This page is intentionally blank.

JBA Project Manager

Richard Pardoe MSc MEng Pipe House Lupton Road Wallingford OX10 9BS

Revision History

Revision Ref/Date	Amendments	Issued to
S3-P01		

Contents

1	Introduction	7
1.1	Background	7
1.2	General approach	8
2	Considerations for Water Neutrality	9
2.1	Accepted definitions	9
2.2	Working towards a water neutrality plan	9
2.3	Spatial scale	10
2.4	Temporal scale	10
2.5	Achieving Water Neutrality	11
3	. 0 222534e Tiro (\$12) \$ ნასწინე დებ W ემ ი ლი 0 38267 თი 6 595.32 841.92 reW* nBT/F9 11.	.04 Tf1 0 0 1 5 32 .14 596.3 T

Introduction to the Water Re0887312oct-6(Rce2(n) Man4(al)g4(e)6(v)m14(o)e5(n)-5(d)-3(r) P 3.1

7.3.5	Application of BREEAM standards	33
7.3.6	Rainwater harvesting	33
7.3.7	Wastewater redirection	34
7.4	Summary	34
7.5	Conclusions and recommendations	38
8	Water Neutrality in Chichester	38
8.1	Growth in Chichester	38
8.2	Demand scenarios	38
8.3	Offsetting options	39
8.3.1	Leakage reduction	39
8.3.2	Metering	39
8.3.3	Household visits	39
8.3.4	Non-household visits	40
8.3.5	Application of BREEAM	40
8.3.6	Rainwater Harvesting	41
8.3.7	Wastewater redirection	41
8.4	Summary	41
8.5	Conclusions and recommendations	44
9	Future work	45
9.1	Discussion points	45
9.2	Next stages	47
1 !a+ a£	Talalaa	
	Tables	
	Key elements of the WRMP19 strategy (Central supply area)	13
	Demand scenarios	19
	Growth forecast for CBC	31 31
	2 Demand scenarios 3 Number of properties requiring home visit in each demand scenario	33
	For Office of Properties requiring notice visit in each demand scenario	36
	Growth in Chichester	38
	2 Demand scenarios	38
	Number of properties requiring a home visit in each scenario	40
	Offsetting options for Chichester (in isolation)	42
Table 9.1	Stakeholder comments	45
1.1-7		
	Figures	
-	1 Sussex North Water Resource Zone	7
-	2 Location of abstractions in relation to protected sites	8
•	1 Consumer water efficiency measures	21
	2 Example mandatory water label from Australia 3 Domestic water use	22 23
•	1 Location of Crawley WwTW relative to the Sussex North WRZ	23 28
	1 Additional water demand scenarios in Crawley	31
	1 Water demand in Chichester in various scenarios	39
_		

1 Introduction

1.1 Background

Southern Water supplies water to Crawley Borough, Horsham District, the northern part of Chichester District and South Downs National Park Authority from its Sussex North Water Resource Zone (WRZ). Within this WRZ there are a number of water sources, one of which is a groundwater source at Hardham one of a number of groundwater and 5()-93(R)fa1.92-(e)-5(r)5()-93(R)-3(e)6(s)-8(o)5(u)-5(r)-und

Figure 1.2 Location of abstractions in relation to protected sites

JBA Consulting has been commissioned to provide a water neutrality assessment to calculate the individual and in-combination impacts of the currently proposed development on water demand within Sussex North WRZ, providing advice on specific measures required to support and achieve water neutrality.

1.2 General approach

The study will be broken into three parts.

