Integrated Water Management Study

25 May 2018

Amec Foster Wheeler Environment
& Infrastructure UK Limited

Report for

Partnership for Urban South Hampshire
David Bibby
Senior Planning Officer
Beech Hurst
Weyhill Road
Andover
Hampshire
SP10 3AJ

Main contributors

Mark Barnett
Katie Hoblyn
Ian Wilson
Alexia Chapman
Richard Marquet
Haydn Johnson
Katy James
Guy Douglas

Issued by

[redacted]

Mark Barnett

Approved by

[redacted]

Nick Jarritt

Amec Foster Wheeler

Shinfield Park
Shinfield
Reading, Berkshire,
RG2 9FW,
United Kingdom

Doc Ref. 38712rr035i4

\\rdg-fs1.global.amec.com\shared\projects\ 38712 South Hampshire IWMS\C000 Client\Report\Final report Mar 2018\38712rr035i4.docx

Copyright and non-disclosure notice

Third-party disclaimer

Management systems

This document has been produced by Amec Foster Wheeler Environment & Infrastructure UK Limited in full compliance with the management systems, which have been certified to ISO 9001, ISO 14001 and OHSAS 18001 by LRQA.

Document revisions

No.	Details	Date
1	Draft Report	20/04/2017
2.	Final Report	14/08/2017
3.	Final Amended Report	07/03/2018

Contents

***Appendix B and E are to be treated separately for the purpose of the Joint Committee and are available, on request, as hard copies at the meeting.**

Glossary

Acronym	Explanation
BAT	Best Available Technology
BOD	Biological Oxygen Demand
BC	Borough Council
DIN	Dissolved Inorganic Nitrogen
dpa	dwellings per annum
GES	Good Ecological Status
m^2	Square meters
mg/l	Milligrams per litre
Ml/d	Mega litres per day
P	Phosphorous
PE	Population Equivalent – a measure of pollution representing the average organic biodegradable load per day
RQP	River Quality Planning Tool
RBMP	River Basin Management Plan
SD	Standard Deviation
SIMCAT	Environment Agency water quality model
TraC	Transitional and Coastal Water Bodies
WFD	Water Framework Directive
WQA	Water Quality Assessment
WwTW	Wastewater Treatment Works

1. Summary

1.1.1 This report has been commissioned by the Partnership for Urban South Hampshire (PUSH) to assess any implications from the planned growth in the region for the water resource and water quality environment. PUSH is a partnership with Hampshire County Council, the unitary authorities of Portsmouth, Southampton and the Isle of Wight and eight district authorities of Eastleigh, East Hampshire, Fareham, Gosport, Havant, New Forest, Test Valley and Winchester (Figure 1.1). The housing strategy for South Hampshire and Isle of Wight sets out the need for over 100,000 new homes across three Housing Market Areas between now and 2036.

1.1.2 To show that planned growth will not have an overall negative impact on the water environment, a robust evidence base is required which can clearly indicate that the required housing can be accommodated and that the environment will be protected. As part of that evidence base, an Integrated Water Management Study (IWMS) was undertaken in 2008. However, since then houses have been built or land allocated, there have been changes to the baseline water environment, the National Planning Policy Framework (NPPF) has been introduced, environmental water quality standards have tightened through the Water Framework Directive (WFD) and two rounds of water company business plans have either been completed or started (AMP5 – 2010-2015 and AMP6 2015-2020). There have also been changes to the Habitats Regulations legislation (Conservation of Habitats and Species Regulations 2017).

1.1.3 This report presents a new IWMS which was commissioned in order to account for all the legislative changes and to provide an updated, defendable, clear and concise evidence base to support future housing growth in the PUSH area that will help with the production of Local Plans that comply with the National Planning Policy Framework, the Water Framework Directive (2000/60/EC) and the Habitats Regulations. More information on methods can be found in Appendix D.

1.1.4 The objectives of the IWMS are:

- to identify the impacts on water quality in receiving watercourses from future housing growth downstream of the Wastewater Treatment Works (WwTWs) related to the housing growth areas (i.e. from increases in discharges of treated sewage effluent from 2015 onwards);
- clarify if future housing growth will impact on the WFD objectives to:
  - Ensure no Deterioration in WFD class of any element;
  - Ensure the WFD water bodies can achieve the 2027 objectives as set out in the 2015 River Basin Management Plans (RBMPs);
  - Limit in class deterioration to less than 10% (an aspirational objective set by the Environment Agency);
- Ensure future housing growth is in line with the needs of the Habitats Directive for Designated Areas and the Urban Wastewater Treatment Directive for Sensitive Areas;
- Model the potential future discharge permit standards from the WwTWs which would be required to reverse potential deterioration in downstream river quality;
- Identify if there will be any significant impacts on protected areas or designated sites downstream of the WwTWs;
- Identify if there are any cumulative impacts from increases in discharges from multiple WwTWs within the same catchment; and
- Identify the impacts of planned growth on water supply and resources.

1.1.5 The study has highlighted the need for:

- Physical upgrades to seven WwTWs to cope with current and future increases in volumes of sewage;
- Physical upgrades to six sewer networks to cope with future increases in volumes of sewage;
- Tighter permit limits at eleven WwTWs to protect receiving waters;
- Catchment measures upstream of 20 WwTWs in order to help reduce nitrate loading to coastal waters;
- Review in 2022 of four WwTWs once further guidance and evidence has been collated;
- Potential need for phasing of development in relation to some WwTW and
- Further investigation and monitoring to examine the existing gaps in the evidence base and potentially, further action, to ensure future growth is compliant with legislation.

1.1.6 A spreadsheet summary of the pressure from future growth on WwTWs, the water environment as well as a summary of the measures which are required within the PUSH area are included in Appendix B. The spreadsheet is intended to be a live document and shows the relevant information for each WwTW and council in order to support the Local Plans.

1.1.7 This study should be used in conjunction with the Chichester Water Quality Assessment which contains the water quality assessment for Thornham WwTW.

1.1.8 In order to ensure these mitigation measures are put in place to support growth and protect the water environment, a primary recommendation is the creation of a new Water Quality Working Group, primarily comprising PUSH, the Environment Agency, Natural England, Portsmouth Water and Southern Water. The group could take responsibility for regularly monitoring and updating (e.g. quarterly or twice a year) the PUSH councils on progress through use of the spreadsheet, as well as updating the proposals by 2022 when more evidence and guidance is available. Recommendations are also made to support PUSH authorities in preparing Local Plans which respond effectively to current uncertainties.

Figure 1-1 The Partnership for Urban South Hampshire boundary

2. Water Resource Assessment

2.1.1 One of the aims of the PUSH study was to assess the impacts of planned growth on water supply and resources in South Hampshire. Data was collected from the water companies, 11 local councils and the Environment Agency (EA). A summary of the data collected and its purpose is shown in Table 2.1.

Table 2.1 Data collated and its purpose for water supply and resources assessments

Data	Description and purpose	Source
WRZ supply information	Current information on supplies, future demand and measures to meet the demand.	Southern Water and Portsmouth Water
Growth areas and annual housing numbers	Proposed future dwelling numbers in each growth area. For input to the Simcat[1] modelling tool to understand the environmental impact of potential discharge increase at WwTWs	All 11 Councils
WR investigations and discussions	Records of WFD investigations, abstraction changes etc.	Environment Agency

2.1.2 Both Southern Water and Portsmouth Water provide drinking water to the areas that fall within the PUSH boundary (Figure 2.1). Both companies have produced Water Resource Management Plans (WRMP) to clarify their sources of water and any options required to increase or protect supply over the next 25 years. This work takes into account forecast changes in population and consumption behaviour, the impact of climate change on demand and water resource availability, and the impact of environmental constraints on the volume of water that each water company is permitted to abstract from its network of surface and groundwater sources. Further details of the assessment are included in Appendix A.

2.1.3 The Environment Agency have advised that they are currently involved in ongoing discussions with Southern Water and Portsmouth Water with regards to public water supply licences and transfer schemes, and the Water Resource Assessment. The following statements in this report are likely to be subject to change, based on the outcomes of these discussions.

2.1.4 Assessments by Portsmouth Water have indicated that they will be in surplus by 2040 even after accounting for growth of up to 68,000 homes. However, they are still proposing to implement 35 feasible options through their WRMP in order to ensure resilience. The Portsmouth Water Plan is sufficient to support the housing growth identified by PUSH.

2.1.5 Assessments by Southern Water of the four main Water Resource Zones (WRZs) show that:

- Hampshire South WRZ - will be in deficit;
- Isle of Wight WRZ - will be in deficit;
- Hampshire Kingsclere - will have a small deficit; and
- Hampshire Andover – will not be in deficit.

2.1.6 In order to tackle the deficit Southern Water have put forward a range of 18 options for delivery in the next 25 years in order to increase their water supply by up to 212 Ml/d. This increase is designed to increase resilience but also account for future growth.

