



Technical Report: 4.12 Habitats Regulations Assessment

Draft Final Water Resources Management Plan 2020-2080

May 2019

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The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Report. The work described in this Report was undertaken in January and April 2019 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances. AECOM disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to AECOM's attention after the date of the Report.

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1. Executive Summary

1.1 Introduction

Affinity Water (as a Water Company) has a statutory duty to prepare and maintain a Water Resources Management Plan (WRMP) identifying how they intend to accommodate future water supply risks and water demand over the next 25 years; updated every 5 years.

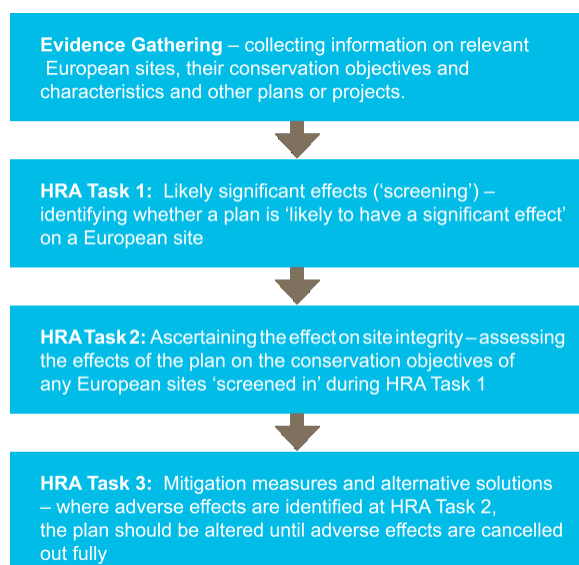
AECOM was appointed by Affinity Water to assist in undertaking Habitats Regulations Assessment (HRA) of the Constrained Options list (hereafter referred to as the 'Constrained Options') and Portfolios (packages of constrained options)¹. Since this time the development of the WRMP has progressed. This document is the HRA report to inform the Revised Draft WRMP.

In accordance with the Habitats and Species Regulations 2017 (as amended) the objective of this HRA is to identify and assess the Options within the Revised Draft WRMP that have the potential for linking pathways to Natura 2000 or European sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites), and could therefore cause a likely significant effect on one or more of these sites, either in isolation or in combination with other plans and projects.

Previous iterations of HRA were intended to inform plan development and therefore included discussion of the full list of Constrained Options in order to identify those which posed the greatest risk of conflict with European sites. However, this report is intended to evaluate the potential effects on European sites of those options that have been selected for actual inclusion in the Revised Draft WRMP and unlike Strategic Environmental Assessment the HRA process does not need to document or investigate all rejected options. This version of the HRA of the Revised Draft WRMP is primary a plan compliance assessment. As such, Constrained Options that Affinity Water does not propose to include in the Revised Draft WRMP are not discussed in this report.

1.2 Methodology

The HRA has taken account of the requirements for HRA set out in the EA (2018) Water Resources Planning Guidelines and was undertaken in accordance with the following guidance: General EC guidance, the former Department for Communities and Local Government (DCLG) consultation paper on the Appropriate Assessment of Plans in 2006, Natural England internal guidance, RSPB internal guidance, UKWIR guidance on HRA and for consistency utilised the assessment method and impact pathways that were used in 2013 for the HRA of the previous Water Resource Management Plan. The figure below outlines the stages of HRA according to current guidance (identified in the above paragraph). 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 on any European sites remain.



Four Stage Approach to Habitats Regulations Assessment. Source CLG, 2006

¹ Affinity Water/ AECOM (November 2017) Habitat Regulations Assessment. Draft Water Resource Management Plan 2019 (unpublished)

The HRA began with consideration of likely significant effects, which is an initial high level analysis to judge those constrained options that can be dismissed generally because potential impact pathways to European sites do not exist. This first stage of HRA screening has taken account of the 2018 judgment of the Court of Justice of the European Union² which ruled that mitigation measures should not be considered at the screening stage. Since existing abstractions not proposed for amendment as part of the Water Resource Management Plan will have already been subjected to sustainability reductions as necessary to protect European sites, they are not re-investigated in this HRA. Following the likely significant effect analysis, a more detailed analysis (appropriate assessment) is undertaken of those options for which pathways of impact do exist.

1.3 Results of Likely Significant Effects Test

Table 5-1 identifies that two Options have the potential to result in a Likely Significant Effect (LSE) upon a European site in isolation and in combination. These are Options:

- AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI)
- AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d)

It is these two Options that are discussed in subsequent chapters of this document.

Table 5-1 and Table 5-2 identifies that all other Options included in the Revised Draft WRMP do not pose the potential to result in a LSE on European sites and as such can be screened out from further consideration.

1.4 Appropriate Assessment: Affinity Water WRMP Alone

Table 5-1 identifies two Options that have the potential to result in a LSE upon a European site in isolation due to proximity.

These are Options:

- AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI/d)
- AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d)

Both Option AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI) and AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d) provide for a pipeline that runs adjacent to the South West London Waterbodies SPA and Ramsar site (and which is also designated as Wraysbury No.1 Gravel Pit SSSI).

1.4.1 South West London Waterbodies SPA and Ramsar site

The bird interest features of the SPA and Ramsar site are sensitive to noise and visual disturbance during the period October to March inclusive. This impact cannot be investigated in more detail for this assessment as it would require details of the scheme design and construction methods, including noise estimates for construction plant and information on the number of construction workers and duration of the construction period. However, based on the outline design information and consideration of the available mitigation measures to address these identified effects, there is a high degree of confidence that adverse effects on the integrity of the SPA through disturbance can be avoided.

Nonetheless, it is recommended that the inclusion of these options within the WRMP are accompanied by an explicit commitment that the programming and construction processes for this scheme take into account the proximity of the SPA and Ramsar site. The WRMP should stipulate that construction works on the short section of pipeline adjacent to the SPA will be programmed to avoid the winter (October to March) period entirely where possible. If this is not possible then a planning application a scheme-specific impact assessment including noise modelling will be undertaken and agreed with Natural England, to demonstrate that maximum noise levels will not exceed 70 dBA(LAmax) at the SPA boundary during the October to March period. If necessary to achieve noise levels below 70dBA (LAmax) mitigation will be implemented. British Standard BS5228 is a suitable source of mitigation measures which sets out tried and tested standard mitigation measures applicable in all situations. They include: using quieter techniques, use of cowling or damping to contain/limit noise and use of close-board fencing (if required). The detailed assessment at the project level will also consider which components of the construction programme (if any) do not have any adverse effects so that these can be programmed for delivery (where feasible) during October to March.

In addition to the low risk of noise-related disturbance, the flooded gravel pits (including Wraysbury No. 1 Gravel Pit) are obviously in hydrological connectivity with the local water table. Depending on the depth and construction method of the pipeline there is thus potential for changes in hydrology and water quality within the SPA and Ramsar site. It is very likely that the pipeline will be installed relatively shallowly and thus be well above the water table.

² People Over Wind and Sweetman v Coillte Teoranta (C-323/17)

However, as a precaution, it is recommended that the inclusion of this option within the WRMP is accompanied by an explicit commitment to carefully design the pipeline, informed by geotechnical and hydrogeological investigations as necessary, to ensure that there is no requirement for dewatering of the excavation, or that any dewatering that is required is returned immediately to ground. These measures would enable the pipeline to be installed at a suitable depth and in a suitable manner that groundwater continuity to the gravel pits would not be disrupted and groundwater quality would be protected.

Affinity Water should work closely with Natural England and the SAC/Ramsar site managers to agree the specific mitigation measures to be included in the project-specific HRA of both schemes to support applications for planning permission and environmental permits. The agreed mitigation measures will be expected to form part of planning conditions and/or conditions of relevant environmental permits, and their implementation managed through contractual obligations with supervision from an Environmental Clerk of Works appointed by Affinity Water.

With these recommendations included, it is considered that an adequate mechanism will be in place before any applications are made for planning permission or environmental permits to ensure that adverse effects on site integrity can be avoided for these two Options (AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI) and AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d)). Moreover, there are five alternative supply options that are not included in the rdWRMP but are included in Affinity Water's alternative "futures" under the adaptive planning approach (runs 7, 9, 12 & 13) and which could come forward to make up for any supply shortfall in the unlikely event that the mitigation for these two options could not be avoided and thus the options could not be delivered. All five of these alternative options have been assessed and deemed not to pose likely significant effects. There is therefore a high degree of confidence that the rdWRMP could be delivered without an adverse effect on the integrity of South West London Waterbodies SPA or Ramsar site.

1.5 Appropriate Assessment: WRMP in Combination with Other Projects and Plans

Table 5-1 identifies that two Options have the potential to result in a LSE upon a European site in combination. These are Options:

- AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI)
- AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d)

These two Options both have the potential to result in Likely Significant Effects on the South West London Waterbodies European site 'alone' and in combination.

Appropriate Assessment in combination investigated potential for disturbance effects on South West London Waterbodies SPA/Ramsar site in combination with three Thames Water dWRMP schemes (Datchet Groundwater, Kempton WTW and South West London Pipelines (Chalk Streams)). However, it concluded no adverse effects in combination due to the absence of impact pathways (in the case of Datchet Groundwater) and the recommended mitigation measures identified for both the Thames Water schemes and Affinity Water schemes.

The HRA also considered atmospheric pollution effects upon Hackpen Hill SAC, Little Wittenham SAC, and Cothill Fen SAC as a result of the reliance of Affinity Water Options AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI) and AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d) in combination with the proposed Thames Water/Affinity Water South East Strategic Reservoir. It was possible to conclude no adverse effects on the integrity of any European sites would result. Additionally, consideration was given to the possibility of hydrological changes to Oxford Meadows SAC. It was possible to conclude no adverse effects on the integrity of this SAC.

1.6 Conclusion

In conclusion, provided the above mitigation measures are included to ensure that Options AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI) and AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d) do not result in an adverse effect on integrity of the South West London Waterbodies European site, it can be concluded that the Affinity Water Revised Draft WRMP will not result in adverse effect on any European sites.

2. Introduction

2.1 Background

Affinity Water (as a Water Company) has a statutory duty to prepare and maintain a Water Resources Management Plan (WRMP) (hereafter referred to as the 'Plan') identifying how they intend to accommodate future water supply risks and water demand over the next 25 years; this must be updated every 5 years. This underpins the company's business planning and funding over these time periods.

AECOM was appointed by Affinity Water to assist in undertaking Habitats Regulations Assessment (HRA) of the Constrained Options list (hereafter referred to as the 'Constrained Options'). In November 2016 AECOM undertook an initial broad screening of the wider Affinity Water Unconstrained Options list. This was a high level assessment to identify any options that were unlikely, likely (i.e. possible) and highly likely to result in likely significant effect upon European designated sites. Essentially it constituted a broad risk assessment based upon criteria such as the proximity of particular options to sensitive European sites. Subsequently AECOM undertook HRA of the Constrained Options³. Since that time, the development of the WRMP has progressed. This documents is the HRA to assess the Options provided with the Revised Draft WRMP that have the potential for linking pathways to Natura 2000 or European sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites), and could therefore cause a likely significant effect on one or more of these sites, either in isolation or in combination with other plans and projects.

2.2 Legislative requirement for HRA

The need for Habitats Regulation Assessment (HRA) is set out in English and Welsh law by the Conservation of Habitats and Species Regulations 2017 (as amended). The Regulations apply the precautionary principle to European sites. Plans and projects can only be permitted having ascertained that there will either be no 'likely significant effects' or no 'adverse effect on the integrity' of the site(s) in question (depending on the stage of HRA). Plans and projects with predicted adverse effects 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 measures would be necessary to ensure the overall integrity of the Natura 2000 site network.

Box 1: The legislative basis for HRA

Habitats Directive 1992

Article 6 (3) states that:

“Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.”

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”.

In order to distinguish the process from the individual stage described in the law as an 'Appropriate Assessment' (AA), over time the phrase 'Habitats Regulations Assessment' has come into wide currency to describe the overall process set out in the Habitats Regulations from screening through to IROPI. Throughout this report the term 'Habitats Regulations Assessment' (HRA) is used for the overall process, with the use of Appropriate Assessment restricted to the specific stage of that name.

³ Affinity Water/ AECOM (November 2017) Habitats Regulations Assessment. Draft Water Resource Management Plan 2019 (unpublished)

Previous iterations of HRA were intended to inform plan development and therefore included discussion of the full list of Constrained Options in order to identify those which posed the greatest risk of conflict with European sites. However, this report is intended to evaluate the potential effects on European sites of those options that have been selected for actual inclusion in the Revised Draft WRMP and, unlike Strategic Environmental Assessment, the HRA process does not need to document or investigate all rejected options. This version of the HRA of the Revised Draft WRMP is primarily a plan compliance assessment. As such, Constrained Options that Affinity Water does not propose to include in the Revised Draft WRMP are not discussed in this report.

2.3 Scope of the Project

In considering the physical scope of the assessment, AECOM was guided primarily by the identified impact pathways rather than by arbitrary distance 'zones'. Current guidance suggests that the following European sites be included in the scope of assessment:

- All sites within the relevant Affinity Water supply area boundary; and
- Other sites shown to be linked to an Option within the Revised Draft WRMP through a known 'pathway' (discussed below).

Briefly defined, pathways are routes by which a change in activity provided within the Plan can lead to an effect upon an internationally designated site.

In undertaking this analysis, regard was given to the UKWIR report 'Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans; Report Ref. No. 12/WR/02/7'⁴ and to the assessment method and impact pathways that were used in 2013 for the HRA of the previous Water Resource Management Plan. Table 7.1 of the UKWIR report provides examples of potential impact pathways and suggests distance-based criteria that may be applicable to some of those impact pathways. These are reproduced in Table 2-1.

⁴ Baker E, Fredenham E, Liney K, Pitts M & Rudd T. 2012. Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans

Table 2-1: Potential Impacts of Water Resource Management Plan Schemes, modified from UKWIR (2012)

Potential Impacts Including Description		AECOM Commentary on Distance Criteria, Where Required
Physical loss		
<ul style="list-style-type: none"> - Destruction (including offsite effects, e.g. foraging habitat) - Smothering 	<p>Development of built infrastructure associated with scheme, e.g. pipelines, temporary weirs, access routes.</p> <p>Physical loss is only likely to be significant where the boundary of the scheme extends within the boundary of the European site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).</p>	-
Physical damage		
<ul style="list-style-type: none"> - Sedimentation / silting - Prevention of natural processes - Habitat degradation - Erosion - Trampling - Fragmentation - Severance/barrier effect - Edge effects 	<p>Development of built infrastructure associated with scheme, e.g. reservoir embankments, water treatment plant, pipelines, pumping stations.</p> <p>Recreation e.g. cycling, walking, horse-riding, water-sports associated with scheme benefits, e.g. reservoirs.</p> <p>Physical damage is only likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).</p>	-
Non-physical disturbance		
<ul style="list-style-type: none"> - Noise - Visual presence - Human presence - Light pollution 	<p>Noise from vehicular traffic during construction of scheme.</p> <p>Noise from construction traffic is only likely to be significant where the transport route to and from the scheme is within 3-5km of the boundary of the European site</p> <p>Plant and personnel involved in construction and operation of schemes e.g. for maintenance, plus non-operational activities such as recreation associated with scheme e.g. reservoirs.</p> <p>These effects (noise, visual/human presence) are only likely to be significant where the boundary of the scheme extends within or is directly adjacent to the boundary of the European site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European site is designated).</p>	<p>Based on AECOM's experience, 3-5km is an extremely precautionary distance to use for traffic-related noise. A 25% increase in traffic flows is required to achieve a 1 decibel (dB) increase in noise even at the roadside, while a 100% increase (i.e. a doubling) is required to achieve a 3 dB increase at the roadside⁵. For most sensitive terrestrial wildlife (e.g. birds, which have similar hearing threshold to humans) a decibel change of 3 dB is perceptible but is very unlikely to be disturbing. As such, noise from traffic only poses a risk of a likely significant effect if it will result in at least a doubling of vehicle flows on a road that lies very close to a European site. Even such a large change in flows would not result in a perceptible change in noise levels at a distance of 3-5km. It is considered extremely unlikely that construction traffic associated with any Constrained Option would result in such a large increase in overall traffic flows on any road.</p>

⁵ Design Manual for Roads and Bridges. November 2011. Volume 11 (Environmental assessment), Section 3 (Environmental Assessment Techniques), Part 7 (Noise and Vibration), Page A1/3