Part A: Individual Local Authority Areas Assessment

Using forecasts of growth during the plan period provided by Crawley Borough Council and Chichester District Council, the study will need to calculate the individual impact of each local authority on water resources. The contribution that could be theoretically possible from different measures (at this stage we are just considering the approximate order of magnitude impact of each measure), both under control of the council and other stakeholders will be presented. As part of

2 Considerations for Water Neutrality

2.1 Accepted definitions

The starting point for a definition of water neutrality is usually the definition developed by Therival et al. (undated):

"For every new development, total water use in the region after the development must be equal to or less than the total water-use in the region before the new development." 1

This definition was adapted by the EA in 2009 for use in the Thames Gateway feasibility study to include mention of offsetting:

"... total demand for water should be the same after new development is built, as it was before. That is the new demand for water should be offset in the existing community by making existing homes in the area more water efficient." 2

Both definitions allow flexibility in the application in terms of spatial scale and context, however the inclusion of offsetting in the second definition may shift the focus away from efforts to reduce the demand in new developments as much as possible before offsetting is applied. For this reason, Waterwise have adopted a new definition in their recent review of water neutrality in the UK.

"For every new development, water demand should first be minimised, then any remaining water demand offset, so that the total demand on public water supply in a defined region is the same after development as it was before" ³

This tighter definition, whilst appropriate for some studies, may miss opportunities to address unsustainable abstraction at Hardham through other means not relating directly to the public water supply.

Although the title of this study is about water neutrality, the objectives of the work should not be obscured by the definition or constraints of water neutrality. The objective is for growth within the study area to be accommodated sustainably, without contribte5(u00008871 05()8-54(t)-3(r)-6()8-)6(a)-12()8-[d)-3(e15(t)--3(r)5(i)(opm6(n)-4(al)-4)).

the technical assessments outlined in section 1.2 are the first steps towards developing a water neutrality plan which will need to go well beyond the scope of previous water neutrality assessments, which have been desktop exercises presenting how water neutrality could be achieved. In or

2.5 Achieving Water Neutrality

Achieving water neutrality involves a twin track approach. First the demand for water from the new development must be reduced as far as is practicable, then this remaining demand should be offset within the region. In following this approach, the volume that requires offsetting can be reduced, reducing the cost of the overall scheme. This is noted in the Waterwise neutrality definition, and they define three steps to achieve water neutrality in their recent review:

Reduce water demand in the new development through improvements in efficiency

Re-use water where possible

And finally offset the remaining water demand from new development.

Southern Water has an ambitious target in its 2019 Water Resource Management Plan (WRMP19) that aims to reduce household water consumption to 100 litres per person per day on average by 2040. Their plan includes many measures typically associated with achieving water neutrality, such as home visits and smart metering.

Section 3 will therefore first identify what measures are currently planned in the Sussex North WRZ as part of activities by Southern Water. Section 4 will then go on to identify demand reduction and offsetting measures that may be used, highlighting where there

that a benefit may be double counted.

Where an action has already been factored into the WRMP, it should not be used to subsequently offset growth to achieve neutrality.

and restoring habitats under the Habitats Regulations (Special Areas of Conservation), safeguarding and restoring sites of Special Scientific Interest (SSSIs), and protecting section 41 habitats and species (habitats and species of principle importance for the conservation of biodiversity under National Environment and Rural Communities Act 2008), as well as ensuring waterbodies do not deteriorate under the water framework directive and improve where this is achievable. This programme also has to contribute n, including

are working with the EA to identify and implement short-term mitigation actions to reduce the risk to customers and the environment in parallel with implementing the supply and demand schemes set out in its WRMP19.

Another element in the WRMP19

Carrying out free home visits, designed to provide water saving information, advice, and bespoke water saving product installation

Education programmes in primary and secondary schools Providing information via the SW website on water saving

These are included in the baseline demand forecast before the inclusion of additional options identified in the WRMP.





water neutrality, more ambitious targets, particularly on larger developments should be considered

Ofwat report into long term reductions in water demand

Ofwat published a study in 2018 into the long-term potential for reductions in household water demand¹⁰. In this report, different scenarios for future water use were created based on a range of drivers, public acceptance, policy ambition, and factors such as climate change, resulting in different levels of ambition in terms of the scope for PCC r

Their research showed that a demand as low as 49l/p/d was possible with high tech , innovative tariffs and

-per- As this study requires the development and adoption of new technology, and a significant shift in behaviour, we consider it to be too ambitious for a study on water neutrality for application during the next twenty years. However, it provides a useful indication for what might be achieved in the future.