[1] Simcat is a catchment based water quality model, used by the EA that can be used to assess impacts on river water quality from one or more discharges.

2.1.7 However, concerns have been raised with regard to Southern Water's existing WRMP14 and their emerging draft WRMP19 options in particular with regards to impacts on the River Itchen Special Area of Conservation (SAC) and the River Test Site of Special Scientific Interest (SSSI). Changes to abstraction licences on the River Itchen have been imposed by the Environment Agency to remove the risk of adverse effect on integrity to the SAC and remove the risk of serious damage to the River Test SSSI. Southern Water has appealed the limits proposed for three abstraction licences and this is subject to a public inquiry. Until the outcome of this inquiry is known, the HRA for Southern Water's extant WRMP cannot be relied upon to ensure there will be no adverse effects on designated sites arising from future development within Southern Water's area. In addition the risk of adverse effects remains until the gap in public water supply (deficit) resultant from the licence changes is fulfilled by alternative options and/or the compensatory habitat requirements are met.

2.1.8 With regard to the Habitat Regulations therefore, there is currently a degree of uncertainty with regard to Southern Water's plan to support the housing growth identified by PUSH.

Figure 2-1 The Southern Water Supply Network (top) and Portsmouth Water Supply Network (bottom)

Figure 2-1 has been redacted

3. Water Quality Assessment

3.1 Baseline

Data Collection

3.1.1 A number of data sets were requested from the Environment Agency, water companies and the 11 local Councils (Table 3.1) for the water quality assessment (WQA). These included information on the growth being considered, estimates of river flow, river quality and also data on WwTW effluent flow and quality. For the river and effluent quality the main focus was on phosphate, ammonia, Biological Oxygen Demand (BOD, a proxy for Dissolved Oxygen in rivers) and nitrate.

3.1.2 Phosphate can be organic (critical in DNA/RNA and energy production) and inorganic (in minerals) Phosphate contributes to the eutrophication of receiving waters, and it is acknowledged that phosphate is more generally the problem nutrient for freshwaters.

3.1.3 Ammonia is a form of nitrogen which aquatic plants can absorb into proteins, amino acids, and other molecules. BOD is a chemical procedure for determining the amount of dissolved oxygen needed by organic material present in a given water sample at certain temperature over a specific time period.

3.1.4 Nitrate is the stable end product of complete nitrification (which involves the conversion of ammonia into nitrite and ultimately nitrate). Both nitrate and phosphate can contribute to the eutrophication of receiving waters, but in saline coastal waters it is acknowledged that nitrate is more generally the problem nutrient, phosphate having a lesser role.

3.1.5 All data sets were reviewed to ensure that information was complete and suitable, before being converted to a format for use in the assessments including the water quality modelling. Where sample data was not available existing model data from the Environment Agency's Simcat tool was used.

3.1.6 It should be noted that although Thornham WwTW does fall within this study area it was not included as it has been assessed as part of Chichester Water Quality Assessment to account for crossboundary issues between Havant and Chichester.

Table 3.1 Data collated and its purpose for the water quality assessments

Data	Description and purpose	Source
WwTW effluent quality data (2015)	Current WwTW quality (BOD, ammonia and phosphate) discharged to receiving waters. For input to the Simcat and RQP modelling tools.	Southern Water
WwTW flow data (2015)	Current WwTW flows discharged to receiving waters. For input to the Simcat and RQP modelling tools.	Southern Water
River quality data (2015)	Current river quality (BOD, ammonia and phosphate) in receiving waters upstream and downstream of WwTWs (where available). For input to the Simcat and RQP modelling tools.	Environment Agency
River flow data (2010-2015)	Current river flow in receiving waters upstream and downstream of WwTWs (where available). For input to the Simcat and RQP modelling tools.	Environment Agency
Simcat model (SE RBD1 model)	Water quality model for the Thames catchment, used to undertake the WQA	Environment Agency
Growth areas and annual housing numbers	Proposed future dwelling numbers in each growth area. For input to the Simcat and RQP modelling tools to understand potential discharge increase at WwTWs	All 11 Councils

Data	Description and purpose	Source
Protected Area conditions and source apportionment for nitrate	Data provided by the EA on the current condition of Protected Areas, problems and where available source apportionment information.	Environment Agency

1. South East River Basin District

Water Framework Directive

3.1.7 The PUSH area extends across eight WFD Operational Catchments, located within the South East River Basin District (RBD), including five transitional or coastal Operational Catchments adjacent to the PUSH Boundary. Only these eight catchments are likely to be impacted by the increase in sewage discharges associated with the proposed growth and are therefore included in this study. These include:

- Southampton Water;
- East Hampshire Rivers;
- East Hampshire TRaCs;
- Itchen;
- Solent;
- Lower Test and Southampton Streams;
- Isle of Wight TRaCs; and
- Isle of Wight Rivers.

3.1.8 As part of the WFD, catchments have been broken down into smaller units, known as WFD water bodies. These are made up of reaches or entire lengths of designated watercourses. The 23 WwTWs affected by future growth are located in 15 water bodies within the eight operational catchments. Of these the EA have reported that 13 of the 15 water bodies which the WwTWs discharge into are at less than Good Ecological Status in the 2015 South East RBMP (Table 3.2). The main elements found to be at less than Good were phosphate, dissolved inorganic nitrogen, fish, macrophytes and phytobenthos. Many shellfish waters are also failing WFD standards for E. coli.

3.1.9 Under the WFD Protection Areas many of the receiving estuaries and harbours have been designated as shellfish production areas. Chichester Harbour, Langstone Harbour, Portsmouth Harbour, Solent and Southampton Water have all been classified according to levels of E. Coli found in samples. Each of these sites have been classified as Class B or worse, which indicates that shellfish from the areas require treatment prior to consumption. This indicates that E. coli contaminants are partially transmitted to the receiving coastal waters, from a number of sources which may include wastewater.

Table 3.2 Water Framework Directive classifications for river, transitional and coastal water bodies (2015 Cycle[2]) broken down by Council

Council	WwTW	Receiving Watercourse/ TraC	WFD Operational Catchment	WFD Waterbody	Overall water body status	Element(s) Not achieving Good Status
Southampton City	Woolston Portswood Millbrook	River Itchen Estuary Tidal River Test	Southampton Water	Southampton Water GB520704202800	Moderate	Dissolved Inorganic Nitrogen (Moderate) Mitigation Measures Assessment (Moderate or less) Tributyltin Compounds (Fail)
New Forest District	Slowhill Copse Ashlett Creek	Southampton Water	Southampton Water	Southampton Water GB520704202800	Moderate	Dissolved Inorganic Nitrogen (Moderate) Tributyltin Compounds (Fail)
Test Valley Borough	Romsey	River Test	Lower Test and Southampton Streams	Test - conf Dun to Tadburn Lake GB107042016460	Moderate	Fish (Poor) Mitigation Measures Assessment (Moderate or less)
	Millbrook	Tidal River Test	Southampton Water	Southampton Water GB520704202800	Moderate	Dissolved Inorganic Nitrogen (Moderate) Tributyltin Compounds (Fail)
	Chickenhall Eastleigh	River Itchen	Itchen	Itchen GB107042022580	Good	- N/A already at good status
Eastleigh Borough	Chickenhall Eastleigh	River Itchen	Itchen	Itchen GB107042022580	Good	- N/A already at good status
	Portswood	River Itchen Estuary	Southampton Water	Southampton Water GB520704202800	Moderate	Dissolved Inorganic Nitrogen (Moderate) Tributyltin Compounds (Fail)
	Peel Common	The Solent	Solent	Solent GB650705150000	Moderate	Angiosperms (Moderate) Dissolved Inorganic Nitrogen (Moderate) Mitigation Measures Assessment (Moderate or less)
Winchester City	Bishops Waltham	River Hamble	East Hampshire Rivers	Main River Hamble GB107042016250	Moderate	Fish (Moderate) Phosphate (Poor)
	Wickham	River Meon		Meon GB107042016640	Poor	Macrophytes and Phytobenthos Combined (Poor)
	Southwick	River Wallington		Wallington below	Moderate	Fish (Moderate)

[2] More information available on the Environment Agency's Catchment Data Explorer website - http://environment.data.gov.uk/catchment-planning/