Potential Impacts Including Description		AECOM Commentary on Distance Criteria, Where Required
	<p>Development of built infrastructure associated with scheme, which includes artificial lighting.</p> <p>Effects from light pollution are only likely to be significant where the boundary of the scheme is within 500m of the boundary of the European site. From a review of Environment Agency internal guidance on HRA and various websites it is considered that effects of vibration and noise and light are more likely to be significant if development is within 500m of a European site.</p>	<p>For the purposes of this HRA therefore, noise related to construction activities such as piling is considered more relevant to a potential likely significant effect than noise from traffic on the road network. The noisiest construction activities (e.g. percussive driven piling) could reasonably be expected to generate noise levels of c. 110 dB at 1m distance from source. Research indicates that noise levels in excess of 84 dB(A) cause a flight response in waterfowl, while levels below 55 dB have no effect⁶. These thresholds therefore define the two extremes. Research by the same authors recommends that '<i>Ambient construction noise levels should be restricted to below 70dBA [at the bird]; birds will habituate to regular noise below this level</i>⁷. Atmospheric noise attenuates by 6 dB for every doubling of distance from source. Therefore, even when percussive driven piling is undertaken, noise levels will generally be below 70dB at 100m from source.</p> <p>Therefore, for atmospheric noise, this HRA considers that a screening distance of 500m is adequately precautionary.</p> <p>Underwater noise attenuates over much longer distances than atmospheric noise and its potential for disturbance depends on the fish or mammal species in question. However, in general, disturbance is unlikely to occur unless particularly noisy construction activities (e.g. percussive piling) take place within the same waterbody as the sensitive receptor.</p>
Water table/availability		
<ul style="list-style-type: none"> - Drying - Flooding / stormwater - Changes to surface water levels and flows - Changes in groundwater levels and flows - Changes to coastal water movement 	<p>Changes to water levels and flows due to water abstraction, storage and drainage interception associated with inland schemes.</p> <p>These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site.</p>	-

⁶ Cutts N & Allan J. 1999. Avifaunal Disturbance Assessment. Flood Defence Works: Saltend. Report to Environment Agency)

⁷ Cutts, N., Phelps, A. and Burdon, D. (2009) Construction and waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA, Institute of Estuarine and Coastal Studies, University of Hull

Potential Impacts Including Description		AECOM Commentary on Distance Criteria, Where Required
Toxic contamination		
<ul style="list-style-type: none"> - Water pollution - Soil contamination - Air pollution 	<p>Air emissions associated with vehicular traffic during construction of schemes.</p> <p>This effect is only likely to be significant where the transport route to and from the scheme is within 200m of the boundary of the European site.</p>	<p>AECOM agrees with the use of a 200m distance, which has a sound evidential basis in air quality monitoring. There is no stipulated distance for water and soil pollution but 200m is a reasonable threshold.</p> <p>The only available official guidance regarding assessment of traffic-related emissions on designated wildlife sites is that published in the Design Manual for Roads and Bridges by Highways England. In that guidance, Highways England includes a preliminary scoping criterion whereby air quality effects of increased traffic are considered effectively <i>de minimis</i> if the change in traffic flows within 200m of the sensitive site does not exceed 1,000 Annual Average Daily Traffic (AADT) or 200 Heavy Duty Vehicle movements per day. A recent Judicial Review⁸ has clarified that these thresholds should not be used by themselves to dismiss any air quality effect from a single scheme (since multiple schemes may be occurring simultaneously which could result in these thresholds being exceeded). However, that same Judicial Review also concluded that changes in flow which are '<i>very low indeed ... can properly be ignored</i>' and cited an example of a change in flows of 20 AADT as a definition of 'very low indeed' on the basis that it would require 50 schemes of this size to result in an exceedance of the 1,000 AADT threshold and the simultaneous occurrence of that many schemes may (depending on circumstances) be considered unlikely. Moreover, that threshold is itself purely a trigger for air quality calculations rather than a damage threshold.</p> <p>The likely scale of change in vehicle flows, and its duration, during construction or operation of a given Constrained Option (or multiple Constrained Options taking place simultaneously) is therefore considered in this HRA alongside the proximity of a road or construction site to a sensitive European site.</p>
Non-toxic contamination		
<ul style="list-style-type: none"> - Nutrient enrichment (e.g. of soils and water) - Algal blooms 	<p>Changes to water salinity, nutrient levels, turbidity, thermal regime due to water abstraction, storage, or inter-catchment transfers.</p> <p><i>These effects are only likely to be significant where the boundary of the</i></p>	-

⁸ Wealden District Council v. Secretary of State for Communities & Local Government, Lewes District Council and The South Downs National Park Authority (defendants) and Natural England (interested party) [2017] EWHC 351 (Admin). The judgment of Jay J is dated 20th March 2017

Potential Impacts Including Description	AECOM Commentary on Distance Criteria, Where Required
<ul style="list-style-type: none"> - Changes in salinity - Changes in thermal regime - Changes in turbidity - Changes in sedimentation/silting - Air pollution (dust) 	<p><i>scheme extends within the same ground or surface water catchment as the European site. However, these effects are dependent on hydrological continuity between the scheme and the European site, and sometimes, whether the scheme is up or down stream from the European site. This level of information is not available until data such as groundwater modelling is collected to accompany planning applications.</i></p> <p>Emissions of dust during earthworks, construction of plant and tunnel/pipeline construction associated with schemes.</p> <p>This effect is only likely to be significant where the construction works for the scheme are within 500m of the boundary of the European site.</p>

The HRA undertaken in 2013 for the previous Water Resource Management Plan⁹ went beyond UKWIR guidance by 'screening in' any Constrained Option that lay within 30km of a Special Area of Conservation designated for bats. In selecting this criterion the authors utilised the Design Manual for Roads and Bridges, which does 'scope in' any European site designated for bats that lies within 30km of a major road scheme (major schemes being the only ones with which Highways England is involved). However, there is a material difference between a major road scheme, which can involve permanent above ground severance of bat commuting routes and, for example, a new water pipeline, which can be engineered to avoid even temporary severance. There are three European sites designated for bats that lie within 30km of Affinity Water's supply areas. These are:

- Mole Gap to Reigate Escarpment SAC – designated for its population of Bechstein's bat and located 5km from the Central supply area;
- Ebernoe Common SAC – designated for its populations of Bechstein's bat and barbastelle bat and located 22km south of the Central supply area; and
- The Mens SAC – also designated for its population of barbastelle bat and located 24km south of the Central supply area.

Bechstein bats travel relatively short distances from their maternity roosts, generally remaining within approximately 1.5km¹⁰. Barbastelle bats do forage a considerable distance from their maternity roosts. However, radio-tracking studies have been undertaken on the barbastelle colonies of both The Mens SAC and Ebernoe Common SAC¹¹. These studies indicate that the third quartile (i.e. the zone within which approximately 75% of monitored bat activity was located) was 7km for Ebernoe Common SAC and 9km for The Mens SAC. The furthest distance bats were recorded foraging was 11km for Ebernoe Common SAC and 12km for The Mens SAC. Therefore, it is possible to be confident that there is no mechanism for any Option included in the Revised Draft Plan to affect any European site designated for bats.

Based on the distance thresholds discussed in Table 2-1 and those identified above, the sites included within this HRA are all European sites that fall under a minimum of one of the following criteria:

- Are located within the Affinity Water Central and Southeast regions;
- Are located within 500m of the Affinity Water Central and Southeast region boundaries;
- Are located within surface and/or groundwater catchments of the Plan's Options; and,
- Have the potential to interact with a European site located outside of the Affinity Water region (such as Options that rely on the joint Thames Water/Affinity Water scheme to construct the South East Strategic Reservoir (formerly known as Abingdon Reservoir)).

⁹ Jacobs (2013). Affinity Water . Final Water Resources Management Plan Habitats Regulations Assessment. Prepared by Jacobs for Affinity Water

¹⁰ Cited in: Schofield H & Morris C. 2000. 'Ranging Behaviour and Habitat Preferences of Female Bechstein's Bats in Summer'. Vincent Wildlife Trust

¹¹ 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

3. Methodology

3.1 Introduction

General European Commission (EC) guidance on HRA does exist¹². The former Department for Communities and Local Government (DCLG) released a consultation paper on the Appropriate Assessment of Plans in 2006¹³. As yet, no further formal guidance has emerged. However, Natural England has produced its own internal guidance¹⁴ as has the RSPB¹⁵. Both of these have been referred to alongside the guidance outlined in chapter 1 in undertaking this HRA. As previously mentioned, UKWIR has also produced its own guidance on HRA. The HRA has also taken account of the requirements for HRA set out in the EA (2018) Water Resources Planning Guidelines. Figure 1 below outlines the stages of HRA according to current 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.

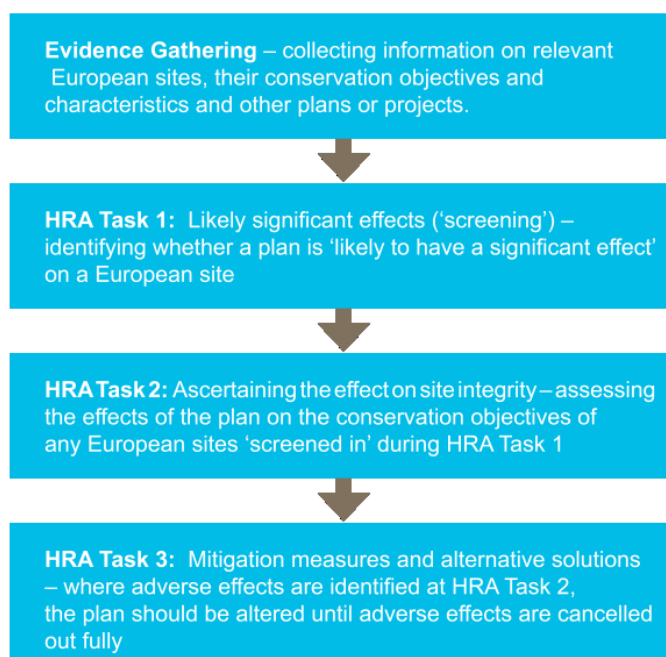


Figure 1: Four Stage Approach to Habitats Regulations Assessment. Source CLG, 2006.

3.2 HRA Task One – Likely Significant Effects (LSE) Screening

3.2.1 Introduction

Following evidence gathering, the first stage of any HRA 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 Plan, either alone or in combination with other relevant projects and plans, likely to result in a significant effect upon European sites?”

The objective is to ‘screen out’ those constrained options that can, without any detailed appraisal, be said to be unlikely to result in significant adverse effects upon European sites, usually because there is no mechanism for an adverse interaction with European sites.

In evaluating significance, AECOM have relied on professional judgement as well as Affinity Water’s previous Water Resource management Plan regarding development impacts on the European sites.

¹² 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.

¹³ CLG (2006) Planning for the Protection of European Sites, Consultation Paper

¹⁴ http://www.ukmpas.org/pdf/practical_guidance/HRGN1.pdf

¹⁵ Dodd A.M., Cleary B.E., Dawkins J.S., Byron H.J., Palframan L.J. and Williams G.M. (2007)

The Appropriate Assessment of Spatial Plans in England: a guide to why, when and how to do it. The RSPB.

A 2018 decision by the European Court of Justice¹⁶ (ECJ) concluded that measures intended to avoid or reduce the harmful effects of a proposed project on a European site, but which are not an integral part of the project or plan, may no longer be taken into account by competent authorities at the LSE stage of HRA, essentially meaning that the role of avoidance and measures should be discussed in the subsequent Appropriate Assessment stage.

Options selected for inclusion in the Revised Draft WRMP cover the delivery of infrastructure to distribute water imported from other water companies. In these cases an assumption has been made throughout the HRA that these Options are identified because surplus water is already considered to be available from that company. The onus is therefore on the water company providing the surplus to ensure that they can provide the water without an adverse effect, before they formalise an agreement with Affinity Water. However, any relevant options are discussed in the 'in combination' section of this HRA report.

3.2.2 Review of Consents

The Environment Agency has considered whether alterations to existing abstraction licences could result in likely significant effects upon a European designated site via the Review of Consents (RoC) process. The Environment Agency undertook a screening exercise to determine likely significant effects, and where necessary an Appropriate Assessment was undertaken to determine if the existing abstraction might have a negative adverse effect upon designated features either alone or in combination with other projects and plans. Depending on the outcome, the Environment Agency has either confirmed the existing licence conditions, or has identified the need for avoidance measures to ensure that the integrity of the European designated site is not negatively affected (with the impact of any licence changes on reliable water supply termed "sustainability reductions"). In some instances, abstraction at a location may be increased in the future compared to the current abstraction rate, but it will still be within the existing licence limit. Since existing abstractions that are not proposed for amendment as part of the Revised Draft Water Resource Management Plan will have already been subjected to the Review of Consents process and either confirmed or subject to sustainability reductions as necessary to protect European sites, they are not re-investigated in this HRA (i.e. only options within this report have been assessed).

3.3 Appropriate Assessment

Where a conclusion of 'no Likely Significant Effect' cannot be drawn, analysis proceeds 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.

The level of detail in land use plans concerning developments that will be permitted under the plans is rarely sufficient to allow the fullest quantification of potential adverse effects. It is therefore necessary to be cognisant of the fact that HRA of plans is an iterative process, with assessments being undertaken at each key stage, becoming increasingly specific as the plan in question becomes more detailed. This is in line with DCLG guidance and court rulings that the level of detail of the assessment, whilst meeting the relevant requirements of the Habitats Regulations, should be 'appropriate' to the level of plan or project that it addresses.

On these occasions the advice of Advocate-General Kokott¹⁷ to the European Court of Justice is worth considering. She commented that: "*It would ...hardly be proper to require a greater level of detail in preceding plans [rather than planning applications] 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*". In this case therefore the Appropriate Assessment has considered whether further technical analysis is possible at this point in the scheme development process, and if not (due for example to the impacts being dependent on detailed scheme design or construction methodologies) has focussed on the protective measures that must be built into the WRMP to ensure that the scheme can be delivered without an adverse effect on the integrity of the relevant European sites, or otherwise demonstrating in the WRMP that an alternative option is available to replace an option assessed as having an adverse effect when assessed as part of detailed design.

A 2018 case¹⁸ also confirmed that an Appropriate Assessment must consider the interest features of European sites even where those features may be found outside the strict boundaries of those sites and must also consider other habitat types or species, which are present on the site, but for which that site has not been listed but which are necessary to the conservation of the habitat types and species listed for the protected area. The former matter is traditionally captured in Appropriate Assessment in England (and in this HRA) through consideration of the concept of 'functionally linked land' (e.g. land outside the Solent SPA boundaries which supports wintering Brent goose and waders or the aforementioned 12km core zone surrounding the Sussex bat SACs) while the latter is captured where, for example, habitats within a European site that are not themselves designated are nonetheless

¹⁶ People Over Wind and Sweetman v Coillte Teoranta (C-323/17).

¹⁷ Opinion of Advocate-General Kokott, 9th June 2005, Case C-6/04. Commission of the European Communities v United Kingdom of Great Britain and Northern Ireland, paragraph 49.
<http://curia.europa.eu/juris/document/document.jsf?docid=58359&doclang=EN>

¹⁸ Holohan et al vs. An Bord Pleanála (C-461/17)

considered when assessing impacts because of the functional role in enabling the site to meet its conservation objectives (e.g. the plantation woodlands of Wealden Heaths Phase II SPA).

Box 2: The steps involved in Appropriate Assessment

1. Explore the reasons for the European designation of these sites.
2. Explore the environmental conditions required to maintain the integrity of the selected sites and become familiar with the current trends in these environmental processes.
3. Gain a full understanding of the plan and its proposals and consider each proposal within the context of the environmental processes – would the policy lead to an impact on any identified process?
4. Decide if the identified impact will lead to an adverse effect on integrity.
5. Identify other plans and projects that might affect these sites in combination with the Plan and decide whether there are any adverse effects that might not result from the Plan in isolation but will do so "in combination".
6. Develop policy mechanisms to enable the delivery of measures to avoid the effect entirely, or if not possible, to mitigate the impact sufficiently that the effect on the European site is rendered effectively inconsequential.

3.4 HRA Task 3: Avoidance and Mitigation

Where necessary, measures will be recommended for incorporation into the Plan in order to avoid or mitigate adverse effects on European sites. There is considerable precedent in relation to Local Plans 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 Local Plan, but the Local Plan (or similar strategic plan, such as a WRMP) must provide an adequate policy framework within which these measures can be delivered.

Following the 2018 decision by the European Court of Justice¹⁹ (ECJ) that measures intended to avoid or reduce the harmful effects of a proposed project on a European site, but which are not an integral part of the project or plan, may no longer be taken into account by competent authorities at the LSE stage of HRA, the role of avoidance and measures should only be discussed as part of the Appropriate Assessment stage.

When discussing mitigation for a WRMP, one is concerned primarily with the policy framework and strategic planning necessary to enable the delivery of such mitigation rather than the details of the mitigation measures themselves since the WRMP (like Local Plan documents) is a high-level policy and strategy document.

3.5 Other Plans and Projects

The Conservation of Habitats and Species Regulations 2017 (as amended) makes it clear that the determination of likely significant effects must not be made in isolation but 'in combination', taking into account the in combination effects of the WRMP option for which future planning permission and/or environmental permits will be sought alongside those of other plans or projects. In this case, the projects and plans that are located within the area affected by the WRMP due to their proximity or potential for similar impacts on the same European sites are:

- M20 Junction 10A;
- M4 Junctions 3 to 12 Smart Motorway;
- West Rail Link to Heathrow;
- M1 Junction 10a Grade Separation - Luton;
- Woodside Link Houghton Regis Bedfordshire;
- Other Water Resource Management Plans (see below)
- Dover District Council Core Strategy (2010);
- Canterbury City Council Local Plan (adopted 2017);
- Shepway District Council Core Strategy Local Plan 2013;

¹⁹ People Over Wind and Sweetman v Coillte Teoranta (C-323/17).

