves for recycled water to the toilets and the washing machine Choose from three colours: Dew, Chili and Stone Front Plate: Premium stainless-steel front plate with Hydraloop LED logo lights

Add-ons

Output Garden	One (1) extra valve for recycled water in the garden
Output Pool	One (1) extra valve for recycled water for the pool
Lift pumps *	DAB Novabox 30/300. This lift pump is submerged underneath the floor DAB Genix VT 030. This lift pump is on the floor

A lift pump is only necessary if the Hydraloop is positioned on the same floor or a storey higher as the shower/bathtub

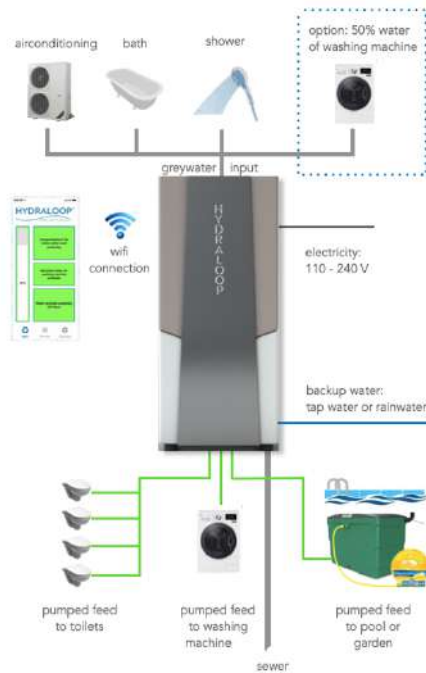
Hydraloop H600 Dual Specifications

Volume	600 litres / 160 gallons
Cleaning capacity	1000 litres / 260 gallons per day
Dimensions	80 cm wide, 69 cm deep, 187 cm high 31,5" wide, 27,5" deep, 74" high
Voltage	100/240 Volt, 24 Volt internal
Usage	40 watts during treatment Average power consumption: 350 kWh/year
WIFI	The Hydraloop unit needs to be connected to the internet with a WIFI-network
Average recycled water quality	non-potable water CBOD5 (mg/L) < 10 TSS (mg/L) < 10 Turbidity (NTU) < 5 E. coli (MPN/100ml.) < 14 PH (SU) 6.0 – 9.0
Noise Level	± 46 dB.

LED Light Indications

White	Hydraloop provides recycled water.
Blue	Hydraloop provides mains water (until recycled water becomes available).
Purple	The washing machine mode is active.
Green	In self-cleaning mode.
Orange + two (2) short sound signals per minute	The UV disinfection lamp is not functioning properly.
Red + three (3) short sound signals/minute	The water distribution pump has switched itself off. Which might happen when water is leaking somewhere in-house.

Schematic overview



- Input from wastewater of bath & shower
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For more information, please visit www.hydraloop.com

APPENDIX C - DRAFT S106 CONDITIONS

WATER NEUTRALITY DRAFT HEADS OF TERMS

- *Developer* -
- *Development Property* -
- *Water Offsetting Property* -

DEVELOPER OBLIGATIONS

- 1) *The developer undertakes to install the proposed development in accordance with the Water Neutrality Report -*
- 2) *The proposed water neutrality works at the proposed development property should be installed as per the following schedule:*
 - a) *The maximum allowable water use per individual is 110l/p/d in perpetuity unless regulation requires further improvement in the future.*
 - b) *The proposed water efficiency fittings will be in accordance with the typical specifications proposed in the Water Neutrality report or better.*
 - c) *The installation will incorporate low water usage wcs (dual flush 6/3 or better), showers, aerated taps etc.*
 - d) *At property handover the developer will issue a paper and electronic Home User guide advising residents about the water fittings and the maximum allowable water use of the property.*
- 3) *A detailed verification report will be produced once the works have been completed and prior to occupation of the proposed house and submitted to both Horsham Council and theWaterBank database. The verification report will contain the following elements:*
 - a) *A water calculator indicating that the installed fittings will meet the proposed water use of 110l/p/d.*
 - b) *Installation images and receipts of all the water fittings will be provided in the Verification Report.*
 - c) *At the end of the 6/12months of occupation the developer must provide copies of the water meter readings indicating that the water demand is not being exceeded.*
 - d) *If it is found that the water use is in excess of the proposed 110l/p/d, the developer will be obliged to undertake remedial works and monitor the water use for a further period of 3 months.*
- 4) *The developer is to ensure that the Title Deeds contain a covenant restricting the water use of the development to a maximum of 110l/p/d in perpetuity.*
 - a) *The covenant will be a requirement for the homes not to downgrade water efficient fittings.*
 - b) *However home occupiers can make improvements, but would need to inform the Council and theWaterBank of these changes.*

WATER OFFSETS DATABASE

theWaterBank is a database maintained and managed by Water Offsets that matches developers with existing property owners willing to offer their existing buildings for retrofits to achieve significant water reductions. More importantly these savings will need to be made within the same water resource zone in which the development is proposed. Offsetting is usually done by working in partnership with local organisations, housing associations, the council, businesses, churches and charities.

Typical Options for water offsetting schemes are as follows:

All offset schemes will require a water efficiency audit and a detailed water efficiency retrofit design.

- *The developer would then need to donate/pay a fee to a housing association to retrofit their homes or existing businesses.*
- *Offsetting by fixing leaks over and above planned work by water companies.*
- *Retrofitting school buildings or local hotels to improve water efficiency.*
- *Retrofitting water reuse schemes such as in public buildings or schools or private institutions like hotels in the area.*
- *Installing smart meters (above what was already planned by water companies) can also help encourage water saving behaviours, and provide information on how much water is being used.*

In addition to the above water offsetting activities councils may require an investment into awareness campaigns and promoting water saving behaviours via S106 Obligations.

WATER OFFSETS OBLIGATIONS

- 1) *Water Offsets (theWaterBank) will provide “water offsetting” credits from an applicable site in Horsham.*
- 2) *The “Water Offsetting” site is given a unique reference number together with the number of credits that are available.*
 - a) *The number of water offsetting credits will not exceed the maximum allowable water use per individual or 110l/p/d or the annual demand of the property which is 202,575 litres in perpetuity unless regulation requires further improvement in the future.*
 - b) *The database will also retain a copy of the verification report, and update the database with any changes as may be informed by the homeowners/Horsham Council.*
 - c) *The installation will incorporate low water usage wcs (dual flush 6/3 or better), showers, aerated taps etc.*

www.wateroffsets.co.uk

- d) *Water Offsets will grant Horsham Council access to check the database and to ensure that there is no duplication of the award of water offsetting credits from participating sites.*
- e) *Water Offsets will undertake to have the database to be independently audited once a year with the results shared with Horsham Council.*
- f) *Water Offsets will maintain a copy of the Home User guide.*
- g) *Water Offsets will maintain a copy of the Verification Report and issue the prompts for the 12 months water consumption records to be issued by the developer.*
- h) *Water Offsets will maintain a copy of the Title Deeds containing a covenant restricting the water use of the development to a maximum of 110l/p/d in perpetuity.*

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The logo for Aspect Ecology Ltd features the word "aspect" in a white, lowercase, sans-serif font. A thin, white, diagonal line is positioned above the "t", extending from the top of the letter to the right.

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