				Southwick GB107042016360		Phosphate (Moderate)
	Peel Common	The Solent	Solent	Solent GB650705150000	Moderate	Angiosperms (Moderate) Dissolved Inorganic Nitrogen (Moderate) Mitigation Measures Assessment (Moderate or less)
	Budds Farm	The Solent/ Langstone Harbour		Langstone Harbour GB580705130000	Moderate	Mitigation Measures Assessment (Moderate or less)
	Chickenhall Eastleigh	River Itchen	Itchen	Itchen GB107042022580	Good	- N/A already at good status
Fareham Borough	Peel Common	The Solent	Solent	Solent GB650705150000	Moderate	Angiosperms (Moderate) Dissolved Inorganic Nitrogen (Moderate) Mitigation Measures Assessment (Moderate or less)
Portsmouth City	Budds Farm	The Solent/ Langstone Harbour	Solent	Langstone Harbour GB580705130000	Moderate	Mitigation Measures Assessment (Moderate or less)
Gosport Borough	Peel Common	The Solent	Solent	Solent GB650705150000	Moderate	Angiosperms (Moderate) Dissolved Inorganic Nitrogen (Moderate) Mitigation Measures Assessment (Moderate or less)
Havant Borough	Budds Farm	The Solent/ Langstone Harbour	Solent	Solent GB650705150000 Langstone Harbour GB580705130000	Moderate	Mitigation Measures Assessment (Moderate or less)
East Hampshire District	Budds Farm	The Solent/ Langstone Harbour	Solent	Langstone Harbour GB580705130000	Moderate	Mitigation Measures Assessment (Moderate or less)
Isle of Wight	Sandown	The English Channel	Isle of Wight TraCs	Isle of Wight East GB650705530000	Good	- N/A already at good status
	Shalfleet	Caul Bourne Stream	Isle of Wight Rivers	Caul Bourne GB107101006020	Moderate	Phosphate (Moderate) Mitigation Measures Assessment (Moderate or less)
	Shorwell	Shorwell Stream		Brighstone Streams GB107101005940	Moderate	Macrophytes and Phytobenthos Combined (Moderate)
	St Helens	Tributary of the Eastern Yar		Eastern Yar (Lower) GB107101005971	Poor	Macrophytes and Phytobenthos Combined (Poor) Phosphate (Moderate) Mitigation Measures Assessment (Moderate or less)
	Wroxall	Wroxall Stream		Wroxall Stream	Poor	Macrophytes and Phytobenthos Combined (Poor)

		GB107101006210		Phosphate (Poor)
Brighstone	Brighstone Stream	Brighstone Streams GB107101005940	Moderate	Macrophytes and Phytobenthos Combined (Moderate)
Calbourne	Caul Bourne	Caul Bourne GB107101006020	Moderate	Phosphate (Moderate) Mitigation Measures Assessment (Moderate or less)
Chale	River Medina	Medina GB107101005990	Moderate	Invertebrates (Moderate) Mitigation Measures Assessment (Moderate or less)
Chillerton	Sheat Stream	Medina GB107101005990	Moderate	Invertebrates (Moderate) Mitigation Measures Assessment (Moderate or less)
Godshill	Tributary of Godshill Stream	Eastern Yar (Upper) GB107101006220	Moderate	Macrophytes and Phytobenthos Combined (Moderate) Phosphate (Moderate)
Roud	Tributary of the River Yar	Eastern Yar (Upper) GB107101006220	Moderate	Macrophytes and Phytobenthos Combined (Moderate) Phosphate (Moderate)

Designated Sites Review

3.1.10 There are several designated areas located either within the PUSH area or downstream thereof with the potential to be affected by increases in discharges of treated sewage effluent from future housing growth. In line with the Habitat Regulations, the water quality assessment needs to consider the potential for future growth to impact on the interest features and conservation objectives of the designated sites.

3.1.11 There is a difference between the water quality assessment needed for a WFD assessment and a Habitats Assessment. The WFD assessment records deterioration in a water body when there is a degradation between classes, for example from good to moderate or moderate to poor. For the Habitats Regulations Assessment, consideration needs to be given to whether the site is in favourable condition and whether the conservation objectives of the site are being met. If this is not the case and the conservation objectives are failing due to water quality, then any deterioration (even if there is no degradation between WFD classes) could lead to an adverse effect on the integrity of the site.

3.1.12 The following section summarises the relevant conservation sites in the PUSH area.

Solent Maritime SAC

3.1.13 The Solent Maritime SAC covers a widespread area along the south coast and consists of a series of habitats and features around Southampton Water, Medina Estuary, Newtown Harbour, the New Forest and the northern coast of the Isle of Wight, Chichester and Langstone Harbours. Information provided by the EA and Natural England indicates that there is evidence of eutrophication within the SAC.

3.1.14 The Supplementary Advice on Conservation Objectives (SACOs) for the Solent Maritime SAC estuaries are to restore water quality to be maintained to mean winter dissolved inorganic nitrogen levels at which biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features. The objective for the coastal lagoons is the same.

South Wight Maritime SAC

3.1.15 The South Wight Maritime SAC consists of the entire southern stretch of the Isle of Wight coast. Further assessment is needed to assess whether there is evidence of the interest features within this SAC being affected by eutrophication.

3.1.16 The Supplementary Advice on Conservation Objectives (SACOs) for the South Wight Maritime SAC are to maintain water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macroalgal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels for reefs and submerged or partially submerged sea caves.

Portsmouth Harbour SPA and Ramsar site

3.1.17 Portsmouth Harbour is a large estuary used for industry and designated for its bird interest. As with the neighbouring Chichester and Langstone Harbours, the harbour is composed of intertidal mudflats and sandflats along with seagrass beds, saltmarsh, shallow coastal waters, coastal lagoons and coastal grazing marsh. Evidence provided by the EA and Natural England indicate that there is a eutrophication problem in the harbours and that measures are required now to reduce nitrate input.

Chichester and Langstone Harbours SPA and Ramsar site

3.1.18 These harbours are composed of intertidal mudflats and sandflats along with seagrass beds, saltmarsh, shallow coastal waters, coastal lagoons and coastal grazing marsh. Evidence provided

by the EA and Natural England indicate that there is a eutrophication problem in the harbours and that measures are required now to reduce nitrate input.

Solent and Southampton Water SPA and Ramsar site

3.1.19 The Solent and Southampton Water SPA includes stretches of coastline in Hampshire and the Isle of Wight. The site comprises estuaries, mud-flats and saltmarshes together with adjacent coastal habitats including saline lagoons, shingle beaches, reedbeds, damp woodland and grazing marsh. Evidence provided by the EA indicates that there is an eutrophication problem in the area and that measures are required now to reduce nitrate input.

River Itchen SAC

3.1.20 The River Itchen is one of the `classic` chalk rivers of southern England. The Itchen is rich in plant nutrients and supports an abundant and exceptionally species rich aquatic flora. In particular, it supports Water crowfoot (*Ranunculus*) vegetation, which is an internationally scarce habitat. The aquatic invertebrate fauna is equally rich and includes nationally rare and scarce species. The riparian habitats and wet meadows associated with the river are also of high nature conservation interest for vegetation communities, invertebrate assemblages and a population of a nationally rare damselfly, *Coenagrion mercuriale*. The Itchen supports populations of otters and White-clawed crayfish, both important as they are amongst the few remaining on the rivers of central southern England. There is evidence of high nutrient source trends in the water flow of this designated site.

3.1.21 There are also concerns with regard to the quantity of water flow in the River Itchen and impacts on the River Itchen Special Area of Conservation (SAC). Changes to abstraction licences on the River Itchen are required by the Environment Agency to remove the risk of adverse effect on integrity to the SAC and remove the risk of serious damage to the River Test SSSI. Southern Water has appealed the limits proposed for three abstraction licences and this is subject to a public inquiry. As water quantity interacts with water quality, it is important to consider both in relation to impacts on the SAC.

River Test SSSI

3.1.22 The River Test is one of the 'classic' chalk rivers of southern England. It is larger and more diverse in its plant and invertebrate communities than the Itchen. The Test is rich in plant nutrients and supports an abundant and exceptionally species rich aquatic flora. The aquatic invertebrate fauna is equally rich, includes nationally rare and scarce species, and is especially rich in aquatic molluscs. The riparian habitats and wet meadows associated with the river are also of high nature conservation interest for vegetation communities and invertebrate assemblages. The river Dever is a typical chalk tributary of the Test, comparable in character and interest to upper sections of the main river, but also supporting significant areas of riparian vegetation. These habitats face pressures from nutrient pollutants.

3.2 Existing Capacity Assessment for WWTWs

3.2.1 All WwTWs are permitted to discharge a set volume of treated effluent based on the population size they serve. This is generally referred to as the Dry Weather Flow (DWF), which is the baseflow going to a WwTW of raw sewage with a small amount of groundwater infiltration and with no surface water drainage inputs. The DWF is used to help determine the quality of effluent required to protect the water environment and can also be used as an indicator of when a WwTW is reaching its volumetric design capacity and requires an upgrade.

3.2.2 Using data provided by Southern Water an initial assessment of the current volumes of treated effluent discharged by the main WwTWs indicated that five were already discharging volumes in excess of the permits and a further 3 had less than 10% additional capacity (Appendix B).