- Ashford Borough Council Draft Local Plan 2030 (draft Reg 19);
- Guildford Borough Council Proposed Submission Plan (Reg 19) 2017;
- Woking Borough Council Core Strategy (Adopted 2012);
- Elmbridge Borough Council Local Plan documents (2011 and 2015);
- Surrey Heath Borough Council Core Strategy (2012);
- Runnymede Borough Council 2030 Draft Local Plan (2018);
- Bracknell Forest Council Core strategy (2008);
- Royal Borough of Royal Windsor and Maidenhead draft Borough Local Plan (Reg 18 consultation);
- Spelthorne Borough Council Core Strategy and Policies Development Document (2009);
- London Borough of Hounslow Local Plan (2015);
- Slough Borough Council Core Strategy (2006);
- London Borough of Hillingdon Local Plan Part 1 (2012);
- South Buckinghamshire District Council Core Strategy (adopted 2011);
- Chiltern District Council Core strategy (adopted 2011);
- Three Rivers District Council Local Plan (2014);
- Dacorum Borough Council Core Strategy (2013);
- Wycombe District Council Core Strategy (2008);
- Central Bedfordshire Borough Council Core Strategy and Development Management Policies Development Plan Document (2009);
- Luton Borough Council Local Plan (2017);
- St Albans City and District Council Strategic Local Plan (Reg 19 2016);
- Watford Borough Council Core Strategy (adopted 2013);
- Hertsmere Borough Council Core Strategy (2013);
- Harrow Council Local Plan Core Strategy (2012);
- London Borough of Brent Core Strategy (adopted 2010);
- London Borough of Ealing Core Strategy DPD (2012);
- London Borough of Camden Core Strategy (2010);
- London Borough of Haringey Local Plan: Strategic Policies 2013 (with alterations 2017);
- London Borough of Barnet Core Strategy Development Plan Document (adopted 2012);
- London Borough of Enfield Core Strategy (2010);
- Welwyn Hatfield Borough Council draft Local Plan (2016);
- Borough of Broxbourne Regulation 18 draft Local Plan (2016);
- East Hertfordshire District Plan (adopted 2018);
- North Hertfordshire District Council (Proposed Submission 2016);
- Stevenage Borough Council Local Plan 2011-2031 (Publication draft 2016);
- South Cambridgeshire Local Plan (adopted 2018);
- Harlow Local Development Plan Pre-Submission Publication (May 2018);
- Epping Forest District Council Local Plan (2017);
- Brentwood Borough Council Replacement Local Plan (2005);
- Uttlesford District Council Local Plan (2005);

- Colchester Emerging Local Plan 2017-2033, and
- Tendring District Council Local Plan 2013-2033 (Publication Draft 2017).
- Coastal Strategies (where relevant to coastal options)
- Flood Risk Management Plans

When developing a Local Planning document, the Local Authority will have consulted with the relevant water company to ensure that the water demands stemming from development provided in these plan documents can be accommodated. As such, it is most pertinent to investigate in combination effects with neighbouring water companies Water Resource Management Plans and Drought Plans. Those plans assessed are:

- Anglian Water Water Resource Management Plan 201, revised draft Water Resources Management Plan 2019 and Drought Plan 2014;
- Cambridge Water (South Staffs) Water Resource Management Plan 2014, Draft Water Resources Management Plan 2019 and Drought Plan 2018;
- Thames Water Final Water Resource Management Plan 2014 – 2040, revised draft Water Resources Management Plan 2019 and Drought Plan Update 2017;
- South East Water Water Resource Management Plan 2014, Revised Water Resources Management Plan 2019 and revised draft Drought Plan 2017;
- Southern Water Water Resource Management Plan 2015 – 2040, draft Water Resources Management Plan 2019 and draft Drought Plan 2018; and
- Sutton and East Surrey Water (SES Water) Final Water Resource Management Plan 2014, revised draft Water Resources Management Plan 2019 and draft Drought Plan 2018.

In addition, the Water Resources South East (WRSE) Planning Group produced a report titled 'Environmental Information to Inform Water Company SEAs - Identification of potential for cumulative effects between water companies for WRMP19 SEAs' in summer 2018 which contains a region wide cumulative effects assessment. That assessment has been referenced in considering the potential for in combination effects between the Affinity Water rdWRMP and the emerging rdWRMPs of other water companies. In summary, the review process of other emerging rdWRMPs and Drought Plans undertaken for this HRA has only identified potential cumulative effects relevant to the Affinity Water rdWRMP with the Thames Water rdWRMP, notably through the South East Strategic Reservoir (formerly Abingdon Reservoir) which is now a joint scheme between the two water companies. This HRA has also considered potential interaction with other non-WRSE WRMPs, notably in the East of England. However, since no supply options are proposed for the East of England area there is no potential for in combination effects with those WRMPs covering the East of England.

4. European Sites and Interest Features

4.1 Introduction

European designated sites are sites that are designated under the following legislation:

- Special Protected Areas (SPA): are sites protected under Article 4 of the EC Birds directive. These sites are designated for their internationally important populations of rare and vulnerable birds and for regularly occurring migratory species (including assemblages). It is not the footprint of the SPA itself that is protected but rather the bird species ('features') that utilise the habitats within the SPA site boundary.
- Special Areas of Conservation (SAC): are sites protected under Article 3 of the Habitats Directive which requires the establishment of a network of high quality conservation sites across Europe that make a significant contribution to conserving habitats and species listed under Annex I and II of the Directive (as amended). It is the habitats within the site boundary that are protected and the fauna species utilising habitats within the SAC boundary that are protected.
- Ramsar sites: are sites designated under the Convention on Wetlands signed in Ramsar, Iran (and hence known as the Ramsar Convention). This treaty provides a framework for the conservation and wise use of wetlands and their resources.

The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), and any confirmed HRA compensatory habitat sites to be considered in the same way.

4.2 This report

This document discusses the following European sites as being relevant to the analysis of the Options selected for the Revised Draft WRMP:

- Chilterns Beechwoods SAC;
- Cothill Fen SAC;
- Epping Forest SAC;
- Folkestone to Etchinghill Escarpment SAC;
- Hackpen Hill SAC;
- Lee Valley SPA and Ramsar site;
- Little Wittenham SAC;
- Lydden and Temple Ewell Downs SAC;
- Oxford Meadows SAC;
- South West London Waterbodies SPA;
- South West London Waterbodies Ramsar site;
- Thames Basin Heaths SPA ;
- Thursley, Hankley and Frensham Commons SPA;
- Windsor Forest and Great Park SAC;
- Burnham Beeches SAC;
- Dover to Kingsdown Cliffs SAC;
- Thursley, Ash, Pirbright and Chobham SAC;
- Parkgate Down SAC; and
- Wormley-Hoddesdonpark Woods SAC.

The interest features of each designated site are catalogued in Table 4-1 below as are the potential environmental vulnerabilities linked to the Affinity Water Revised Draft WRMP options. The Conservation Objectives are detailed in Section 4.3. The locations of these designated sites are illustrated in Appendix A, Figure A1.

Table 4-1: European Designated Sites and Interest Features

European Designated Sites	Interest Features	Potential Environmental Vulnerabilities Linked to Affinity Water Options in the Revised Draft WRMP
Chilterns Beechwoods SAC	Designated as an SAC for its Annex I habitats: <ul style="list-style-type: none"> • <i>Asperulo-Fagetum</i> beech forests – representing a very extensive tract of this habitat in the centre of the habitat’s UK range. Annex I habitats present as a qualifying feature: <ul style="list-style-type: none"> • Semi-natural dry grasslands and scrubland facies on calcareous substrates Annex II species present as a qualifying feature: <ul style="list-style-type: none"> • Stag beetle (<i>Lucanus cervus</i>) 	<ul style="list-style-type: none"> • Forest and Plantation management and use • Problematic native species • Invasive non-native species • Interspecific floral relations
Cothill Fen SAC	Designated as an SAC for its Annex I habitats: <ul style="list-style-type: none"> • Alkaline fens • Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) 	<ul style="list-style-type: none"> • Water pollution • Hydrological changes • Atmospheric pollution (atmospheric nitrogen deposition)
Epping Forest SAC	Qualifies as an SAC due to the presence of the following: Annex I habitats: <ul style="list-style-type: none"> • Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion) • Northern Atlantic wet heaths with <i>Erica tetralix</i> • European dry heaths Annex II species: <ul style="list-style-type: none"> • Stag beetle (<i>Lucanus cervus</i>) 	<ul style="list-style-type: none"> • Atmospheric pollution • Changes in species distribution • Disturbance to designated features from construction and operational activities • Human induced changes to hydraulic conditions (water levels) • Water pollution • Invasive species
Folkestone to Etchinghill Escarpment SAC	Qualifies as a SAC due to the extensive areas of semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>). Also includes important orchid sites.	<ul style="list-style-type: none"> • Biocenotic evolution, succession • Air pollution, air-borne pollutants • Grazing
Hackpen Hill SAC	Qualifies as an SAC due to the presence of the following: Annex I habitats: <ul style="list-style-type: none"> • Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) Annex II species: <ul style="list-style-type: none"> • Early gentian (<i>Gentianella anglica</i>) 	The Natural England Site Improvement Plan does not identify any issue or threats of relevance to the SAC.
Lee Valley SPA	Qualifies as a SPA due to its population of wintering bittern (<i>Botaurus stellaris</i>) as well as migratory populations of Gadwell (<i>Anas strepera</i>) and Shoveler (<i>Anas clypeata</i>).	<ul style="list-style-type: none"> • Pollution to groundwater • Human induced changes to hydraulic conditions • Disturbance to designated features from construction and operational activities • Loss of supporting habitat
Lee Valley Ramsar	Qualifies as a Ramsar site under Ramsar Criterion 2 and 6. Ramsar Criterion 2 states that ‘A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.’ Ramsar criterion 2 The site supports the nationally scarce plant species whorled water-milfoil <i>Myriophyllum verticillatum</i> and the rare/vulnerable invertebrate <i>Micronecta minutissima</i> (a water-boatman). Ramsar criterion 6	<ul style="list-style-type: none"> • Pollution to groundwater • Human induced changes to hydraulic conditions • Disturbance to designated features from construction and operational activities • Loss of supporting habitat

European Designated Sites	Interest Features	Potential Environmental Vulnerabilities Linked to Affinity Water Options in the Revised Draft WRMP
	Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: <ul style="list-style-type: none"> Northern shoveler (<i>Anas clypeata</i>). Species with peak counts in winter: <ul style="list-style-type: none"> Gadwall (<i>Anas strepera strepera</i>). 	
Little Wittenham SAC	Qualifies as an SAC due to the presence of the following: Annex II species: <ul style="list-style-type: none"> Great crested newt (<i>Triturus cristatus</i>) 	<ul style="list-style-type: none"> Invasive species Public access/ disturbance
Lydden and Temple Ewell Downs SAC	Qualifies as a SAC due to the extensive areas of semi-natural dry grasslands and scrubland facies: on calcareous substrates (<i>Festuco-Brometalia</i>). Also includes important orchid sites. The site includes outstanding assemblages of plants and invertebrates.	<ul style="list-style-type: none"> Loss of habitat Air pollution, air-borne pollutants Grazing Outdoor sports and leisure activities, recreational activities
Oxford Meadows SAC	Qualifies as an SAC due to the presence of the following: Annex I habitats: <ul style="list-style-type: none"> Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) Annex II species: <ul style="list-style-type: none"> Creeping marshwort (<i>Apium repens</i>) 	<ul style="list-style-type: none"> Hydrological changes Invasive species
South West London Waterbodies SPA	Qualifies as a SPA due to its population of wintering birds including Gadwell (<i>Anas strepera</i>) and Shoveler (<i>Anas clypeata</i>). In addition, the site supports nationally important numbers of cormorant <i>Phalacrocorax carbo</i> , great crested grebe <i>Podiceps cristatus</i> , tufted duck <i>Aythya fuligula</i> , pochard <i>Aythya ferina</i> and coot <i>Fulica atra</i> .	<ul style="list-style-type: none"> Invasive species Abiotic natural processes Changes in biotic conditions Outdoor sports and leisure activities Marine and freshwater aquaculture
South West London Waterbodies Ramsar	Qualifies as a Ramsar site under Ramsar Criterion 6 which states that 'A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.' Ramsar criterion 6 Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: <ul style="list-style-type: none"> Northern shoveler (<i>Anas clypeata</i>). Species with peak counts in winter: <ul style="list-style-type: none"> Gadwall (<i>Anas strepera strepera</i>). 	<ul style="list-style-type: none"> Invasive species Abiotic natural processes Changes in biotic conditions Outdoor sports and leisure activities Marine and freshwater aquaculture
Thames Basin Heaths SPA	The site qualifies as a SPA as it is regularly used by or more of the Great Britain populations of Nightjar <i>Caprimulgus europaeus</i> , Woodlark <i>Lullula arborea</i> and Dartford warbler <i>Sylvia undata</i> .	<ul style="list-style-type: none"> Air pollution Human intrusions and disturbances Biocenotic evolution, succession Outdoor sports and leisure activities Forest and plantation management and use
Thursley, Hankley and Frensham Commons SPA	Qualified as a site of international importance as it supports summer breeding populations of Nightjar <i>Caprimulgus europaeus</i> , Woodlark <i>Lullula arborea</i> and Dartford warbler <i>Sylvia undata</i> . The site also supports breeding kingfisher <i>Alcedo atthis</i> and wintering hen harriers <i>Circus cyaneus</i> .	<ul style="list-style-type: none"> Outdoor sports and leisure activities Air pollution Biocenotic evolution, succession Human intrusions and disturbances

European Designated Sites	Interest Features	Potential Environmental Vulnerabilities Linked to Affinity Water Options in the Revised Draft WRMP
Windsor Forest and Great Park SAC	Designated as an SAC for its Annex I habitats: <ul style="list-style-type: none"> • Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains Annex I habitats present as a qualifying feature: <ul style="list-style-type: none"> • Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer Designated as an SAC for its Annex II species: <ul style="list-style-type: none"> • Violet click beetle (<i>Limoniscus violaceus</i>) 	<ul style="list-style-type: none"> • Forest and Plantation management and use • Air pollution, air-borne pollutants • Invasive non-native species • Interspecific floral relations
Burnhman Beeches SAC	Designated as an SAC for its Annex I habitats: <ul style="list-style-type: none"> • <i>Asperulo-Fagetum</i> beech forests – within central southern England. Formerly beech wood-pasture with associated <i>Fagus sylvatica</i> and Oak species <i>Quercus spp.</i> • Epiphytic community – retaining nationally important moss communities including <i>Zygodon forsteri</i>. 	<ul style="list-style-type: none"> • Forest and Plantation management and use • Problematic native species • Invasive non-native species • Interspecific floral relations
Dover to Kingsdown Cliffs SAC	Designated as an SAC for its Annex I habitats: <ul style="list-style-type: none"> • Vegetated sea cliffs (Atlantic and Baltic Coasts) – supporting rich maritime cliff communities found in chalk substrate. Annex I habitats present as a qualifying feature: <ul style="list-style-type: none"> • Semi-natural dry grasslands and scrubland facies: on calcareous substrates. 	<ul style="list-style-type: none"> • Human induced changes to hydraulic conditions • Disturbance to designated features from construction and operational activities • Loss of supporting habitat
Thursley, Ash, Pirbright and Chobham SAC	Designated as an SAC for its Annex I habitats: <ul style="list-style-type: none"> • <i>Northern Atlantic wet heaths with Erica tetralix</i> – supporting a mosaic of habitats including lowland heathland, valley bog and dry heathland. • European dry heath – large fragments of heathland; selected as a key representative of NVC type H2 <i>Calluna vulgaris</i>. • Depressions on peat substrates of the <i>Rhynchosporion</i>- peat vegetation species associated with natural bog, patterned valley mire and disturbed peat (trackways and peat- cuttings). 	<ul style="list-style-type: none"> • Air pollution • Biocenotic evolution, succession • Human intrusions and disturbances
Parkgate Down SAC	Designated as an SAC for its Annex I habitats: <ul style="list-style-type: none"> • Semi-natural dry grasslands and scrubland facies on calcareous substrates- supports priority habitat: orchid rich sites (<i>Festuco-Brometalia</i>) and consisting of NVC type CG4 <i>Brachypodium pinnatum</i> grassland. 	<ul style="list-style-type: none"> • Human induced changes to hydraulic conditions • Disturbance to designated features from construction and operational activities • Loss of supporting habitat
Wormley-Hoddesdonpark Woods SAC	Designated as an SAC for its Annex I habitats: <ul style="list-style-type: none"> • <i>Carpinion betuli</i> Sub-Atlantic and medio-European oak or oak-hornbeam forests - supporting a variety of broad-leaved trees and a local bryophyte community. 	<ul style="list-style-type: none"> • Forest and Plantation management and use • Problematic native species • Invasive non-native species • Interspecific floral relations

4.3 Conservation Objectives and Feature Sensitivities

Natural England provides advice on the Conservation Objectives for European sites, including SACs and SPAs. Natural England states that: 'These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations (as amended) ('the Habitats Regulations') and Article 6(3) of the European Habitats Directive²⁰. They provide a framework which should inform any 'Habitats Regulations Assessments' (which may include an Appropriate Assessment) that a competent authority may be required to make under the legislation referred to above. In addition, they can be used to inform any measures necessary to conserve or restore the European Site and/or to prevent the deterioration or significant disturbance of its qualifying features as required by the provisions of Articles 6(1) and 6(2) of the Habitats Directive respectively.'²¹

The Conservation Objectives for the European sites in Table 4-1 are as follows: 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 Habitats and 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.