An ambitious but more realistic scenario was modelled where water scarcity is widely recognised as an important issue, markets in water resources and water services results in widespread competition and local providers delivering integrated services. It includes extensive use of RwH and GwR as well as some smart devices. This scenario resulted in a PCC of 62 l/p/d.

The Ofwat report also presents a scenario based on the installation of water efficient fittings, changing behaviours (less baths, minimising running taps etc.), maximising use of eco settings on appliances such as washing machines and dishwashers, and the use of water butts in the garden. In this scenario, a water use of 86 l/p/d was achieved.

This is supported by research conducted by

Figure 4.1 Consumer water efficiency measures (adapted from Adapted from Booth and Charleswell 2014)

4.4 Education

Despite a few recent news stories about future water shortages in England, awareness of water scarcity is fairly low, and some way behind awareness of climate change and energy use.

Raising awareness of the need to save water, the reason and benefits of fitting water efficient devices and the importance of maintaining existing efficient devices where already fitted are an important part of demand reduction activities, and in maintaining that reduction over time.

It is difficult to quantify the impact an education programme will have directly on PCC,
and so no specific figure for demand reduction will be included within calculations.
bllow 068 867;1 8 867 W 00 1509 5e 8 2 m8 r4 1e 1902 t t real N *e of 1 Barat Toll6 - 25 m (c1 a) vna) r 66 3 6 533 2 f e vm pis 4 (1_i) vn t 4 g 050 3 p 26 12 0 e W * n B T / F 1
any water neutrality plan.

4.5 Water labelling

Over time, water companies have reported an erosion of the benefits of fitting/retro-fitting water efficient fittings in the UK, as they are replaced by inefficient fittings. This points to either a need for rolling programmes of retro-fitting or mandatory efficiency requirements for fittings and appliances.

4.6 Rainwater harvesting

Rainwater harvesting (RwH) is the capture of water falling on buildings, roads or pathways that would normally be drained via a surface water sewer, infiltrate into the ground or evaporate. In the UK, this water cannot currently be used as a drinking water supply as there are strict guidelines on potable water, but it can be used in other systems within domestic or commercial premises.

The local hydrology and the end use of the water harvested should also be taken into account when considering RwH systems to ensure that the expected benefit is realised. For example, a large new development in a headwater catchment can alter the hydrological regime by reducing the volume of water that is infiltrated to recharge groundwater or makes its way back to surface water bodies. If rainwater that would otherwise be infiltrated is collected and used for toilet flushing, it will end up in the sewer system, and discharged elsewhere possibly in a different water resource zone. In this case, the effect within this WRZ may be neutral. Largescale RwH schemes should therefore be considered on a site-by-site basis where there is no hydrological impact.

RwH is not currently being considered in the early stages of the Target 100 plan. Therefore, there may be an opportunity to offer this in both new build houses, and as a retrofit in existing properties.

The Waterwise independent review of RwH and GwR performed by consultants Ricardo, notes that integration of a RWH system is more cost effective in new build properties. It goes on to report consumer research that shows greater enthusiasm for RwH integrated into new build properties, but little interest from developers¹⁷.

The relatively high cost of a retrofit domestic system capable of providing water for toilet flushing and laundry makes it a less attractive option for implementation as part of a water neutrality plan. However, it is included in the analysis due to the high potential to reduce water demand.

RwH can offer the largest potential water saving in a non-

education are likely to have a significant role to play in encouraging a culture change in domestic water use. Trials of smart meters are planned in AMP7 for roll out in AMP8 as part of an extensive programme, so whilst they will contribute to baseline demand falling, they are not

The Waterwise review of water neutrality contains figures provided by Welsh Water, Southern Water and Brighton and Hove City Council on the cost and potential water savings of a typical water audit, reported to be £48 - £100 per house and 30 to 40 litres per home per day saving. The Greater Brighton Water Plan 18 states a cost provided by Southern Water as £70 - £100 per home and a typical saving of 36 litres per household.