3.3 Growth Assessment

Data Collection

3.3.1 For all growth areas projected future housing numbers were provided for each growth period used in the IWMS. A summary of the WwTWs assessed and their association to growth areas and the local councils is shown in Appendix B. Increases in effluent discharges were calculated based on assumed occupancy rates for the new housing and added to the current volume of treated effluent discharged from the relevant WwTWs. The occupancy rates and flows estimates were based on a worst case scenario in order to identify the worst level of impact that could be expected.

3.3.2 The impact of this increase in treated sewage effluent on the receiving watercourses and coastal waters was then modelled for each growth period using the Environment Agency's Simcat or River Quality Planning (RQP) tools and the results assessed against the current condition of the receiving waters and the objectives set above. Where a potential significant deterioration was identified indicative permit standards were calculated for WwTWs, which would prevent the deterioration. Note that an exceedance of a flow permit is not in itself an issue as the sewerage undertaker could apply to the Environment Agency (EA) for a new flow permit. This may be permitted by the EA where it is matched by an equivalent improvement in the quality of the water being discharged, thus protecting the receiving waters (i.e. overall there would be load standstill to the receiving waters).

3.3.3 Data has not been requested from authorities or water companies upstream of the PUSH areas. Any worsening to the water quality situation upstream of the PUSH area could have implications for the designated sites which may need to be considered in combination with the effects of growth within the PUSH area.

3.4 Summary of Impacts on Water Quality

3.4.1 The following section outlines the planned upgrades that are required for the WwTW and sewer capacity in South Hampshire. This assessment of impacts on water quality, WwTW and sewer capacity has considered 20 WwTWs and their associated sewer networks. Some are likely to need upgrading by 2020 in order to ensure that future housing growth in the PUSH area will not have a detrimental impact on water quality. In addition, there are currently gaps in the evidence base that require further investigation, monitoring and potentially, action, to ensure future growth is compliant with legislation. Appendix B shows the WwTWs and the improvements they will require and the Action Plan section sets out the necessary steps to recognise and plan for the uncertainty

3.4.2 Four WwTW will require improvements to reduce ammonia, eleven to reduce phosphate. Although no WwTW have been highlighted for improvements to reduce nitrate loading from their discharges due to direct impacts from future house growth[3], it should be noted that at least four WwTW will require standstill for N once their existing permitted flow limit is reached. Appendix B has highlighted that the permitted flow limits will also need to be reviewed for another six WwTW in 2022, to assess if standstill for N is required at these locations. In addition following the assessment of potential cumulative impacts including diffuse sources, Appendix B identifies where catchment measures to reduce diffuse pollution should be implemented in order to ensure the water body and designated area can achieve their objectives based on the current condition of the area irrespective of housing growth, and this is discussed further in Mitigation Section 4.

3.4.3 Appendix B is a 'live' document that will be subject to regular review and updates as further evidence comes forward and the existing uncertainty with regard to the catchment measures is addressed. Whilst this report presents evidence to support future housing growth in the PUSH area to help with the production of Local Plans to comply with the National Planning Policy Framework, the Water Framework Directive (2000/60/EC) and the Habitats Regulations, further on-going work will be necessary as outlined in the Action Plan section. This is necessary to ensure the full growth proposed during the local plan period is compliant with legislation.

[3] This may have to be reviewed depending on the final choice of method for achieving the tighter ammonia permit limits

New Forest District Council

3.4.4 The area of New Forest District Council covered by the PUSH study is shown on Figure 1-1 and relates to the eastern section of the New Forest authority area. The growth areas within this part of the New Forest District Council area are predicted to drain to either the Ashlett Creek or Slowhill Copse WwTWs. The water quality assessments to date indicate that there are no significant constraints to prevent future housing growth related to these WwTWs. However, there is a degree of uncertainty and gaps in the evidence base and it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation.

East Hampshire District Council

3.4.5 The growth areas within the PUSH part of the East Hampshire District Council area are predicted to drain to the Budds Farm Havant WwTW. The water quality assessments indicated that there are no significant constraints to prevent future housing growth in the Council's area. The WwTW will potentially require capacity upgrades by 2036 and there is a risk of increased sewer network overflows, so improvements might be required. The catchment has nitrate problems and catchment level nitrate measures are required now. To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation.

Portsmouth City Council

3.4.6 The growth areas in the Portsmouth City Council area are predicted to drain to the Budds Farm Havant WwTW. The water quality assessments indicated that there are no significant constraints to prevent future housing growth in the Councils area. The WwTW will potentially require capacity upgrades by 2036 and there is a risk of increased sewer network overflows, so improvements might be required. The catchment has nitrate problems and catchment level nitrate measures are required now. To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation. .

Southampton City Council

3.4.7 The growth areas in the Southampton City Council area are predicted to drain to the Millbrook, Portswood and Woolston WwTWs. The water quality assessments indicated that there are no significant constraints to prevent future housing growth related to Portswood WwTWs, although the works will require upgrades to its sewer networks.

3.4.8 Although overall no significant impact or deterioration is predicted due to future housing growth, the Millbrook WwTW will require improvements by 2036 to increase capacity in the WwTW. The catchment has nitrate problems and catchment level nitrate measures are required.To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation.

Test Valley Borough Council

3.4.9 The growth areas in the Test Valley Borough Council area are predicted to drain to the Chickenhall Eastleigh, Millbrook or Romsey WwTWs. The water quality assessments indicated that there are no significant constraints to prevent future housing growth related to Chickenhall Eastleigh or Romsey WwTWs, although both will require upgrades to their sewer networks.

3.4.10 Although overall no significant impact or deterioration is predicted due to future housing growth, the Millbrook WwTW will require improvements by 2036 to increase capacity in the WwTW. The catchment has nitrate problems and catchment level nitrate measures are required now. To

address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation. .

Winchester City Council

3.4.11 The growth areas in the Winchester City Council area are predicted to drain to one of the six WwTWs (Bishops Waltham, Budds Farm Havant, Chickenhall Eastleigh, Peel Common, Southwick, or Wickham). No significant constraints were identified to prevent future housing growth in the Council's area, although all of the WwTWs or their associated catchments will potentially require capacity upgrades including:

- New ammonia and phosphate permits needed at Wickham WwTW;
- Capacity upgrades required at Bishops Waltham, Budds Farm Havant, Peel Common and Wickham. The requirements for upgrades at Peel Common and Wickham will need to be reviewed in 2022;
- Sewer network upgrades required for Budds Farm Havant, Chickenhall Eastleigh and Peel Common WwTWs;

Measures to reduce current catchment nitrate sources are needed now. To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation.

Eastleigh Borough Council

3.4.12 The growth areas in the Eastleigh Borough Council area are predicted to drain to either the Chickenhall Eastleigh, Peel Common or Portswood WwTWs. The water quality assessments indicated that there are no significant constraints to prevent future housing growth related to Chickenhall Eastleigh or Portswood WwTWs, although they will require upgrades to their sewer networks.

3.4.13 Although overall no significant impact or deterioration is predicted due to future housing growth, the Peel Common WwTW may require improvements by 2025 to increase capacity in the WwTW, which will be subject to review in 2022. Sewer capacity upgrades are also likely to be required at this WwTW. The catchment has nitrate problems and catchment level nitrate measures are required now. To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation.

Fareham Borough Council

3.4.14 The growth areas in Fareham Borough Council area are predicted to drain to the Peel Common WwTW. Although overall no significant impact or deterioration is predicted due to future housing growth, the Peel Common WwTW may require improvements by 2025 to increase capacity in the WwTW, which will be subject to review in 2022. Sewer capacity upgrades are also likely to be required at this WwTW. The catchment has nitrate problems and catchment level nitrate measures are required now. To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation. .

Gosport Borough Council

3.4.15 The growth areas in Gosport Borough Council area are predicted to drain to the Peel Common WwTW. Although overall no significant impact or deterioration is predicted due to future housing

growth, the Peel Common WwTW may require improvements by 2025 to increase capacity in the WwTW, which will be subject to review in 2022. Sewer capacity upgrades are also likely to be required at this WwTW. The catchment has nitrate problems and catchment level nitrate measures are required now. To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation. .

Havant Borough Council

3.4.16 The growth areas in the Havant Council area are predicted to drain to the Budds Farm Havant WwTW. The water quality assessments indicated that there are no significant constraints to prevent future housing growth in the Council's area, although the WwTW will potentially require capacity upgrades by 2036 and there is a risk of increased sewer network overflows, so improvements might be required. The catchment has nitrate problems and catchment level nitrate measures are required now. To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation.

3.4.17 As noted Thornham WwTW is not included within this study but is assessed as part of the Chichester Water Quality Assessment study using combined housing growth predictions for Havant and Chichester.