The features for which each European designated site qualifies are sensitive to different potential impacts which may impact on the conservation status of the site. These impacts may have a direct impact within the designated site or may affect features beyond the site boundary. The potential environmental vulnerabilities for each interest feature of the designated site can be found within the UK Water Industry Research (UKWIR) report²² and have been included in Table 4-1.

²⁰ http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm [accessed 14/01/2019]

²¹ Natural England (2015) <http://publications.naturalengland.org.uk/publication/4901473695563776> [accessed 27/10/2017]

²² Baker E, Fredenham E, Liney K, Pitts M & Rudd T. 2012. Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans

5. Likely Significant Effects

This chapter presents an analysis of the Likely Significant Effects (LSE) of the Options selected for the Revised Draft WRMP upon European designated sites, without taking into account any mitigation measures.

Options assessed in Table 5-2 are not included within the rdWRMP19; however, they are identified through Affinity Water’s programme appraisal process as potentially coming forward under other reasonable Adaptive Plan alternative programmes (essentially different packages of schemes to balance supply/ demand, namely model runs 7, 9, 12 & 13). As a result, there is a reasonable likelihood that they could come forward in the future given the adaptive planning approach used by Affinity Water²³. They have therefore been considered through the HRA process.

The first column of Table 5-1 and Table 5-2 lists the relevant options. The second column presents the test of LSE from the Revised Draft WRMP in isolation, while the third column considers whether the WRMP may result in LSE in combination with other projects or plans. Where an Option is shaded green, the Option will not result in LSE either in isolation and/ or in combination. Where an Option is identified as orange, this identifies that this Option has the potential to result in LSE either alone or in combination with other projects and plans, and as such will progress to the Appropriate Assessment stage.

Table 5-1: Test of Likely Significant Effects

Option	Test of Likely Significant Effects (In Isolation)	Test of Likely Significant Effects (In Combination)
AFF-EGW-WRZ6-0173 Clandon Source Optimisation	No LSE. This Option is a software upgrade, with no linking impact pathways to any European sites in isolation.	No LSE. This Option is a software upgrade, with no linking impact pathways to any European sites in combination.
AFF-EGW-WRZ2-0090 Stonecross Source Optimisation	No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, 14.9 km distant and with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. The option is sufficiently remote from the nearest European site that no other impact pathways (i.e. noise or air quality during construction) will occur as Table 2-1 of this report identifies these may only arise from schemes located within 200m (air quality) or 500m (noise) of European sites. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-CTR-WRZ3-4005 :Arkley North	No identified impact pathways to European designated sites the nearest of which is Wormley-Hoddesdonpark Woods SAC, at a distance of 15.6 km and with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.

²³ Affinity Water (2019) Decision Making Report.

<p>AFF-CTR-WRZ4-4001 :Egham to Iver</p>	<p>Project to install stronger pumps at Egham water treatment works to make full use of the existing pipeline capacity between Egham and Iver. The new pumps will be 1.5km from the South West London Waterbodies SPA and Ramsar site at their closest and will not require below ground construction or dewatering. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, or Windsor Forest & Great Park SAC which is even more distant, that significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI)</p>	<p>Likely Significant Effects The pipeline that will link the reservoir to Harefield will lie within the Affinity Water supply area and is adjacent to a section of the South West London Waterbodies Ramsar and SPA, which is also designated as Wraysbury No.1 Gravel Pit SSSI.</p>	<p>Likely Significant Effects This Option is reliant on Affinity Water and Thames Water taking forward the South East Strategic Reservoir. It is considered that the scheme has the potential to result in likely significant effects on Cothill Fen SAC (2.7km from the reservoir), Hackpen Hill SAC, Little Wittenham SAC (both >7km from the reservoir) and Oxford Meadows SAC (>15km from the reservoir) in combination with the Affinity Water pipeline. Thames Water has undertaken extensive studies investigating the effects of the proposed reservoir, including an assessment of impacts on European sites. In addition, the HRA of the Thames Water rdWRMP identified two schemes that could themselves affect the South West London Waterbodies SPA and Ramsar site: Kempton Park Water Treatment Works and South West London pipelines (chalk streams) These will therefore be discussed further in the 'in combination' effects section of the appropriate assessment.</p>
<p>AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d)</p>	<p>Likely Significant Effects The pipeline that will link the reservoir to Iver will lie within the Affinity Water supply area and is adjacent to a section of the South West London Waterbodies Ramsar and SPA, which is also designated as Wraysbury No.1 Gravel Pit SSSI.</p>	<p>Likely Significant Effects This Option is reliant on Affinity Water and Thames Water taking forward the South East Strategic Reservoir. It is considered that this scheme has the potential to result in likely significant effects on Cothill Fen SAC (2.7km from the reservoir), Hackpen Hill SAC, Little Wittenham SAC (>7km from the reservoir) and Oxford Meadows SAC (>15km from the reservoir) in combination with the Affinity Water pipeline. Thames Water has undertaken extensive studies investigating the effects of the proposed reservoir, including an assessment of impacts on European sites. In addition, the HRA of the Thames Water dWRMP identified two schemes that could themselves affect the South West London Waterbodies SPA and Ramsar site: Kempton Park WTW and South West London pipelines (chalk streams). These will therefore be discussed further in the 'in combination' effects section of the appropriate assessment.</p>
<p>AFF-EGW-WRZ7-0629 Lye Oak Scheme</p>	<p>No identified impact pathways to European designated sites the nearest of which is Lydden & Temple Ewell Downs SAC, 1.6 km distant and a terrestrial site with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>

<p>AFF-NGW-WRZ3-1053 Kings Walden</p>	<p>No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, 18.4 km distant and with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-NGW-WRZ3-1068 Runley Wood (AMP7 LGS Borehole)</p>	<p>No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, 9.4 km distant and with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-RES-WRZ4-0832 Brent Reservoir</p>	<p>This is a scheme to import water from the Canals & Rivers Trust covered reservoir at Brent. The water would be transmitted via the River Brent and the Grand Union Canal to the existing Iver Water Treatment Works for abstraction and subsequent treatment at a new Iver 2 WTW. For the most part the existing main from Iver to Harrow would be used to convey water, with some additional pipelines to link to Harrow covered storage reservoir. There are no identified impact pathways to European designated sites the nearest of which is South West London Waterbodies SPA and Ramsar, 4.8 km distant from the nearest piece of infrastructure and which has no hydrological connection to this scheme since this scheme does not involve a net increase in abstraction but rather the utilisation of spare capacity in another organisation's licence. There is also no functionally linked habitat for the SPA/Ramsar site in the vicinity of the scheme or its new pipelines. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-RES-WRZ5-0809 Birds Green Reservoir</p>	<p>No identified impact pathways to European designated sites the nearest of which is Epping Forest SAC, 4.3 km distant and with no hydrological connection; although the SAC is partly designated for wet heathland this habitat is related to differential permeability in the superficial deposits on site, rather than a connection to the water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-RTR-WRZ1-1066 Grand Union Canal (GUC-Berkhamstead/Hemel Hempstead)</p>	<p>The Option is 2.5km from Chilterns Beechwoods SAC. Due to the distance and the lack of sensitivity that SAC interest features have to impacts arising at this distance, no effects are anticipated. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>Drought Option – HUNT Hunton Bridge Gade Catchment Drought Permit</p>	<p>No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, at a distance of 11.6 km and with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>

<p>Drought Option – BOWB Bowbridge Ver Catchment Drought Permit</p>	<p>No identified impact pathways to European designated sites the nearest of which is Wormley Hoddesdon Park Woods SAC, at a distance of 15.6 km and with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-RTR-WRZ6-0752 : Ladymead Optimisation / Grand Union Canal (Pitsford Transfer)</p>	<p>No identified impact pathways to European designated sites the nearest of which is Thames Basin Heaths SPA, 1.9 km distant from the closest infrastructure and with no hydrological connection since none of the birds for which this site is designated are dependent upon a high water table. There is also no functionally linked habitat for this SPA (heathland/managed plantation) that would be affected by the scheme. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-RNC-WRZ7-0900 Dover Constraint Removal</p>	<p>The pipeline is 2.1km from Lydden and Temple Ewell Downs SAC, and 2.6km from Dover to Kingsdown Cliffs SAC. However, due to the distance to both sites, their lack of hydrological sensitivity (since none of the habitats for which this site is designated are in connectivity with a high water table) and the fact that the River Dour hydrologically separates the Option from the SACs. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. It is considered there are no linking impact pathways and as such no likely significant effect will arise.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>Drought Option – WHIH Whitehall Beane Catchment Drought Permit</p>	<p>No identified impact pathways to European designated sites the nearest of which is Lee Valley SPA, at a distance of 13.1 km and there is no link between the River Beane and water levels in the gravel pits and reservoirs of the Lee Valley SPA, which is in the Lower Lea catchment rather than the Beane catchment. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>Drought Option – FULL Fulling Mill Mimram Catchment Drought Permit</p>	<p>No identified impact pathways to European designated sites the nearest of which is Wormley-Hoddesdonpark Woods SAC, at a distance of 11.2 km and with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>Drought Option – PICC Piccotts End Gade Catchment Drought Permit</p>	<p>No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, at a distance of 4.7 km and with no hydrological connection since none of the habitats for which this site is designated are in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>

<p>Drought Option – UTTL Uttlesford Bridge Cam Catchment Drought Permit</p>	<p>No identified impact pathways to European designated sites the nearest of which is Lee Valley SPA, at a distance of 29 km and with no hydrological connection since it is a different catchment. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-RNC-WRZ7-0626 Broome Network Improvement</p>	<p>The pipeline is 4.3 km from Lydden & Temple Ewell Downs SAC, and 4.6 km from Parkgate Down SAC. However, there are no HRA implications identified due to the distances from the Option to designated sites and the lack of sensitivity that SAC interest features have to impacts arising at this distance. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-CTR-WRZ3-1099 Boxted to Chaul End</p>	<p>This option involves the transfer of 40MI/d of treated water by a new main from Boxted Pump Station to Chaul End Reservoir via Friars Wash. This Option will require the construction of a new main from Boxted Pump Station to Chaul End Reservoir and a 40MI capacity upgrade of Chaul end Reservoir. Boxted Pump Station and the new pipeline are 2.7km from Chilterns Beechwoods SAC. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Given the distances involved and the lack of sensitivity that SAC interest features have to impacts arising at this distance it is considered no likely significant effect will arise.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-EGW-WRZ7-0908 Tappington South – Licence Variation</p>	<p>This option is to re-commission the Tappington south borehole to provided resilience for a licenced group. Tappington South groundwater source is located 3.9 km from Parkgate Down SAC, 5.1 km from Lydden & Temple Ewell Downs SAC and 6.9 km from Folkestone to Etchinghill Escarpment SAC. This option is within existing license group quantities. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Given the distances involved and the lack of sensitivity that SAC interest features have to impacts arising at this distance it is considered no likely significant effect will arise. As a consequence no further assessment is required.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-TPO-WRZ6-1083 Surrey University (Guildford site)</p>	<p>This is a third party scheme to obtain a supply from the Surrey University site in Guildford. The option requires further discussions with Surrey University to lease the use of the borehole, a licence application to the Environment Agency, and pipework to take the water into the existing Affinity Water network.</p> <p>This project is located within the Guildford urban area. Park Barn Drive Reservoir is the closest part of the scheme to any European site and is 3.9 km from Thursley, Ash, Pirbright & Chobham Special Area of Conservation (SAC) and Special Protection Area (SPA). The scheme is also 2.8 km from the Thames Basin Heaths SPA and 9.3 km from Thursley, Hankley & Frensham Commons SPA. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Given the distances involved, the fact that there is no functionally-linked habitat for the SPA (heathland/plantation woodland) that will be affected</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>

	by the scheme and the lack of sensitivity that SAC and SPA interest features have to impacts arising at this distance it is considered no likely significant effect will arise.	
AFF-NGW-WRZ4-0624 Canal River Trust Slough Boreholes	This option proposes obtaining supplies from existing Lower Greensand boreholes that are currently owned by third parties in the Slough area. As such there is no net increase in abstraction. Given this, the distance between the pipeline and closest designated sites (4.3km from South West London Waterbodies Ramsar site/SPA and Burnham Beeches SAC) and the fact the pipeline will not affect any functionally-linked habitat associated with the SPA/Ramsar site no adverse impacts are anticipated as a result of construction. Furthermore, based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-WRZ6-TPO-0412 Hillingdon Hospital Boreholes	There will be no net change to licenced abstraction at the Hillingdon Hospital. The existing boreholes are located 7.3km from South West London Waterbodies Ramsar site and Special Protection Area (SPA). Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Given the distance between the boreholes and the designated site, and the fact that no net change to licenced abstraction will occur, the scheme will not result in LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
Drought option –WELL Well Head Hiz Catchment Drought Permit	No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, at a distance of 22.8 km and with no hydrological connection since none of the habitats for which this site is designated is in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
Drought option –FRIA Friars Wash Ver Catchment Drought Permit	No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, at a distance of 8.9 km and with no hydrological connection since none of the habitats for which this site is designated is in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.

Drought option –HUGH Hughenden Catchment Drought Permit	No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, at a distance of 1.5 km and with no hydrological connection since none of the habitats for which this site is designated is in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
Drought option –THUN Thunthridge Rib Catchment Drought Permit	No identified impact pathways to European designated sites the nearest of which is Lee Valley SPA, at a distance of 2.5 km but located in the Lower Lea catchment rather than the Rib & Quin catchment. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
Drought option –OUGH Oughton and Offley Hiz Catchment Drought Permit	No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, at a distance of 23.6 km and with no hydrological connection since none of the habitats for which this site is designated is in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
Drought option –AMER	No identified impact pathways to European designated sites the nearest of which is Chiltern Beechwoods SAC, at a distance of 12.6 km and with no hydrological connection since none of the habitats for which this site is designated is in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-RTR_WRZ7-0301 Barham Import Increase (from South East Water)	There is an agreement to transfer 2MI/d of water from South East Water to Affinity Water via Barham Interconnection Point. Chalksole Green Reservoir will require an upgrade. This is the only infrastructure requirement to support this option. No increased abstraction will be required by South East Water to support this transfer. The reservoir is located 3.4km from Lydden and Temple Ewell Downs SAC. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Due to the distances involved there are no impact pathways present and no effects are anticipated. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-RTR-WRZ7-0639: Continuation After 2020	Deal Affinity Water South East currently has an agreement with Southern Water for the import of up to 4MI/d via the Deal Connection. This scheme is a continuation of the existing agreement beyond 2020 to continue the average import of 0.0714MI/d up to 4MI/d when required. No new infrastructure is required for this scheme. The scheme will continue to provide 0.0714MI/d during average conditions and 4MI/d during peak conditions for use within WRZ7. This is a contractual agreement for an inter-company water transfer with the	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.

	use of existing infrastructure, therefore, no impact pathways are present and no effects are anticipated. Therefore no LSE.	
AFF-RTR-WRZ7-0909: Barham Continuation (After 2019/20)	Affinity Water South East currently has an agreement with South East Water for the import of 2Ml/d via the Barham connection. This scheme is a continuation of the existing agreement beyond 2019/20 to continue the import of up to 2Ml/d. No new infrastructure is required for this scheme. The scheme will continue to provide 2Ml/d during both peak and average conditions for use within WRZ7. This is a contractual agreement for an inter-company water transfer with the use of existing infrastructure, therefore, no impact pathways are present and no effects are anticipated. South East Water have undertaken HRAs of their WRMPs and identified they have sufficient surplus to provide the 2 mega-litres per day to Affinity notwithstanding the sustainability reductions that were imposed on them after the EA Review of Consents process. Therefore no LSE will arise.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-MET-WRZ1-0531 : Metering of Leftover Commercials	None identified. These Options are considered Demand Management Options such as metering. Due to the nature of these Options (audits and retrofits, or resident and commercial properties, targeted Housing Association programmes, Community Water Efficiency Schemes and metering), no realistic linking impact pathways to European designated sites have been identified. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-MET-WRZ2-0531 : Metering of Leftover Commercials		
AFF-MET-WRZ3-0531 : Metering of Leftover Commercials		