The Target 100 programme includes home visits aimed at encouraging water use and as this has already been factored into the WRMP care must be taken to ensure that a water neutrality benefit is not claimed that is already part of the baseline demand.

The WRMP does not include details of how many home visits are planned as part of Target 100. It may be possible for the programme of visits to be expended if further funding was available. These could be either performed by the water company (funded by developers) or by an independent party coordinating with Southern Water. Further information is required from Southern Water in order to be able to fully scope this option.

5.6 Other measures

5.6.1 Non-household visits

Since the opening of non-household market in 2017, SW do not communicate directly with non-household customers. There is therefore potential for non-household water saving visits aimed at reducing water use in businesses. These could provide advice on water saving toilets and onn.98 2den[g)-3(apETQg32 841.pcie)3-5(d)-3(e)6 TJ7.27-d

Figure 5.1 Location of Crawley WwTW relative to the Sussex North WRZ

5.6.3 Strategic transfers and re-zoning

It may also be possible to serve growth in the Sussex North WRZ via a strategic transfer of water from an adjacent WRZ that has fewer constraints on water resources. Whilst not within the definition of water neutrality, which states that offsetting should be within the same region, if water demand were reduced in an adjacent region (such as the Sussex Worthing WRZ) that already has a transfer set up with the Sussex North WRZ, it may be possible to use the reduction in demand in one WRZ to increase the transfer into the other zone.

As a short-term mitigation scheme to offset the non-delivery of the 2019-20 Hardham Wellfield Reconfiguration scheme, Southern Water are proposing to re-zone some customers (mainly non-household) in the Manor Royal area of Crawley to be supplied by SES Water. This will take some of the pressure off the Hardham abstraction. This mitigation option was received after the first draft of this report, the extent and timing of this mitigation

The emerging Water Resources South East (WRSE) regional

6 Methodology

6.1 Water neutrality calculator

A water neutrality calculator was developed as part of a research and development project at JBA. This estimates the future water use based on local authority growth forecasts and published water company data. It also estimates the volume of water that could be offset through retrofitting properties, leakage reduction, metering, and other identified measures.

In Part A of this research, the local authority boundary has been taken as the area over which neutrality will be applied. The water company data, for instance on potential future leakage, has therefore been apportioned to local authority area based on the split of population within the WRZ in each LPA area.

7 Water Neutrality in Crawley

7.1 Growth in Crawley

CBC provided an up-to-date growth forecasts for this study containing recent completions, sites already in the planning system and local plan allocations. An estimate of windfall was also included. Growth during the whole of the plan period was included (starting in 2018) and is summarised in Table 7.1 below.

Table 7.1 Growth forecast for CBC

Type	Growth 2018 to 2037
Housing (completions, extant planning and allocations)	5,278 dwellings
Windfall allowance	1,440 dwellings
Employment	5,780 approx. new employees*

^{*} Estimated based on employment use type and standard employment densities

7.2 Water demand

Water demand in the five scenarios defined in Tablec92 reariin

Table 7.3 Number of properties requiring home visit in each demand scenario

Demand scenario	Total additional water demand (MI/d)	No. properties requiring home visit to offset total	% Properties in LPA area visited
Building Regs. Standard	2.417	67,149	148%
Building Regs. Optional	2.171	60,305	133%
Target 100	2.007	55,742	123%
Realistic achievable	1.615	44,868	99%
Ambitious	1.146	31,837	70%

7.3.4 Non-household visits

According to ONS figures²⁵ there were 96,000 employee jobs in 2019, made up of 1 0.333 RG[-)]TJETi6e/f,"040′02f8**19 5141⁄2el5an1c862.65,500′03·p.5et 1**6m/te0*j4*b**1/1**80**68**36**x6d o**n0t**h**ea**1RG/C**inestimated in 6.2, thref*5(p)-3()