Isle of Wight Council

3.4.18 The growth areas in the Isle of Wight Council area are predicted to drain to one of the 11 WwTWs on the island (Sandown, Shalfleet, Calbourne, Shorwell, Brighstone, Wroxall, Roud, Godshill, St Helens, Chale and Chillerton). No significant constraints were identified to prevent future housing growth in the Council's area, although all of the WwTWs or their associated catchments will potentially require capacity upgrades including:

- New ammonia or phosphate permits needed at ten WwTWs;
- Capacity upgrades required at seven WwTWs, with three WwTWs being subject to review in 2022;
- Sewer network upgrades required for one WwTW; and
- Measures to reduce current catchment nitrate sources are needed now.

3.4.19 To address the uncertainty relating to catchment measures, it is recommended that Local Plans acknowledge the gaps in the evidence base and recognise it will be necessary to respond to emerging evidence to determine whether housing development in later stages of the plan period would require mitigation. .

3.5 Flood Risk Review

3.5.1 Based on the DWF assessments a high level review was undertaken to clarify if there would be any potential increase in flood risk downstream of the WwTW based on the increases in volumes discharged (Table 3.3). The assessments indicated that four of the WwTWs were at medium or high risk of potentially increasing downstream flood risk. These include:

- Shorwell;
- Calbourne;
- Chale; and
- Chillerton.

Table 3.3 Flood risk review of increases in discharge volumes from WwTWs in the PUSH area

WwTW	Flood Risk	Reasoning
Ashlett Creek Fawley	None	DWF permits not exceeded by 2036. Discharge to Sea.
Bishops Waltham	Low	DWF permits exceeded by 2025, to a maximum 10% by 2036. This causes only 0.3% change in proportion of discharge to flow, to that calculated from consented discharge.
Budds Farm Havant	Negligible	DWF permits exceeded by 2036, to a maximum 3% by 2036. This is only a small exceedance, and discharges to sea, so is not thought to impact flood risk.
Chickenhall Eastleigh	None	DWF permits not exceeded by 2036. Discharge proportion of flow small, and within consent proportion.
Millbrook	Negligible	DFW permits exceeded by 2036, to a maximum 6% by 2036. This is only a small exceedance, and discharges to sea, so is not thought to impact flood risk.
Peel Common	Negligible	DFW permits exceeded in 2025, to a maximum 18% by 2036. Discharges to sea, so is not thought to impact flood risk impact.
Portswood	None	DWF permits not exceeded by 2036. Discharge within tidal limits of River Itchen.
Romsey	None	DWF permits not exceeded by 2036. Discharge proportion of flow small, and within consent proportion.
Slowhill Copse Marchwood	None	DWF permits not exceeded by 2036. Discharge to Sea.
Southwick	None	DWF permits not exceeded by 2036. Discharge proportion of flow small, and within consent proportion.
Wickham	Negligible	DWF permits exceeded by 2030, but only to a maximum 2% by 2036. This causes only 0.3% change in proportion of discharge to flow, to that calculated from consented discharge.
Woolston	None	DWF permits not exceeded by 2036. Discharge to Sea.
Sandown	Unknown	Unclear if discharges straight to English Channel, or close to drains which pass alongside Sandown.
Shalfleet	Low	DWF permits exceeded by 2030, to a maximum 15% by 2036. This causes only 0.8% change in proportion of discharge to flow, to that calculated from consented discharge.
Shorwell	Medium	DWF permits exceeded by 2020, to a maximum 56% by 2036. This causes a 2.2% change in proportion of discharge to flow, to that calculated from consented discharge. This is approximately a two third increase over the consented discharge permitted.
St Helens	Low – Uncertain	DWF permits currently exceeded, increasing to a maximum 65% by 2036. This causes only 0.3% change in proportion of discharge to flow, to that calculated from consented discharge. However, there is uncertainty over whether the flow volume stated is that of the Eastern Yar, or the tributary which the WwTW flows into. It is anticipated that the tributary has a much lower flow, and therefore the proportion of flow the discharges is represented to be much higher. If this were the case, immediate flood risk on the tributary before entering the Eastern Yar could be an issue.
Wroxall	None	DWF permits not exceeded by 2036. Discharge proportion of flow small, and within consent proportion.
Brighstone	Low	DWF permits exceeded by 2025, but only to a maximum 9% by 2036. This causes only 0.5% change in proportion of discharge to flow, to that calculated from consented discharge.
Calbourne	Unknown - Potentially high	DWF permits currently exceeded, increasing to a maximum 46% by 2036. This causes 2.7% change in proportion of discharge to flow, to that calculated from consented discharge. However, there is uncertainty over whether the flow volume

WwTW	Flood Risk	Reasoning
		stated is appropriate of the Calbourne - this figure has been taken from the flow figure given for the Shalfleet WwTW, which is much further down the catchment. It would be expected that the flows at Calbourne WwTW would have a much lower flow, and therefore the proportion of flow the discharges represent would be much higher. If this were the case, flood risk on upper reaches of the Calbourne may be an issue.
Chale	Medium	DWF permits currently exceeded, increasing to a maximum 83% by 2036. This causes a 2.0% change in proportion of discharge to flow, to that calculated from consented discharge. This almost doubles the consented proportion of flow.
Chillerton	Unknown - Potentially High	DWF permits currently exceeded, increasing to a maximum 29% by 2036. Flow in the Sheat Stream is not currently known. The Sheat Stream is a small tributary to the River Medina, where flows are likely small. If is therefore possible that a 29% exceedance of consented discharge would have a notable impact to flows.
Godshill	None	DWF permits not exceeded by 2036. Discharge proportion of flow small, and within consent proportion.
Roud	None	DWF permits not exceeded by 2036. Discharge proportion of flow small, and within consent proportion.
Assumptions **Flood cells in sea / within tidal limits are large enough to be 'sea level driven' flood risks, which discharge from WwTWs would not impact upon** **River flows provided are dry-weather flows, around the Q90/95 mark. Therefore where WwTW discharges are only a small proportion of stated flows, it is assumed small increases to this proportion are likely to still be within bank capacity.** **The proportion of the same WwTW discharges on high flows (Q10/30 etc.) would be much less than on the dry flows, however the proportions and relation to bank full flows is unknown.** **It is not known where the gauged flow volumes have been taken from is relation to the location of the WwTW, it is therefore possible that the flow at the WwTW is notably different to those used here.** **The EA's Flood Map for Planning associates a Flood Zone with all the rivers the WwTW are noted to discharge into in this assessment, therefore all discharges have the potential to impact flood risk.**		

3.6 Summary of Cumulative Impacts

3.6.1 A review was undertaken to identify the potential for cumulative impacts where two or more WwTW were located in the same WFD catchment (Appendix B). This was done as, although the assessments for individual WwTW might not highlight a problem, catchments with multiple WwTWs could still be at risk from deteriorations in water quality. The assessment indicated that there were potential risks to:

- Southampton Water;
- Eastern Yar;
- Medina Estuary;
- Brighstone Streams/Bay;
- Newtown Harbour; and
- Portsmouth Harbour.

3.6.2 It is recommended that this issue be further examined by the Water Quality Working Group to ensure the in-combination impacts of future growth on the designated sites are examined in line with the Habitats Regulations. This should consider growth outside the sub-region which could impact on the same designations.

3.6.3 Although impacts will potentially be seen in other WFD catchments that overlap the PUSH area these are not expected to be significant.

4. Mitigation

4.1.1 Measures to improve WwTWs and effluent quality were primarily based on site level requirements although catchment management was considered for issues highlighted for nitrate. A summary of the measures is included in Appendix B and noted in more detail below.

4.2 Ammonia and BOD

4.2.1 Four WwTWs (Wickham, Shalfleet, Roud and Godshill) have been predicted to require new permits for ammonia. No improvements to BOD were identified as required. All the indicative permits highlighted have been assessed as technically feasible and can be achieved through onsite treatment techniques at the WwTWs. As such no catchment level options were investigated.

4.3 Phosphates

4.3.1 The assessments indicated that 11 WwTWs (Wickham, Calbourne, Shalfleet, Shorwell, Brigstone, Wroxall, Roud, Godshill, St Helens, Chale and Chillerton) will potentially need upgrades in order to remove phosphate from their final effluents to ensure there is no deterioration in downstream water quality. The tightest consent required was 1.3 mg\l which is technically feasible. As such deterioration of phosphate concentrations can be avoided. The WWTWs include discharges into the Solent Estuary (Wickham), Eastern Yar (Godshill, St Helens, Wroxall, Roud) Newtown Harbour (Calbourne, Shalfleet), Medina Estuary (Chillerton, Chale), and Brighstone Bay (Shorwell, Brightstone).