AFF-MET-WRZ4-0531 : Metering
of Leftover Commercials

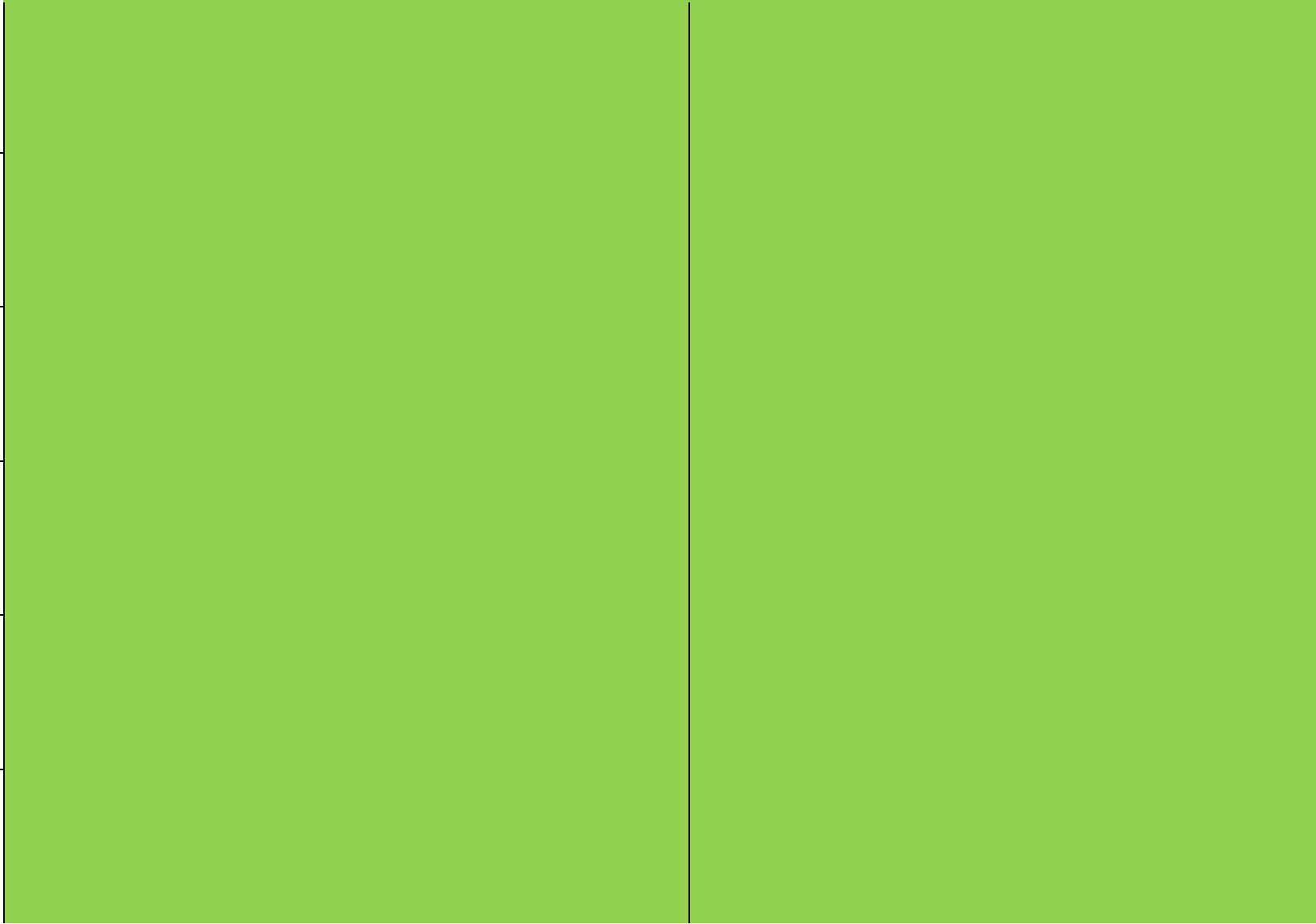
AFF-MET-WRZ5-0531 : Metering
of Leftover Commercials

AFF-MET-WRZ6-0531 : Metering
of Leftover Commercials

AFF-MET-WRZ7-0531 : Metering
of Leftover Commercials

AFF-MET-WRZ1-0904 :
Compulsory Metering fixed
network

AFF-MET-WRZ2-0904 :
Compulsory Metering fixed
network



AFF-MET-WRZ3-0904 :
Compulsory Metering fixed
network

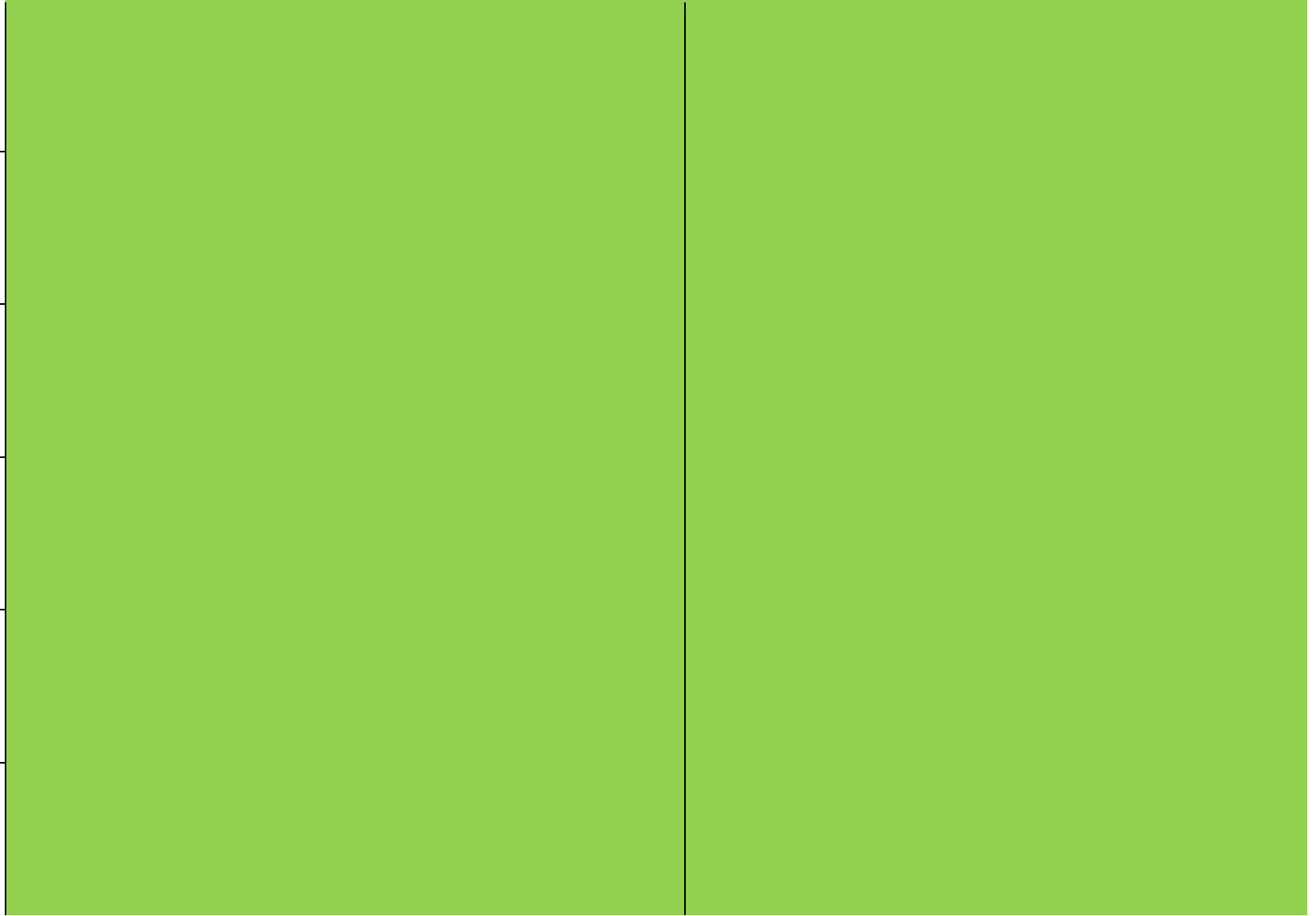
AFF-MET-WRZ4-0904 :
Compulsory Metering fixed
network

AFF-MET-WRZ5-0904 :
Compulsory Metering fixed
network

AFF-MET-WRZ6-0904 :
Compulsory Metering fixed
network

AFF-WEF-WRZ1-0567 :
Community Water Efficiency
Scheme

AFF-WEF-WRZ2-0567 :
Community Water Efficiency
Scheme



AFF-WEF-WRZ3-0567 :
Community Water Efficiency
Scheme

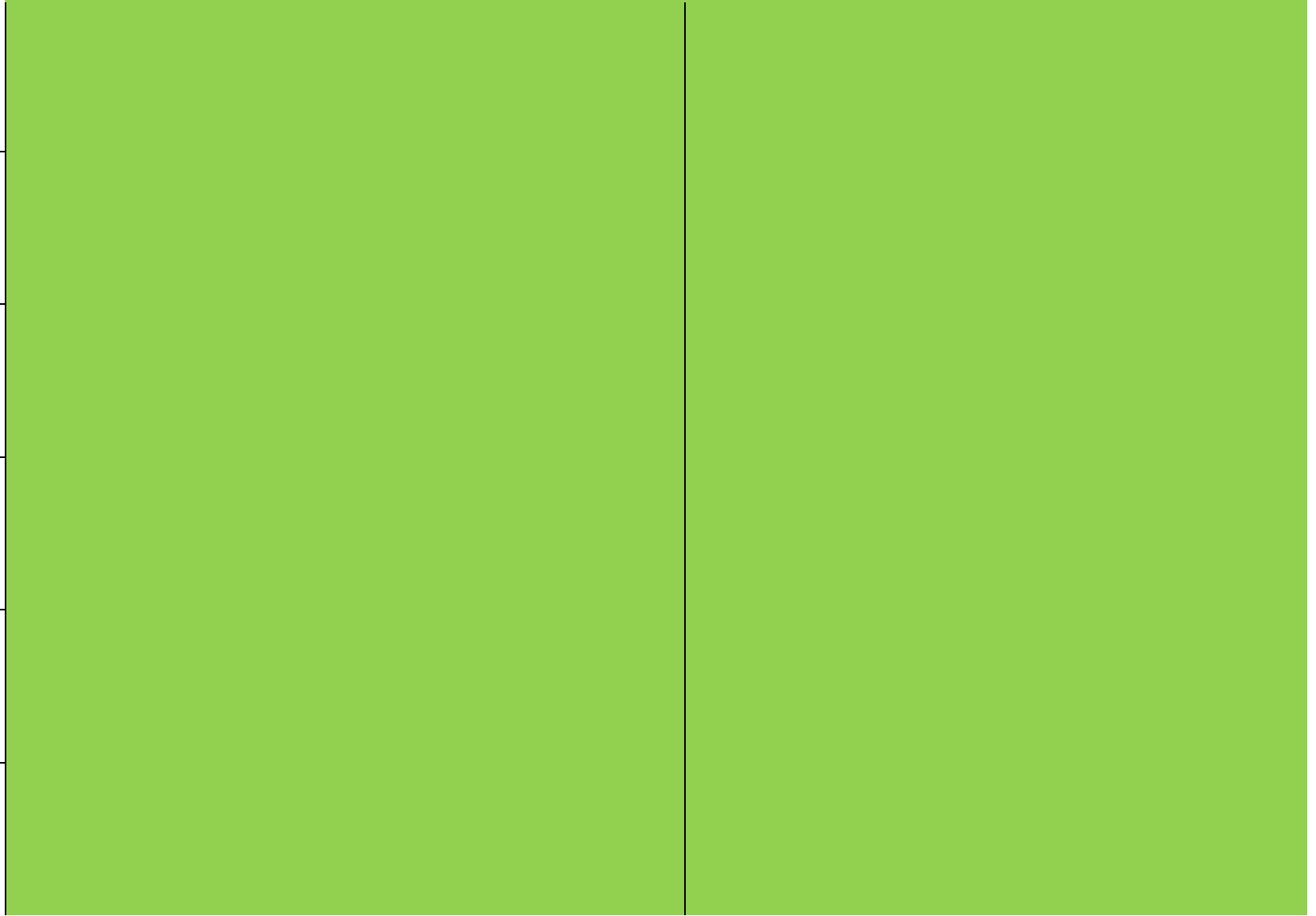
AFF-WEF-WRZ4-0567 :
Community Water Efficiency
Scheme

AFF-WEF-WRZ5-0567 :
Community Water Efficiency
Scheme

AFF-WEF-WRZ6-0567 :
Community Water Efficiency
Scheme

AFF-WEF-WRZ7-0567 :
Community Water Efficiency
Scheme

AFF-WEF-WRZ1-0901 :
Comprehensive household water
audit and retrofit



AFF-WEF-WRZ2-0901 :
Comprehensive household water
audit and retrofit

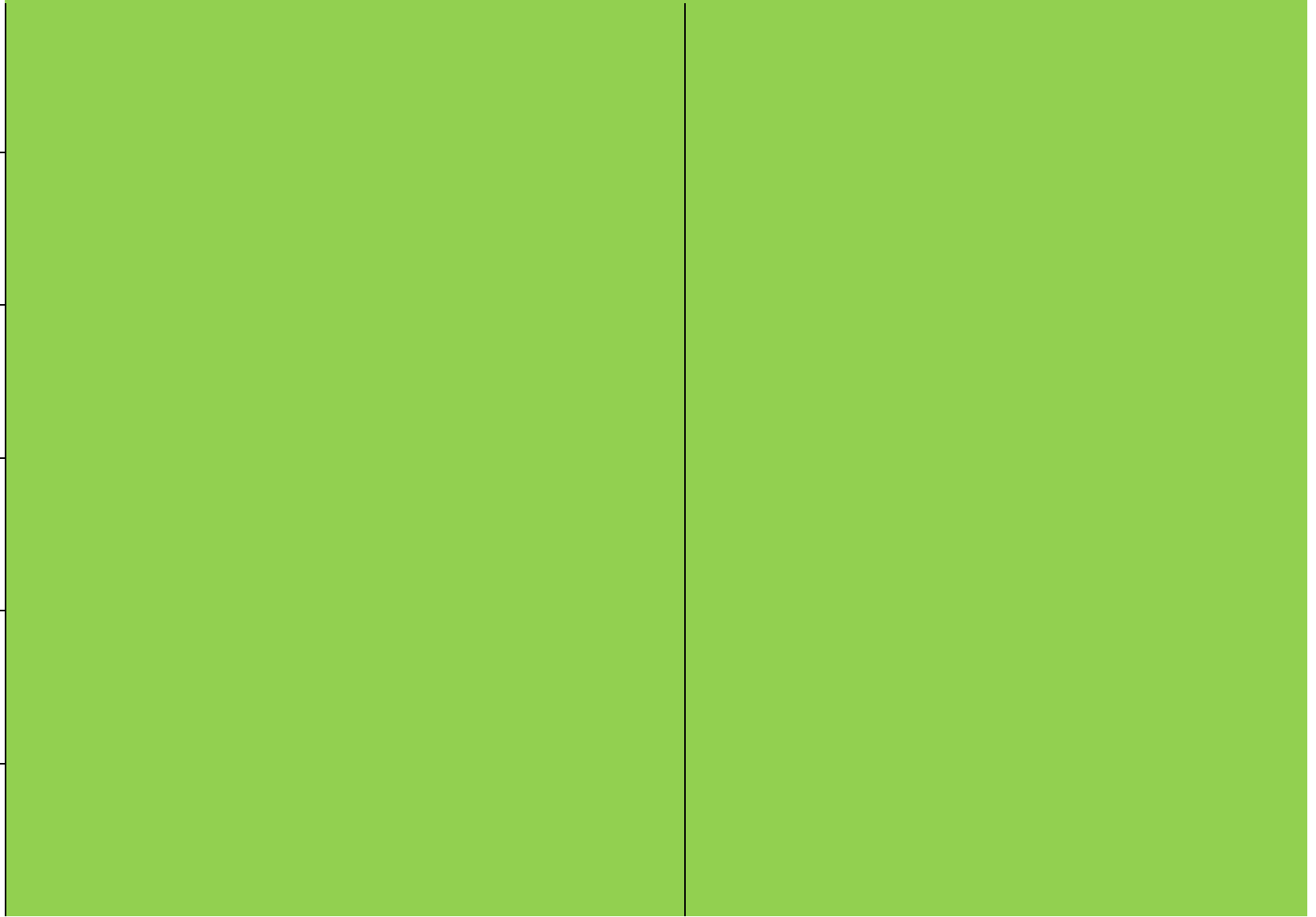
AFF-WEF-WRZ3-0901 :
Comprehensive household water
audit and retrofit