 ${\hbox{\it EYP-JBAU-XX-XX-RP-EN-0001-A1-C03-Water_Neutrality_Assessment_Part_A}$

Therefore, a

Table 7.4 Offsetting options for CBC (in isolation)

Mitigation	Potential	% of
option	water	neutrality
	saving	3.
	(MI/d)	

Mitigation	Potential	
option	water	
	saving	
	(MI/d)	

7.5 Conclusions and recommendations

It is likely that a package of measures will be required in order for the water neutrality target to be met in Crawley. This is likely to consist of:

An expansion of the leakage reduction programme

Visits to businesses in Crawley to encourage more efficient use of water, and to offer water saving devices

Implementation of a largescale rainwater harvesting or greywater recycling system in the Manor Royal

Fiaure	8.1	Water	demand	in	Chichester	in	various	scenarios
9								

8.3 Offsetting options

8.3.1 Leakage reduction

Southern Water publish their forecast leakage reduction at the WRZ level as part of the Water Resources Market Information (WRMI) tables. To obtain an approximate

Table 8.4 Offsetting options for Chichester (in isolation)

Mitigation option	Potential

Mitigation option	Potential water saving (MI/d)	% of neutrality target 100 l/p/d	% of neutrality target 85 I/p/d	% of neutrality target 62 I/p/d	Opportunities	Challenges	Party best placed to deliver
RwH retrofit household	0.113 (max)	108%	127%	174%		Significant cost for a single household and uptake uncertain and voluntary so not likely to achieve full uptake.	Partner needs to be identified
RwH retrofit commercial	Negligible	N/A	N/A	N/A		No opportunities identified	N/A
Education	Unknown				Awareness of water scarcity is low -	Difficult to quantify benefits or demonstrate success	Southern Water / Waterwise
Wastewater re-direction	Complete	100%	100%	100%	Could offset total demand in existing scheme	Extension to Littlehampton scheme over and above the WRMP may not be possible	Southern Water

New water supplier from outside WRZ

Unknown

Utilise water resources from neighbouric (100%)

8.5 Conclusions and recommendations

It is difficult to achieve water neutrality in Chichester District in isolation unless part of the Target 100 activities can be used to offset growth. The total demand that requires offsetting is fairly low, so it could be achieved by offsetting measures within other authorities in the WRZ. It is likely a package of measures will be required in order for the water neutrality target to be met in Chichester. This is likely to consist of:

An expansion of the leakage reduction programme

Visits to businesses in Chichester to encourage more efficient use of water, and to offer water saving devices

Discussions with Southern Water are required to understand the extent of the household visits as part of the Target 100 activities in order to assess the likely contribution of household visits to a neutrality plan.

Stakeholder Comment

this requirement.

Just a note from an HRA perspective on consideration of future reductions in other plans / policy in relation to the Dutch Ruling.

The Dutch Nitrogen Ruling CJEU Cases C-293/17 & C-293/18

In HRA appropriate assessment we cannot take account of the future benefits of other wider measures if the expected benefits are uncertain (para 130). This may be because:

quantified

But the HRA appropriate assessment can take account of all measures above where the expected benefits are certain at the time of the assessment.

I wonder how we would quantify and ensure enforcement of some of these behavioural changes—the HRA needs to rely upon mitigation which is, beyond reasonable scientific doubt, effective, timely, reliable, quaranteed to be delivered and as long term as necessary.

How would we demonstrate that such measures will in reality take place in the future?

9.2 Next stages

Part A of this study introduced the concepts of water neutrality, assessed the requirement for offsetting under different scenarios and identified possible offsetting and demand reduction measures. This was completed for Crawley Borough Council and Chichester District Council in isolation. A technical note was prepared by Aecom for Horsham District Council as part of their HRA process. Part B will build on this work and look at the water neutrality at



Offices at