4.4 Treatment Options

4.4.1 The conventional technologies for phosphate removal in sewage treatment in the UK are commonly based around the addition of iron salts to the final effluent. This binds with the phosphate to produce a flocculent which is allowed to settle out before the effluent is discharged. Other treatment methods for removal of phosphate from effluent include biological treatment (either in activated sludge or the final effluent). Current onsite treatment methods can ensure a WwTW produces an effluent quality of up to 0.25mg\l (based on OfWat guidance). As such they are adequate to deliver the reductions required to support future housing growth and prevent deterioration.

4.4.2 Tighter permit standards are also required to help the receiving water bodies get to Good Status. However, EA assessments indicate that it is not possible to achieve the required permit standards with current technology. This will be reviewed on completion of the national P Stripping trials in 2017 being undertaken by all water companies.

4.5 Lead in time for construction\ installation of any infrastructure

4.5.1 The lead in time for construction/installation of any infrastructure is dependent on a number of factors including the size of the existing works and the complexity of the solution and of its installation on site (especially in the case of limited land availability). However a water company like Southern Water has experience of steering the delivery of complex projects in a relatively short period of time. The scale of indicative permits identified as potentially required in order to allow future growth can be achieved through current technology (i.e. iron salt dosing). As such only a short lead in time is expected to be required.

4.6 Catchment Management Measures

4.6.1 On-going catchment management measures have been delivered and are on-going to address the main agricultural sources of nitrates and phosphate. Most improvements have only been delivered recently (2014/2015) and it is therefore too early to record environmental improvement in terms of macroalgae in the marine designated sites. In addition, further measures are proposed between 2017 and 2036. Whilst, it is estimated that these solutions could effectively reduce the nitrate and phosphate loading towards the designated sites, there is uncertainty with regard to the timing and scale of environmental improvement that will be achieved.

4.6.2 The catchment sources that can be targeted include:

- Agriculture;
- Sewer network overflows;
- Private discharges;
- Natural sources;
- Industrial discharges; and
- Effluent reuse.

4.6.3 A combination of these measures at the catchment level can bring about reductions. Additionally they can form part of an integrated set of options e.g. effluent reuse can not only provide a supply of drinking water but could also reduce the amount of effluent discharged to a river and therefore provide water quality improvements. Although these are all technically feasible measures the level of reductions possible and the timeline and certainty for improvements are much more variable than for end of pipe solutions at WwTWs.

4.6.4 One known problem with catchment level solutions for nitrate is the lead in time for seeing reductions in the environment due to the time of travel through groundwater. Nitrate levels can remain high even after reductions in sources. This can lead to a misunderstanding as to whether a measure is working or not and therefore whether the measure is appropriate to support future housing growth. As such it should be noted that although catchment measures for nitrate are recommended, they are done so for the lifetime of the houses themselves rather than limited to the lifetime of the Local Plan. Impacts of groundwater are generally limited to the mainland where groundwater dominates the baseflow of the rivers and nitrate levels are high.

5. Action Plan

5.1.1 This report presents evidence to support future housing growth in the PUSH area to help with the production of Local Plans to comply with the National Planning Policy Framework, the Water Framework Directive (2000/60/EC) and the Habitats Regulations. There are currently gaps in the evidence base that require further investigation, monitoring and potentially, action, to ensure future growth is compliant with legislation.

5.1.2 A key issue behind the uncertainty is that it is known that catchment measures take time to make a measureable difference to water quality. It is not yet known how effective the existing catchment measures will be, but it is hoped that they will deliver improvements. However, if this improvement does not materialise, there is uncertainty whether the planned growth can be accommodated across all catchments. It is therefore necessary for the PUSH LPAs, statutory agencies and water companies to work together to consider incoming evidence and assess the water quality impacts at interest feature level as is required in line with the Habitats Regulations.

In order to recognise and plan for the uncertainty in both water quality and water resources, the following steps are recommended:

Number	Action	Suggested Timescale
1	PUSH authorities, NE and EA should continue to work together, and prioritise the production of a statement making clear their joint position.	As soon as possible
2	A Water Quality Working Group should be established, involving (at a minimum) each of the PUSH LPAs, Southern Water, Portsmouth Water, EA and NE. This group should meet regularly and receive and discuss new evidence as it emerges, taking action where necessary to ensure that any required mitigation is developed at a pace which enables both environmental protection and development.	Establish and meet by Q2 2018/2019.
3	The remit of this Working Group is for the participants to decide (a similar group in Chichester might provide a model), but at a minimum it should: Note and agree the WwTW improvements and delivery timescales (Appendix B) Refresh the IWMS in 2020 Work together to scope any potential future Nutrient Management Plan, recognising the time that developing such plans can take.	As soon as possible In 2020 As necessary, but in advance of need
4	In order to effectively deal with the remaining uncertainty around water quality, Local Plans must: Acknowledge that there is uncertainty as to whether housing development in the later stages of the plan period would require mitigation Acknowledge that effective mitigation may mean development proceeding on a nutrient neutral basis in some catchments Indicate that LPA's will work in partnership to secure timely mitigation if emerging evidence indicates it is needed Identify where phasing of new development is necessary to ensure that headroom in the most sensitive WwTWs is not exceeded prior to the review of IWMS and any necessary mitigation being identified and secured.	As soon as possible and as Local Plans come forward
5	In order to deal effectively with the uncertainty around water resources, Local Plans within the Southern Water area must: Acknowledge the uncertainty around delivery of water resources over the plan period (given WRMP's not finalised and Public Inquiry on changes to abstraction licences). Include policy requiring development to be built to the higher standard under the Building Regulations (which equates to 110l/head/day including external water use)	As soon as possible and as Local Plans come forward

5.1.3 Appendix B presents a review of pressures from growth on water quality and a summary of the measures which are required within the PUSH area. It should be noted that this is a live document, which will need to be updated regularly by the responsible parties. The Water Quality Working Group will need to take responsibility for reviewing and updating this document, in order to monitor the progress of mitigation proposals put forward within this report.

Appendix A Water Resource Management Planning

Southern Water – Water Resource Management Plan

In the context of water resources planning for future development, Southern Water and Portsmouth Water account for proposed developments in their Water Resources Management Planning (WRMP) Process. The Environment Agency have advised that they have been working with Southern Water and Portsmouth Water, on a programme of license changes to restore sustainable abstraction across Hampshire and the Isle of Wight. They have noted that they are actively engaged with both Water Companies during ongoing discussions in the development of their next Water Resource Management Plans. The following sections will therefore be subject to change based on the outcomes of these discussions.

Two WRZs in the PUSH area are completely within Southern Water's "Western Sources" area; Hampshire South (HS) and Isle of Wight (IW).

Southern Water forecast 'baseline' demand and supply across its supply network for the period 2015 to 2025. The supply demand balance calculations consider "the difference between the supplies available (water sources) and anticipated demands (water use) over each year of the planning period for a given planning scenario" (Southern Water, 2014). The WRMP includes the results of the baseline supply demand balances calculations for each of the individual WRZ's. These calculations were based on current (2014) include allowances for:

- Housing and population growth;
- Industrial and commercial demand for water;
- The effects of climate change; and
- The impact of new legislation.

The results denote whether an individual WRZ is going to have a surplus or deficit in water resource availability over the planning period. To examine the potential water constraints (and pressure that new developments and population increases can exert on water resources) it is necessary to consider the wider area from which resources are drawn. For the PUSH area, Southern Waters resources are contained within the geographical area except where there are pre-agreed water transfers. Given that there are no transfers between Southern Water's Western Sources area and its' Central and Eastern Sources, the review of the Western Sources baseline and final planning option scenario calculations can be considered separately from the rest of Southern Waters WRZ. It should be noted that there is uncertainty associated with the 2014 WRMP given that potential options to secure a supply demand balance in Hampshire South are to be confirmed.

Understanding supply in the Western Sources

In the Western Sources area, water is abstracted from both groundwater and surface water (river) sources. The bulk of the groundwater sources are located in the Chalk aquifer which underlies much of Hampshire and the Isle of Wight. The transmission and storage of groundwater in the Chalk aquifer is mainly a function of the distribution and continuity of fissures, which leads to uncertainty in how these sources may react in times of very low groundwater levels. These sources are often highly reliant on winter rainfall recharge. There are three river sources in the Western Sources; the Test and Itchen surface water abstractions which lie in Hampshire South WRZ and the Eastern Yar in the Isle of Wight WRZ.

There is no water currently sourced from bulk imports from other water companies and there are no raw-water reservoirs in the Western Sources area. The significant proportion of run-of river abstractions in the Hampshire South and Isle of Wight WRZ means that the Western Sources are most susceptible to the "minimum resource period", known as the Dry Year Minimum Deployable Output period, and to the Dry Year Critical Period (i.e. peak demand period). As a result, when discussing both the baseline and final planning calculations for each of the zones, both the Dry Year Minimum Deployable Output (MDO) and Dry Year Critical Period (CP) are considered.