AFF-WEF-WRZ4-0901 :
Comprehensive household water
audit and retrofit

AFF-WEF-WRZ5-0901 :
Comprehensive household water
audit and retrofit

AFF-WEF-WRZ7-0901 :
Comprehensive household water
audit and retrofit

AFF-WEF-WRZ1-0569 : Housing
Associations - targeted
programme



AFF-WEF-WRZ2-0569 : Housing
Associations - targeted
programme

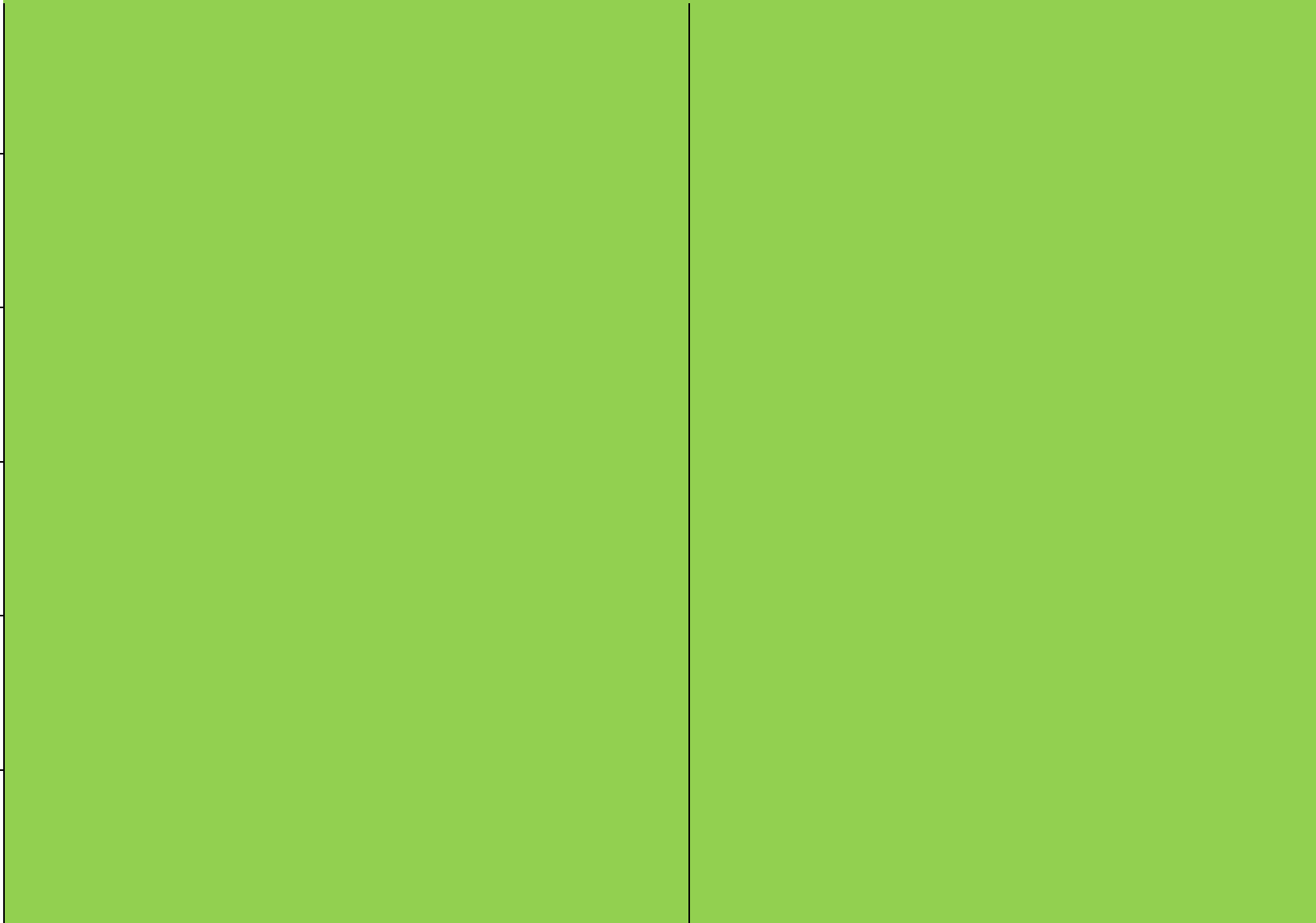
AFF-WEF-WRZ3-0569 : Housing
Associations - targeted
programme

AFF-WEF-WRZ4-0569 : Housing
Associations - targeted
programme

AFF-WEF-WRZ5-0569 : Housing
Associations - targeted
programme

AFF-WEF-WRZ6-0569 : Housing
Associations - targeted
programme

AFF-WEF-WRZ7-0569 : Housing
Associations - targeted
programme



AFF-WEF-WRZ1-1000 : Water Audits Retail - non process

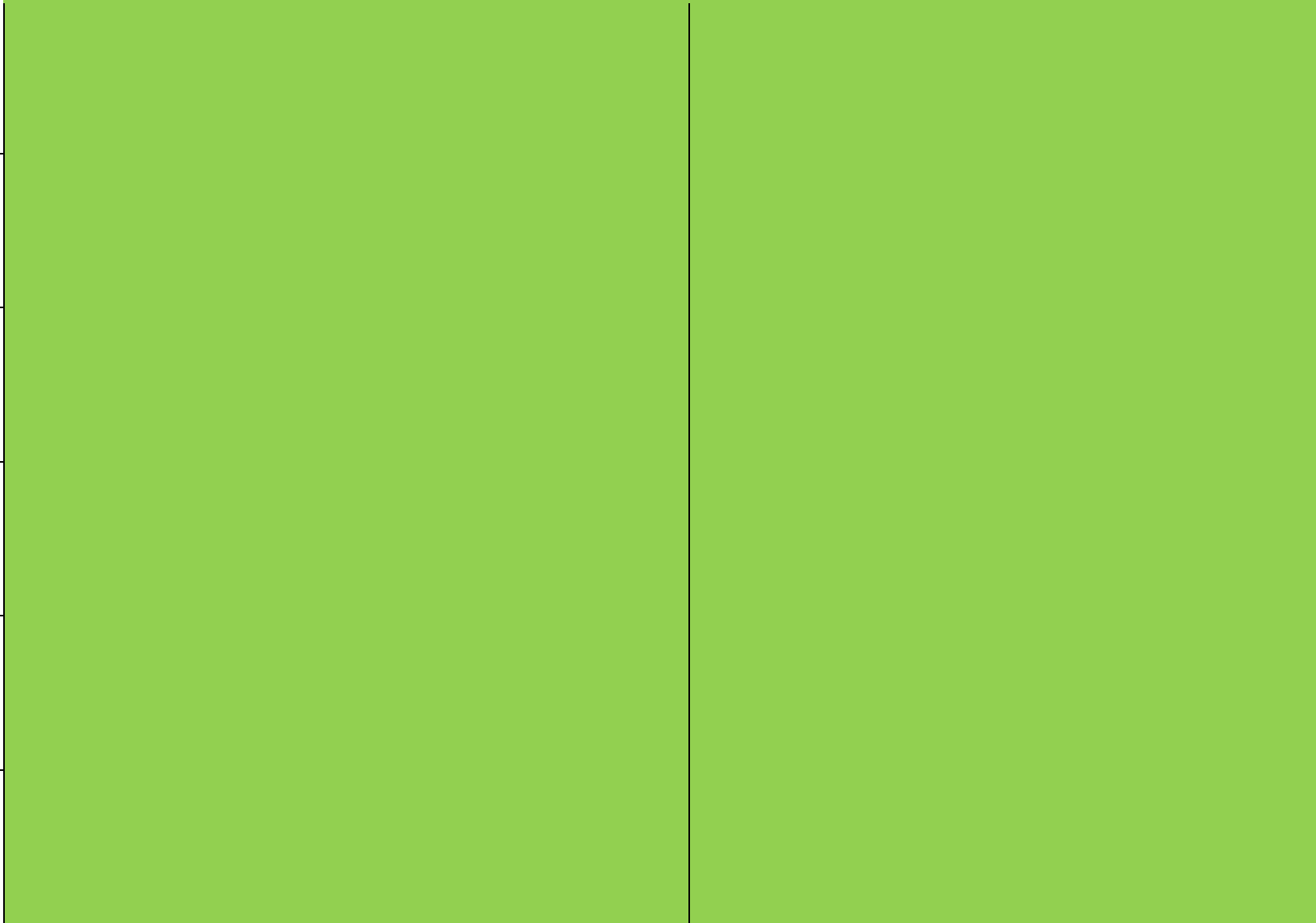
AFF-WEF-WRZ2-1000 : Water Audits Retail - non process

AFF-WEF-WRZ3-1000 : Water Audits Retail - non process

AFF-WEF-WRZ4-1000 : Water Audits Retail - non process

AFF-WEF-WRZ5-1000 : Water Audits Retail - non process

AFF-WEF-WRZ6-1000 : Water Audits Retail - non process



AFF-WEF-WRZ7-1000 : Water
Audits Retail - non process

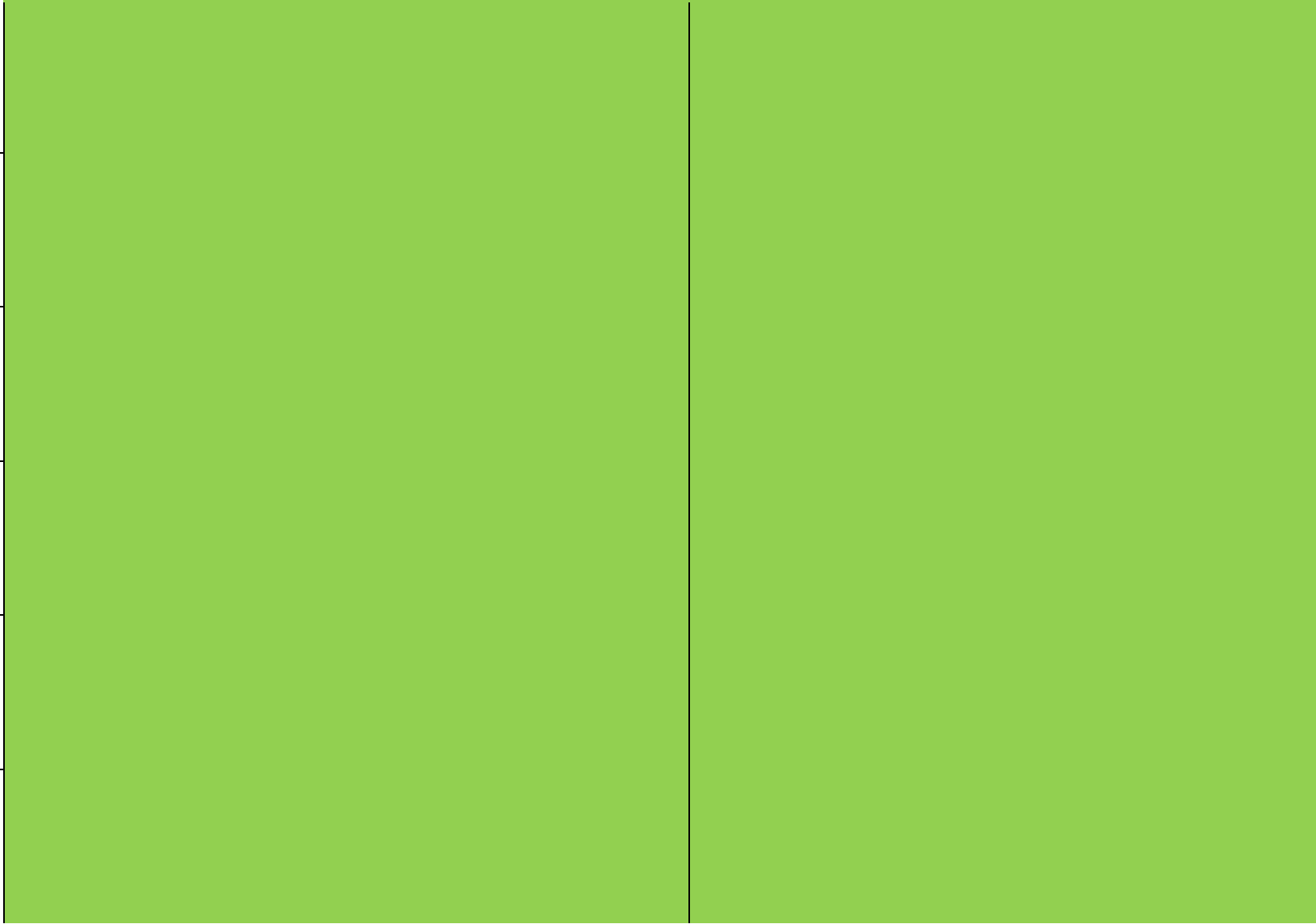
AFF-WEF-WRZ1-1050 :
Concerted action on Water
efficiency

AFF-WEF-WRZ2-1050 :
Concerted action on Water
efficiency

AFF-WEF-WRZ3-1050 :
Concerted action on Water
efficiency

AFF-WEF-WRZ4-1050 :
Concerted action on Water
efficiency

AFF-WEF-WRZ5-1050 :
Concerted action on Water
efficiency



AFF-WEF-WRZ6-1050 :
Concerted action on Water
efficiency

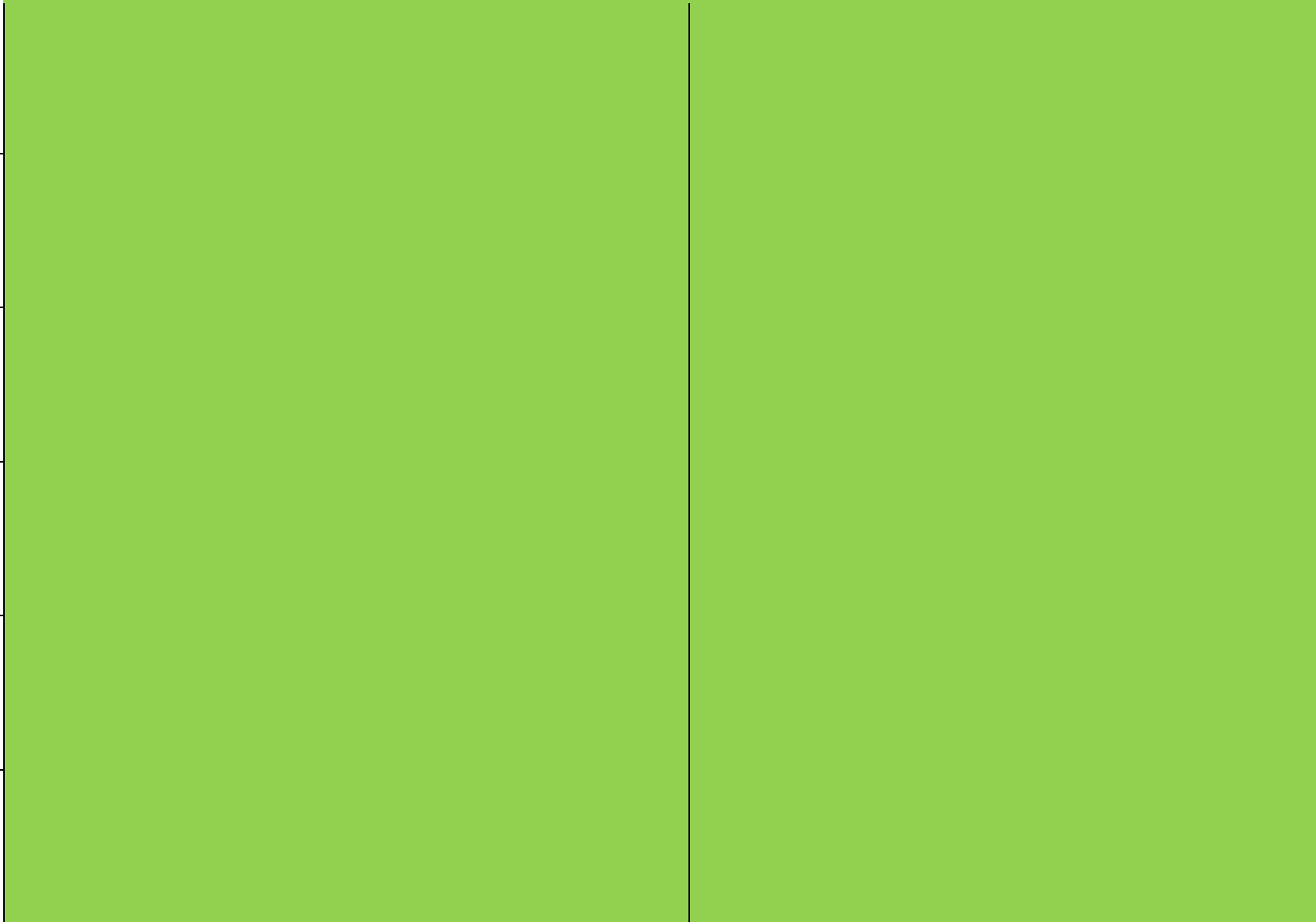
AFF-WEF-WRZ7-1050 :
Concerted action on Water
efficiency

AFF-WEF-WRZ8-1050 :
Concerted action on Water
efficiency

AFF-LEA-WRZ1-ALC4

AFF-LEA-WRZ2-ALC4

AFF-LEA-WRZ3-ALC4



AFF-LEA-WRZ4-ALC4

AFF-LEA-WRZ5-ALC4

AFF-LEA-WRZ7-ALC4

AFF-MET-WRZ1-1010 : Street level PHC (Per Household Consumption)

AFF-MET-WRZ2-1010 : Street level PHC

AFF-MET-WRZ3-1010 : Street level PHC

None identified. These Options are Demand Management Options. Due to the nature of these Options no realistic linking impact pathways to European designated sites have been identified. Therefore no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.