Water situation by Water Resource Zone

Hampshire South

Water in the Hampshire South WRZ is sourced from 37% groundwater sources which abstract from the Chalk aquifer, and 63% from river sources. Southern Water currently abstract 66.55 Ml/d from two surface water sources and thus the remaining groundwater abstraction is ~39.08 Ml/d. The surface water abstractions are from the River Test and River Itchen.

The Hampshire South WRZ is the largest in the company's supply area with dry year demands typically around 150 Ml/d, which includes an inter-zonal bulk export to the Isle of Wight WRZ (Cross-Solent main) which has a capacity of 12 Ml/d. The WRZ supplies around 615,000 people, with no bulk imports in the baseline scenario.

When considering the baseline scenario calculations it is important to note that:

- Southern Water's WRMP (2014) outlines that a Sustainability Reduction on the River Itchen has been proposed and will be implemented from 2018. The sustainability reduction will "reduce, under certain flow conditions, the amount of water that Southern Water can abstract from its Lower Itchen sources" restricting the amount of water that can be abstracted in the months of June to September each year from 2018. Note that there is uncertainty associated within this assumption, given that Southern Water have appealed against the proposed license at Testwood, which is designed to protect against the SSSI; and
- During AMP5, the Lower Test National Environment Programme (NEP) investigation was completed. The investigation concluded that an increase in abstraction from the current deployable output of 105 Ml/d to the licensed quantity of 136 Ml/d would not have a detrimental effect on the environment. This increase was not included as part of the baseline calculations as Southern Water's correspondence with the EA concluded that "The baseline deployable output… should remain as 105 Ml/d in the draft WRMP unless you have evidence to reassess the deployment output for this source" (Southern Water, 2014 p.73).

The baseline which includes the Itchen Sustainability Reduction, and retains the current Lower River Test abstraction quantity (105 Ml/d) also includes considerations for climate change and the impact of new legislation and the following:

- There is expected to be an increase in population from 625,470 to 739,680;
- There is expected to be an increase in the number of properties from 265,410 to 321,930; and
- There is expected to be an increase in industrial and commercial demand for water.

The baseline supply demand forecast presented in the 2014 WRMP starts the 25 year planning period with a surplus, and includes a significant volume of water which is transferred through the cross-Solent main to support the Isle of Wight WRZ. Under the baseline scenario the full implementation of the sustainability reduction for the River Itchen will lead to immediate deployable output reductions so that the Hampshire South WRZ has a large-scale deficit and can no longer support the Isle of Wight WRZ. It should be noted that sustainability reductions at the River Itchen will only occur during severe droughts, when Southern Water will have recourse to drought emergency measures until alternative supplies have been secured. The baseline supply demand calculations present in Southern Water's WRMP14 are shown in Figure B.1 and B.2.

Figure B.1 Hampshire South Baseline Supply Demand Balance Dry Year Minimum Deployable Output (MDO)

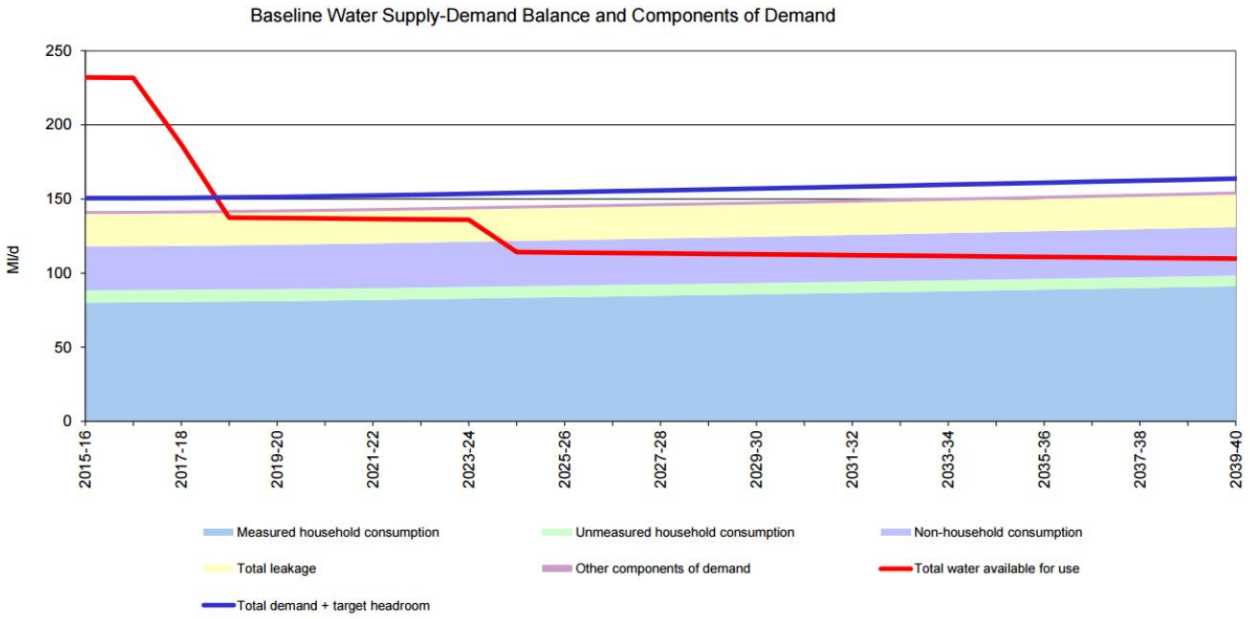
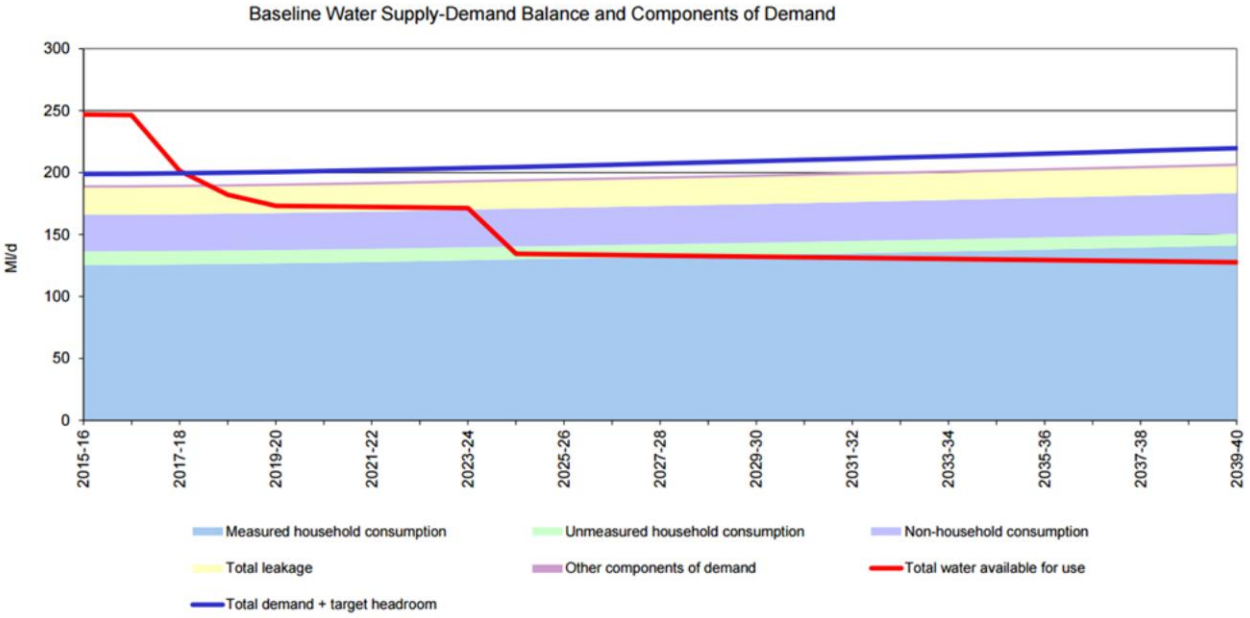


Figure B.4 Hampshire South Baseline Supply Demand Balance Dry Year Critical Period Planning Scenario (PDO)



Isle of Wight

Water in the Isle of Wight WRZ is sourced from 47% groundwater sources which abstract from the Chalk aquifer, and 23% from the Eastern Yar river source. An additional 30% of water is sourced from internal transfer from the Hampshire South Zone via the Cross-Solent main. Southern Water currently abstract 5.5 Ml/d from the Eastern Yar river source with a calculated 11.4 Ml/d abstracted from groundwater sources.

The Isle of Wight WRZ is a small WRZ and the source supplies around 135,000 people. The office of national statistics predicts that the Isle of Wight will have one of the highest population growth rates in the south east of England over the next WRMP period. The WRZ is supported by a bulk import from the Hampshire South WRZ which has a capacity of 12 Ml/d and is critical to the water security of the Isle of

Wight source. The aforementioned sustainability reduction on the River Itchen therefore could also impact the Isle of Wight WRZ if the cross-Solent import cannot be maintained.