AFF-MET-WRZ4-1010 : Street level PHC

AFF-MET-WRZ5-1010 : Street level PHC

AFF-MET-WRZ6-1010 : Street level PHC

AFF-LEA-WRZ2-0423 : Option 423 New PRVs

AFF-LEA-WRZ1-1008 : OPTION 1008 POLICY 3: COMM PIPE RENEWAL

AFF-LEA-WRZ2-1008 : OPTION 1008 POLICY 3: COMM PIPE RENEWAL

<p>None identified. These Options relate to replacing pipelines that extend from mains pipes to private properties and are yet to be attributed spatial locations. There is potential for these Options to be screened in once spatial locations are attributed if the selected locations are likely to affect European designated sites. If this were to occur, at a project level an HRA may be required. However, this level of detail is not available at the Plan level. At the level of detail available at the Plan level it is considered that there are no realistic linking impact pathways present and these Options will not result in LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>

AFF-LEA-WRZ3-1008 : OPTION 1008 POLICY 3: COMM PIPE RENEWAL

AFF-LEA-WRZ5-1008 : OPTION 1008 POLICY 3: COMM PIPE RENEWAL

AFF-LEA-WRZ1-1012 : OPTION 1012 POLICY 2: MAINS & COMM PIPE RENEWAL - on selected DMAs

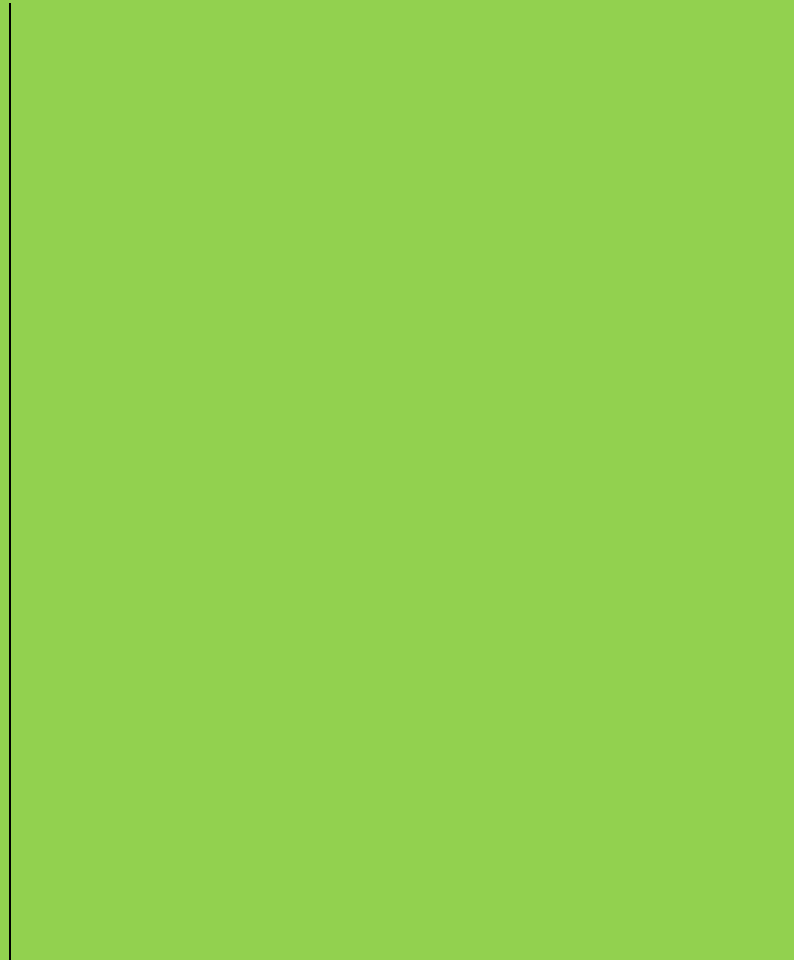
AFF-LEA-WRZ2-1012 : OPTION 1012 POLICY 2: MAINS & COMM PIPE RENEWAL - on selected DMAs

AFF-LEA-WRZ4-1012 : OPTION 1012 POLICY 2: MAINS & COMM PIPE RENEWAL - on selected DMAs

AFF-LEA-WRZ7-0955 : Option 955 reduction in DMA sizes Zone R07 only



None identified. This Option is considered a Management Option which reduces the size of a District Metering Area. Due to the nature of this Option, no impact pathways to European designated sites have been identified. Therefore, no LSE.



Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.

<p>AFF-REU-WRZ3-620 : Large user - rainwater harvesting (Luton Airport)</p>	<p>None identified. These Options relate to rainwater recycling options. Although the spatial locations not yet being identified, the distance from Luton Airport to the nearest EU designated site, Chiltern Beechwoods SAC, is 14km, while the distance from Stansted Airport to Lee Valley SPA is 16km. Considering the distance to European designated sites and the limited impact likely caused by rainwater harvesting at an airport, no likely significant effects are anticipated.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-REU-WRZ3-621 : Large user - surface water reuse (Luton Airport)</p>		
<p>AFF-REU-WRZ5-606 : Large user - rainwater harvesting (Stansted Airport)</p>		
<p>AFF-EFF-WRZ3-0180: Stevenage STW – Effluent Reuse</p>	<p>Given the location of this scheme (12km from the nearest European site: Lee Valley SPA/Ramsar site) and its nature (effluent reuse and thus no change in abstraction) there is no potential for an LSE on any European sites. The option is sufficiently remote from the nearest European site that no other impact pathways (i.e. noise or air quality during construction) will occur as Table 2-1 of this report identifies these may only arise from schemes located within 200m (air quality) or 500m (noise) of European sites.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>
<p>AFF-CTR-WRZ4-4025: Egham AMP8</p>	<p>The new booster station is not within 500m of any designated sites. One section of new main will be constructed in the carriageway of the A30 adjacent to the Staines Reservoirs components of the South-West London Waterbodies SPA/Ramsar site. However, construction noise impacts on the European site will not arise because in this location the SPA waterbodies are at a considerable elevation above the carriageway and behind a high earth embankment which will entirely attenuate noise reaching the waterbodies from construction in the carriageway. There will be no hydrological impact from pipeline construction on the SPA because Staines Reservoirs are sealed and therefore not in direct contiguity with the surrounding water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore, no LSE.</p>	<p>Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.</p>

AFF-TPO-WRZ6-4026 : 4 MI/d Trade	The scheme is to trade 4MI/d from an existing abstraction license held by a third party. No new pipeline or intakes are required and no net change in abstraction will occur. Therefore, no LSE.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
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Table 5-2: Test of Likely Significant Effects for alternatives not included in the dWRMP but which could come forward during the plan period²⁴

Option	Test of Likely Significant Effects (In Isolation)	Test of Likely Significant Effects (In Combination)
AFF-RTR-WRZ3-4016 : Minworth Strategic Transfer (100 MI/d)	None identified. At its closest the new main is located 2.7km from Chiltern Beechwoods SAC. This SAC is not vulnerable to changes in hydrological conditions since none of the habitats for which this site is designated is in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Due to the lack of sensitivities and the distance involved, there are no linking impact pathways present.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-CTR-WRZ3-0028 : Iver Arkley Transfer Upgrade	None identified. At its closest this pipeline is located 4.5km from Wormley Hoddesdonpark Woods SAC. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Due to the lack of sensitivities and the distance involved, there are no linking impact pathways present.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-ASR-WRZ6-0174 : Egham ASR	None identified This option is a speculative scheme to inject winter excess water into the confined chalk or Lower Greensand (LGS) for use in the summer peak demand period. This will involve constructing a treatment building, new pipework and a capacity upgrade of Englefield Green Reservoir. The proposed pipeline is 520m from the closest designated site Windsor Forest & Great Park SAC. However, this site is not particularly hydrologically sensitive (since none of the habitats for which this site is designated is in connectivity with a high water table), the site is over 200m from the works so no air quality issues will arise and the 500m cut off distance that is used in this HRA for lighting and disturbance impacts is already highly precautionary for a species such as violet click beetle (the only animal species for which the SAC is designated). It is therefore considered that no likely significant effects will arise.	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-RTR-WRZ3-4014: South Lincolnshire Reservoir (100 MI/d)	This scheme is a transfer of surplus raw water from Anglian Water from their Grafham Water reservoir in Cambridgeshire to Sundon. Nearest European site is Portholme SAC located 7.6km east of the connection to Graffham Water. The SAC is a dry grassland site so there is no hydrological connection and it is too far for any other impact pathways (e.g. dust). Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. No LSE.	The Affinity Water scheme is dependent on a new South Lincolnshire Reservoir being delivered by Anglian Water, which will free capacity at Grafham Water for Affinity Water to take. The new South Lincolnshire Reservoir will include a river intake on the River Witham) and a raw water delivery system to the downstream network. There are few European sites in Lincolnshire so the new reservoir can be located by Anglian Water without an adverse effect on European sites and the River Witham is not a European site. Since there are no relevant pathways of impact from the Affinity Water component (the pipeline from Grafham Water to Sundon) there is no scope for an

²⁴ There is also a second version of the Abingdon to Iver 2 scheme (option AFF-RTR_WRZ4-4012) for 100 MI/d rather than the 50 MI/d in option AFF-RTR-WRZ4-4011, but the change to yield doesn't affect the assessment already provided.

		effect in combination. If the Anglian Water scheme cannot be delivered for any reason the Affinity Water scheme will not be delivered either.
AFF-RES-WRZ3-0814: Honeywick Rye Reservoir	<p>This is an augmentation scheme proposed to help offset the Runley Wood and Periwinkle Lane 10 Ml/d sustainability reductions that are required by the Environment Agency under AMP7. The scheme involves abstracting water from the River Ouzel at Leighton Buzzard, storing it at a new fully bunded raw water reservoir at Honeywick Rye, and discharging flow to the Upper Lee River at Dunstable. The River Ouzel is not a European site and is not functionally linked to any European sites. The nearest European site is Chilterns Beechwoods SAC which is 6.4km south and consists of dry habitats. Since the scheme is intended to augment the River Lee 30km upstream of the Lee Valley SPA/Ramsar site, and to enable increased abstraction without any net change in downstream flow or volume, its effect on the Lee Valley SPA/Ramsar site will be neutral. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Therefore no LSE.</p>	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-NGW-WRZ6-0005: Horsley source recommissioning	<p>None identified.</p> <p>At its closest this source is located 5.8km from the Thames Basin Heaths SPA. None of the species for which this site is designated is in connectivity with a high water table. Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. Due to the lack of sensitivities and the distance involved, there are no linking impact pathways present.</p>	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.
AFF-RTR-WRZ7-0842 : Aldington to Saltwood Import Increase by 3Mld	<p>None identified.</p> <p>The proposed pipeline route is located 8.6 km from Dungeness, Romney Marsh and Rye Bay Ramsar site and Special Protection Area (SPA). The pipeline route is also 3.6 km from the Dungeness, Romney Marsh and Rye Bay Extension potential Special Protection Area (pSPA) and does not traverse areas of functionally-linked land (grazing marsh) for this pSPA. The pipeline route is 2.6 km from Folkestone to Etchinghill Escarpment Special Conservation Area (SAC), 5.6 km from Wye & Crundale Downs SAC and 8.7 km from Crundale Downs SAC. At its closest point Saltwood Reservoir is 2.7 km from Folkestone to Etchinghill Escarpment SAC.</p> <p>Based on Table 2-1 there is sufficient assurance on a precautionary basis that, given the distance of the scheme from the nearest European Site, significant effects from other impact pathways such as noise or air quality impacts during construction are not likely. No HRA implications identified as this option does not involve any net change in abstraction and the pipelines are at a sufficient distance from these sites that no disturbance effects would arise.</p>	Since there are no relevant pathways of impact there is no scope for an effect in combination with other projects or plans.

5.1 Summary

Table 5-1 identifies that two Options in the Revised Draft WRMP have the potential to result in a LSE upon a European site in isolation and in combination. These are:

- AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI)
- AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d/100 MI/d)

It is these two Options that are discussed in subsequent chapters of this document.

Tables 5-1 and 5-2 identify that all other Options in the Revised Draft WRMP do not pose the potential to result in a LSE on European sites and as such can be screened out from further consideration.

6. Appropriate Assessment

6.1 Affinity Water WRMP Alone

Table 5-1 identifies two Options that have the potential to result in a LSE upon a European site in isolation due to proximity. These are Options:

- AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI)
- AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d/100MI/d)

Both Option AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer and AFF-RTR-WRZ4-4011: Abingdon to Iver 2 provide for a pipeline that runs adjacent to the South West London Waterbodies SPA and Ramsar site. The part of the SPA and Ramsar site that is of relevance to these schemes is Wraysbury No.1 Gravel Pit. This site is also designated as a SSSI but it should be noted that it is the European site features (i.e. non-breeding gadwall and shoveler) rather than the notified SSSI features that are the subject of this appropriate assessment.

6.1.1 South West London Waterbodies SPA and Ramsar site

Both the SPA and Ramsar site are designated for their internationally important wintering populations of gadwall and shoveler. The birds frequently move between waterbodies (for example in response to disturbance) such that the entire complex is of importance although average bird numbers on some waterbodies are much lower than on others. The interest features of the SPA are therefore sensitive to noise and visual disturbance during the period October to March inclusive. Research indicates that at noise levels in excess of 84 dB(A) there is a flight response in waterfowl, while at levels below 55 dB there is no effect²⁵. These thresholds therefore define the two extremes for *maximum* noise levels (defined in noise analysis by the subscript suffix 'L_{Amax}' as opposed to typical noise levels which are defined by the subscript suffix 'L_{Aeq}'). Research by the same authors recommends that '[maximum] ambient construction noise levels should be restricted to be below 70dBA_{L_{Amax}} [at the bird]; birds will habituate to regular noise below this level'²⁶.

This impact cannot be investigated in more detail for this assessment as it would require details of the scheme design and construction methods, including noise estimates for construction plant and information on the number of construction workers and duration of the construction period. However, it is possible to state given the nature of the works that the noisiest activity is likely to be removing the pavement surface to install the pipes. There will be no requirement for piling. Although detailed design and construction information is unavailable at this point, there is a high degree of confidence that adverse effects on the integrity of the SPA and Ramsar site through disturbance can be avoided:

- Firstly, the road corridor within which the pipeline would be situated is separated from Wraysbury Gravel Pit No. 1 either by residential properties and gardens or a dense tree belt, or both. As such there will be a) a requirement to control noise to protect the residential properties and b) considerable visual screening of the gravel pit from the works. Moreover, gadwall and shoveler are not inherently highly sensitive to visual disturbance and are readily able to adapt (habituate) to the presence of shore-based human activities without being flushed (as opposed to water-based activities which are potentially highly disturbing);
- Given the small stretch of pipeline adjacent to the SPA (c. 200m in length) it is very likely that the preference of the contractor in any event will be to avoid construction works at this location during the winter period (the period during which disturbance may occur) as winter is the period least favourable for undertaking construction work.

Nonetheless, it is recommended that the inclusion of these options within the WRMP are accompanied by an explicit commitment that the programming and construction processes for this scheme take into account the proximity of the SPA and Ramsar site. The WRMP should stipulate that construction works on the short section of pipeline adjacent to the SPA will be programmed to avoid the winter (October to March) period entirely where possible. If this is not possible then a planning application a scheme-specific impact assessment including noise modelling will be undertaken and agreed with Natural England, to demonstrate that maximum noise levels will not exceed 70 dBA_(L_{Amax}) at the SPA boundary during the October to March

²⁵ Cutts N & Allan J. 1999. Avifaunal Disturbance Assessment. Flood Defence Works: Saltend. Report to Environment Agency

²⁶ 2Cutts, N., Phelps, A. and Burdon, D. (2009) Construction and waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA, Institute of Estuarine and Coastal Studies, University of Hull

period. If necessary to achieve noise levels below 70dBA (L_{Amax}) mitigation will be implemented. British Standard BS5228 is tailored to human receptors rather than wildlife; therefore its assessment thresholds are not appropriate to use in this case. However, it is also an excellent source of noise mitigation measures which sets out tried and tested standard mitigation measures applicable in all situations. They include: using quieter techniques, use of cowling or damping to contain/limit noise and use of close-board fencing (if required). The detailed assessment at the project level will also consider which components of the construction programme (if any) do not have any adverse effects so that these can be programmed for delivery (where feasible) during October to March.

Maximum noise levels (L_{Amax}) for any works undertaken during October to March should not exceed 70dB at the SPA boundary. Since the noisiest activity associated with the works is likely to be removing the pavement surface to install the pipes this should be possible. If it isn't possible to keep below that noise level then the relevant works must avoid the October to March period. Achieving this requirement should be entirely possible given the nature of the works. For example, hand-held pneumatic breakers typically produce noise levels of 85 dB at 1m from source (L_{Aeq})²⁷. Since noise attenuates by 6 dB for every doubling of distance²⁸ and the SPA boundary is 20m from the nearest area of open water in the SPA typical noise levels should have fallen to 55 dB and maximum noise levels will be below 70 dB. This is without any mitigation. Moreover the open water of the SPA is only that close to the route for a short stretch of c. 10m. Most of the SPA is much more distant.

it is recognised that as part of the project-level HRA, noise surveys will need to be carried out of the baseline, existing noise levels and patterns that can then be compared with the predicted construction noise levels and patterns once these have been confirmed by the contractor carrying out the work and the final construction details are confirmed. Affinity Water will consult with Natural England on the findings of the surveys and the detailed construction assessment and agree any required mitigation measures and noise thresholds that cannot be exceeded.

In addition to the low risk of noise-related disturbance the flooded gravel pits (including at the Wraysbury No. 1 Gravel Pit) are obviously in hydrological connectivity with the local water table. Depending on the depth and construction method of the pipeline there is thus potential for changes in hydrology and water quality within the SPA and Ramsar site. Although the water table in the locality is fairly high (since it is gravel and the former gravel pits have flooded), it has been possible to deliver housing, employment, tarmac roads and buried services in the same location (and in the case of the latter, at the same depth) as the proposed pipeline, which will generally follow existing road corridors.

The SPA lakes are supported by groundwater inflows from the sand and gravel aquifer of the Shepperton Gravel Member. Outflows from the Wraysbury No. 1 Gravel Pit lakes via groundwater flow are also likely with the general groundwater flow direction likely to be converging on the River Thames in a southerly and south westerly direction. Therefore inflows to the Wraysbury No. 1 Gravel Pit lakes can be expected from the north and outflows toward the south. Therefore, the likely groundwater flow direction to and from the lakes is in a north to south, south westerly direction, and therefore the presence of the pipeline on the western side of the lake is not in the flow direction providing inflows to the lakes, except potentially when the River Thames is at very high levels. If groundwater inflows could occur from the west, the pipeline may affect groundwater flows to the lakes only if it obstructs flow. For this to occur it would need to form an obstruction of a significant portion of the gravel aquifer thickness, through which groundwater flows.

Geological logs in the area have been reviewed to determine the likely geological profile where a trench would be excavated and a pipe laid, and the general thickness of the gravel aquifer in the area. Soil and made ground are recorded to depths of 0.3-1.3m. Some logs then record a discrete sand layer underlain by gravel while other logs refer to sand and gravel as a combined unit (e.g. sandy gravel). A discrete sand layer is recorded from 0.6-1.8m depth. This is underlain by sandy gravel to between 6.4m and 10m depth, where London Clay has been recorded. Some boreholes are terminated before encountering London Clay at 10m depth. Therefore the base of the gravel is an undulating surface between 6.4m depth to in excess of 10m depth in the area. Rest water levels are recorded at elevations less than 1m depth to greater than 4m depth. Generally groundwater may be considered to be typically at approximately 2m depth though in winter depths are likely to be approximately 1m. Therefore the aquifer is anticipated to have a typical saturated thickness of at least 5m and in some places 10m.

²⁷ Defra. 2005. Update of Noise Database for Prediction of Noise on Construction and Open Sites
http://randd.defra.gov.uk/Document.aspx?Document=NO01102_5302_FRP.pdf

²⁸ <https://www.acoustical.co.uk/distance-attenuation/how-sound-reduces-with-distance-from-a-point-source/>

Detailed design for the pipeline is not known at this stage but is likely to be at a depth of 1 to 1.5m. This is above the water level in the adjacent gravel pits, indicating that the typical groundwater level lies below the pipeline depth. From the local borehole information available it is concluded that it is unlikely the pipeline would be situated beneath the water table. At high groundwater elevations the pipeline may sit at the water table elevation, but this is considered unlikely as it would mean the water table would pose a serious flood risk for the surrounding housing and employment. Even then, the pipeline would impede a negligible proportion of the aquifer saturated thickness and thus not affect groundwater movement or levels. There is anticipated to be 5-10m of available aquifer for groundwater to flow to and from the Wraysbury No. 1 Gravel Pit lakes, and therefore the pipeline is not considered to create a significant impediment to groundwater through flow.

Construction activities associated with this type of works have the potential to result in other physical impact relating to dust emissions and pollution runoff. However, the works will not generate significant dust given their nature and the gravel nature of the substrate; dust generation generally occurs with friable materials like (for example) chalk or limestone rather than gravel. The most dust-generating activity will probably be removal of the pavement surface but there are guards built into the equipment which will limit dispersal except in the immediate vicinity of the operator and the waterbodies will be protected by the thick tree belt that lies between them and the works. As such it is considered that there will be no adverse effects on the SPA/Ramsar site through this pathway, although this will of course require verification as part of the planning application. With regards to pollution, it is in any event a legal offence to pollute any watercourse or groundwater under the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 and Environmental Permitting (England and Wales) Regulations 2010. There will be no chemicals required for the installation and burial of a water supply pipeline and to comply with existing water protection regulations it will be a requirement of any planning permission and/or Affinity Water's standard environmental protection procedures that any fuelling takes place away from site in an appropriate location. It is therefore considered that there will be no adverse effects on the SPA.

Although there is thus good evidence to conclude that no adverse effect on integrity would arise, it is recommended that the inclusion of this option within the WRMP is accompanied by an explicit commitment to carefully design the pipeline, informed by geotechnical and hydrogeological investigations as necessary, to ensure that there is no requirement for dewatering of the excavation, or that any dewatering that is required is returned immediately to ground. These measures would enable the pipeline to be installed at a suitable depth and in a suitable manner that groundwater continuity to the gravel pits would not be disrupted and groundwater quality would be protected.

All construction work will be carried out in accordance with industry best practice mitigation measures for water pollution control (e.g. ensuring bunding of all plant using hydrocarbon fuels, bunding of any chemicals or fuels stored on the construction site, use of temporary storage to retain any polluted runoff on site to avoid it entering any watercourse). Industry best practice mitigation measures for dust suppression will be applied. Monitoring of compliance with best practice measures and regulations will be carried out by an Environmental Clerk of Works appointed by Affinity Water to ensure all mitigation measures are adhered to.

Affinity Water should work closely with Natural England and the SAC/Ramsar site managers to agree the specific mitigation measures to be included in the project-specific HRA of both schemes to support applications for planning permission and environmental permits. The agreed mitigation measures will be expected to form part of planning conditions and/or conditions of relevant environmental permits, and their implementation managed through contractual obligations with supervision from an Environmental Clerk of Works appointed by Affinity Water.

With these mitigation recommendations included in the Revised Draft WRMP, it is considered that an adequate mechanism will be in place to ensure that adverse effects on site integrity will be avoided for these two Options (AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI) and AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d)) either alone or in combination with each other. Moreover, there are five alternative supply options that are not included in the rdWRMP but are included in Affinity Water's alternative "futures" under the adaptive planning approach (runs 7, 9, 12 & 13) and which could come forward to make up for any supply shortfall in the unlikely event that the mitigation for these two options could not be avoided and thus the options could not be delivered. All five of these alternative options have been assessed and deemed not to pose likely significant effects. There is therefore a high degree of confidence that the dWRMP could be delivered without an adverse effect on the integrity of South West London Waterbodies SPA or Ramsar site.

6.2 WRMP in Combination with Other Projects and Plans

It is a requirement of the Conservation of Habitats & Species Regulations 2017 (as amended) that impacts are not considered wholly in isolation but that any in combination effects are identified when the Scheme is considered alongside other projects and plans. Within this report in combination assessment between Options within the Revised Draft WRMP are also included.

Wraysbury No. 1 Gravel Pit lies within the Royal Borough of Windsor & Maidenhead. The district's Local Plan is still under Examination but makes provision for at least 14,240 new dwellings over the plan period from 2013 to 2033, although there is only one allocated site at Wraysbury, for thirty dwellings. However a net increase in housing and residents is likely to result in increased recreational use of the park at Wraysbury Reservoir with accompanying potential for disturbance risk. However, with delivery of the mitigation measures set out for schemes 4010 and 4011 there will be no in combination effects as potential for disturbance arising from these options will be removed.

In this section in combination impacts are also considered in relation to Water Resource Management Plans (WRMP) of neighbouring water companies and their potential interactions with the Affinity Water' Revised Draft WRMP Options, the Environment Agency's Abstraction Licensing Strategies of catchments that have potential to interact with European designated sites and also the effects of the interaction between Options provided within Affinity Water's Revised Draft WRMP.

The Water Resources South East (WRSE) Planning Group produced a report titled 'Environmental Information to Inform Water Company SEAs - Identification of potential for cumulative effects between water companies for WRMP19 SEAs' in summer 2018 which contains a region wide cumulative effects assessment. That assessment has been referenced in considering the potential for in combination effects between the Affinity Water rdWRMP and the emerging rdWRMPs of other water companies. The review process of other emerging rdWRMPs undertaken for this HRA has only identified potential cumulative effects relevant to the Affinity Water rdWRMP with the Thames Water rdWRMP, notably through the South East Strategic Reservoir (formerly Abingdon Reservoir) which is now a joint scheme between the two water companies and three scheme options that are in close proximity to the South West London Waterbodies SPA/Ramsar site (Kempton Park Water Treatment Works (WTW), Datchet groundwater scheme and South West London Pipelines (Chalk Streams)). This HRA has also considered potential interaction with other non-WRSE WRMPs, notably in the East of England. However, since no supply options are proposed for the East of England area there is no potential for in combination effects with those WRMPs covering the East of England.

To inform the in combination assessment of the South East Strategic Reservoir option to be provided jointly by Affinity Water and Thames Water, AECOM has undertaken their own assessment and reviewed the Thames Water rdWRMP HRA²⁹. AECOM has reviewed the conclusions reached and concurs that potential impact pathways that could result in a likely significant effect as a result of the options provided within the Thames Water rdWRMP that could interact in combination with the Affinity Water rdWRMP and the schemes that are to be jointly delivered can be suitably mitigated and that no adverse effect on the integrity of European sites will result.

Table 5-1 identifies that two Options have the potential to result in a LSE upon a European site in combination. These are:

- AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50MI)
- AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50MI/d)

These two Options both have the potential to result in Likely Significant Effects on the South West London Waterbodies European site in combination with each other and with three schemes in the Thames Water rdWRMP: Kempton Park WTW, Datchet groundwater scheme and South West London Pipelines (Chalk Streams), which are all linked to the South West London Waterbodies SPA and Ramsar site.

6.2.1 Kempton Park WTW, Datchet Groundwater scheme and South West London Pipelines (Chalk Streams)

Kempton Park WTW which was taken to appropriate assessment in the HRA of the Thames Water rdWRMP due to construction period disturbance impacts between 2071 and 2075. The Kempton Water Treatment Works is located approximately 520m from the South West London Waterbodies SPA & Ramsar. The proposed new shaft is

²⁹ Ricardo (2018) Thames Water Revised Draft Water Resources Management Plan 2019 Habitats Regulations Assessment

approximately 220m from the SPA & Ramsar site. As such the proposals carry a risk of impacting upon the European sites and/or their qualifying features, namely over-wintering gadwall and shoveler. In addition, there is a non-designated waterbody at Kempton racecourse to the south that could be used as off-site functional habitat by the qualifying feature bird species of the SPA/Ramsar Site. Ultimately, the HRA of the Thames Water rdWRMP identified a series of construction-period mitigation measures very similar to those identified in this HRA of the Affinity Water rdWRMP for schemes 4010 and 4011. This enabled the HRA to conclude no adverse effects on integrity. Moreover, the Kempton WTW will be constructed between 2071 and 2075 and therefore long after schemes 4010 and 4011 are completed. As such no 'in combination' adverse effects will arise.

The Datchet Groundwater scheme was considered in the HRA of the Thames Water rdWRMP to require investigation for potential disturbance impacts of construction on wintering birds associated with the South West London Waterbodies SPA/Ramsar site. However, a conclusion of no likely significant effect was ultimately reached because the scheme does not have any pipeline element and construction consists solely of a minor scale upgrade to existing assets (borehole pump and work inside the existing Water Treatment Works). AECOM agrees that no adverse effect would arise, for the reasons given and also due to a combination of distance from the SPA waterbodies (c.800m) and the fact that closer waterbodies like the Queen Mother reservoir and Datchet gravel pit are poor for gadwall and shoveller due to the heavy disturbance levels from sailing/water-skiing and screened from visual disturbance due to treelines and (for the reservoir) high embankments. As a result effects in combination with the Affinity Water options will not arise.

South West London pipelines (chalk streams) scheme was also taken to appropriate assessment in the HRA of the Thames Water rdWRMP due to construction period disturbance impacts, this time during 2033 and 2037. The Walton to Chessington pipeline runs adjacent to the South West London Waterbodies SPA & Ramsar and another reservoir that is not designated but has the potential to be utilised as off-site functional habitat by the qualifying bird species of the SPA & Ramsar. As such the proposals carry a risk of impacting upon the European sites and/or their qualifying features, namely over-wintering gadwall and shoveler. Ultimately, the HRA of the Thames Water rdWRMP identified a series of construction-period mitigation measures very similar to those identified in this HRA of the Affinity Water rdWRMP for schemes 4010 and 4011. This enabled the HRA to conclude no adverse effects on integrity. As such, since this scheme and the two Affinity Water schemes will be implementing appropriate mitigation even if construction occurs simultaneously, no 'in combination' adverse effects will arise.

6.2.2 South East Strategic Reservoir

As a jointly developed scheme between Thames Water and Affinity Water, the South East Strategic Reservoir is included in the Revised Draft WRMPs of both water companies. This HRA has therefore addressed this reservoir in this section on in-combination effects given the proposed joint promotion and ownership status.

This appropriate assessment of the Affinity Water options AFF-RTR-WRZ1-4010: Abingdon Reservoir to Harefield Transfer (50Ml/d) and AFF-RTR-WRZ4-4011: Abingdon to Iver 2 (50Ml/d) – which incorporate the South East Strategic Reservoir as an integral part of each scheme – has considered whether there may be adverse effects on any European site in relation to this component of these two options, either alone or in combination with other WRMP options, plans or projects.

The HRA of the Thames Water Revised Draft Water Resource Management Plan 2019³⁰ investigated the potential impacts of this reservoir in detail. This investigated the potential for the reservoir to result in likely significant effects on Cothill Fen SAC (located 2.7km from the reservoir), and Hackpen Hill SAC and Little Wittenham SAC (located 7km from the reservoir) and Oxford Meadows SAC (located more than 15km from the reservoir) in combination. The analysis undertaken for the Thames Water rdWRMP HRA has been re-evaluated for this HRA.

Cothill Fen SAC is designated for its alkaline fens and alluvial forests. It is located 2.7km from the reservoir. Hackpen Hill SAC is designated for its semi-natural dry grasslands and scrubland on calcareous substrates and early gentian *Gentianella anglica*. It is located 7km from the reservoir. Little Wittenham SAC is designated for its population of great crested newts. Similar to Hackpen Hill SAC, it is located 7km from the reservoir.

The HRA of the Thames Water Revised Draft Water Resources Management Plan³¹ considered the air quality impact pathway in relation to Hackpen Hill SAC, Little Wittenham SAC, and Cothill Fen SAC. It was concluded that there would be no likely significant effects on Cothill Fen SAC, Hackpen Hill SAC and Little Wittenham SAC due to atmospheric pollution as a result of the distance separating the scheme from these sites. The Thames Water

³⁰ Ricardo (2018) Thames Water Revised Draft Water Resources Management Plan 2019 Habitats Regulations Assessment

³¹ Ibid

Revised Draft WRMP HRA also concluded that there would be no likely significant effects arising from hydrological changes on these same European sites. No in-combination likely significant effects between the reservoir scheme and any other projects or plans were identified in the Thames Water HRA.

AECOM agrees with the analysis and concludes there would be no adverse effects on the integrity of the above SACs in relation to the reservoir scheme as set out in the Thames Water Revised Draft WRMP HRA. For the purposes of this appropriate assessment, it can therefore be concluded that the reservoir would have no adverse effects on Hackpen Hill SAC, Little Wittenham SAC and Cothill Fen SAC.

Oxford Meadows SAC is designated for its lowland hay meadows and creeping marshwort *Apium repens*. It is located more than 15km from the South East Strategic Reservoir. There is no risk of an adverse effect on this European site from the South East Strategic Reservoir scheme due to the distance involved and lack of hydrological or groundwater connectivity.

7. Appropriate Assessment Conclusions

Taking the two Affinity Water options (AFF-RTR-WRZ1-4010 and AFF-RTR-WRZ4-4011) in their entirety as required for the appropriate assessment, there are no pathways that would lead to the South East Strategic Reservoir having any adverse effects on the South West London Waterbodies SPA and Ramsar site, nor are there any pathways that would lead to the downstream abstraction and raw water pipeline having any adverse effects on the integrity of Hackpen Hill SAC, Little Wittenham SAC, Cothill Fen SAC and Oxford Meadows SAC. **Subject to the application of the mitigation measures as described in Section 6.1.1**, there will be no adverse effects of these two options on the integrity of the South West London Waterbodies SPA and Ramsar site.

In-combination effects have been considered in relation to the Local Plan of the Royal Borough of Windsor & Maidenhead and other relevant WRMP options, projects and plans. Aside from the two Affinity Water options acting in combination with each other, there are also three options included in the Thames Water Revised Draft WRMP that could potentially lead to adverse in combination effects. The appropriate assessment has concluded that there would be no in combination adverse effects arising from the construction or operation of these five options on the integrity of any European site, subject to the application of mitigation measures in relation to the South West London Waterbodies SPA and Ramsar site only.

No other WRMP options, projects or plans have been identified that could lead to any adverse in combination effects with the two Affinity Water options on the integrity of any European site.

It is therefore concluded that Affinity Water's options AFF-RTR-WRZ1-4010 and AFF-RTR-WRZ4-4011 will have no adverse effects on the integrity of any European site during construction or operation.

8. Abbreviations and Glossary

HRA	Habitats Regulations Assessment
AA	Appropriate Assessment
IROPI	Imperative Reasons of Overriding Public Interest
LSE	Likely Significant Effect
SPA	Special Protected Area
SAC	Special Area of Conservation
Ramsar	Designated under the Ramsar Convention
pSPA	potential Special Protected Area
cSAC	candidate Special Area of Conservation
SSSI	Site of Special Scientific Interest
EC	European Commission
DCLG	Department for Communities and Local Government
RSPB	Royal Society for the Protection of Birds
UKWIR	UK Water Industry Research Ltd.
RoC	Review of Consents
UTRD	Upper Thames Resource Development
EFI	Environmental Flow Indicator
CAMS	Catchment Abstraction Management Strategy
TCAMS	Thames Catchment Abstraction Management Strategy
AP	Assessment Points
GS	Gauging Station
WRMP	Water Resource Management Plan

Appendix A Locations of European Designated Sites