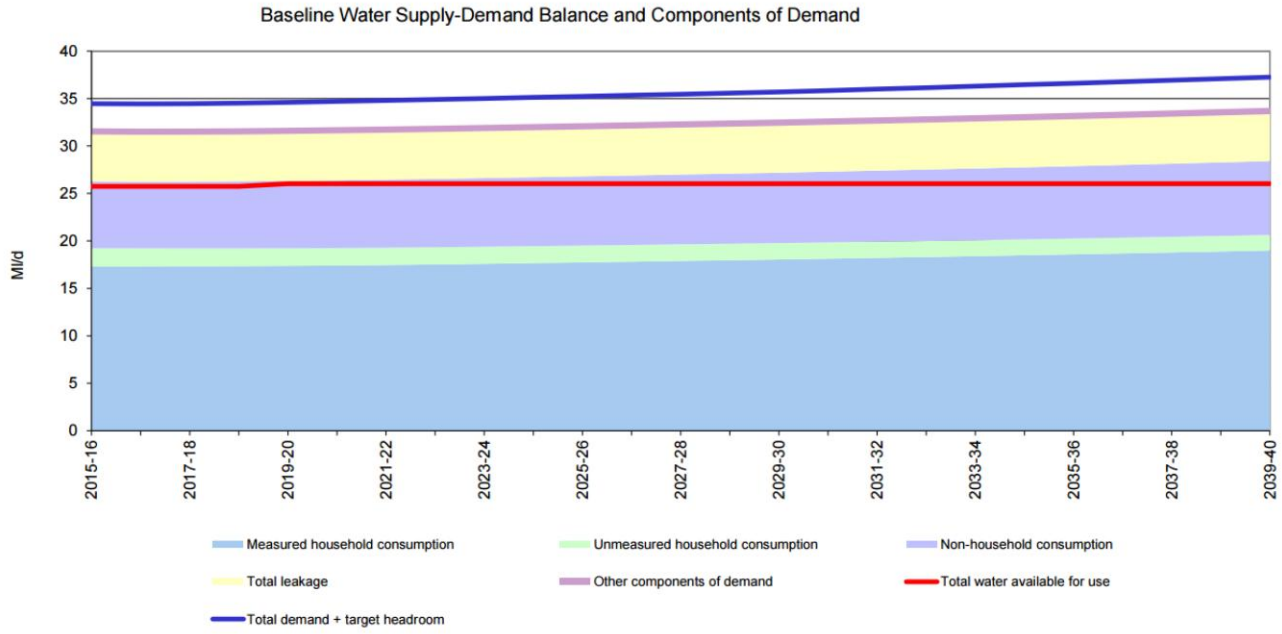
There are no bulk exports and Isle of Wight WRZ typically has dry year demands of around 35 Ml/d.

The Isle of Wight WRZ is considered to be at low vulnerability to climate change and there are no sustainability reductions planned in the period for the Isle of Wight WRZ. The baseline supply demand balance calculations include allowance for:

- Increase in population from 138,190 to 156,500;
- Increase in the number properties from 68,870 to 82,210;
- Increase in industrial and commercial demand for water; and
- Reduction in DO at one of its WSW.

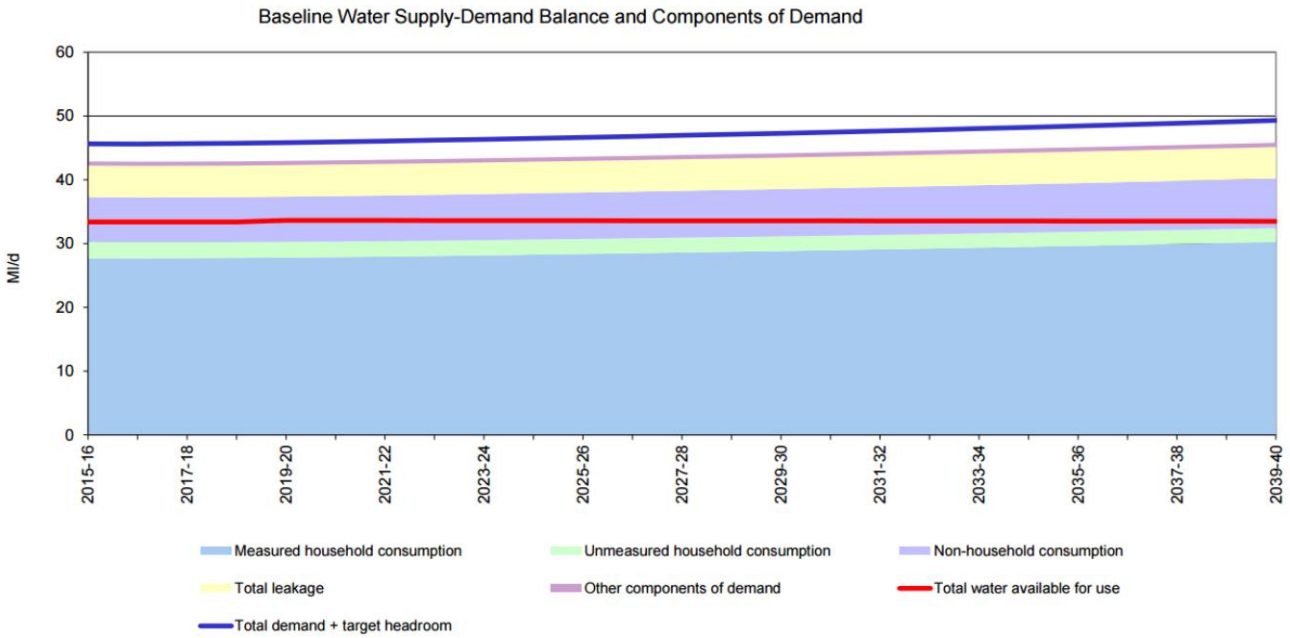
The baseline supply demand balance provided in Southern Waters WRMP (2014) shows that there is a supply deficit in the baseline demand forecasts over the 25 year planning period as shown in Figure B.3 and Figure B.4.

Figure B.3 Isle of Wight Baseline Supply Demand Balance Dry Year Minimum Deployable Output (MDO)



Note: that this baseline does not include supplies from Hampshire South WRZ

Figure B.4 Isle of Wight Baseline Supply Demand Balance Dry Year Critical Period Planning Scenario (PDO)



Note: that this baseline does not include internal transfer from Hampshire South WRZ

Hampshire Kingsclere

Water in the Hampshire Kingsclere WRZ is sourced solely from groundwater sources which is abstracted from the Chalk aquifer which underlies most of the WRZ. The Hampshire Kingsclere WRZ is a very small entirely self-contained WRZ and the source supplies approximately 15,000 people. There are currently no bulk imports nor exports to or from the WRZ and dry year demands in the WRZ are currently around 5 Ml/d, with a peak deployable output of 9.5 Ml/d.

The Hampshire Kingsclere WRZ is considered to be at low vulnerability to climate change and there are no sustainability reductions planned in the period for the Hampshire Kingsclere WRZ. The calculations produced by Southern Water and provided in the WRMP show that there is a small deficit in the peak deployable output towards the end of the planning period. This includes a deficit in the peak deployable output of less than 0.1 Ml/d from 2037.

Hampshire Andover

Water in the Hampshire Andover WRZ is sourced solely from groundwater sources which abstract from the Chalk aquifer which underlies the WRZ. The Hampshire Andover WRZ is a small WRZ and the source supplies 65,000 people. There is currently one small existing bulk export to Wessex Water from Hampshire Andover through the planning period which has an average deployable output of 0.33 Ml/d and peak deployable output of 0.41 Ml/d. There are no bulk imports currently active or planned in the planning period. The Hampshire Andover WRZ is considered to be at low vulnerability to climate change and there are no sustainability reductions planned in the period for the Hampshire Andover WRZ. The baseline supply demand balance provided in Southern Waters WRMP (2014) shows that there is no deficit in the supply demand forecasts over the 25 year planning period.

Plan for Strategic Grid

The baseline supply demand calculations presented by Southern Water WRMP14 have shown deficits in both of the water resource zones encompassed with the PUSH area. Additionally there is a very small deficit in the Western Sources Hampshire Kingsclere WRZ towards the end of the planning period. The baseline WRMP14 calculations considered:

- Completion of universal metering programme undertaken by end of AMP5;

- Continuation of baseline water efficiency activity throughout the planning period;
- Maintain leakage at agreed Ofwat target (unless leakage reduction is selected as least cost);
- Stochastic approach to calculation of deployable outputs from 2019/20;
- Inclusion of climate change impacts on supply and demand;
- Continuation of bulk supply to commercial customer in Hampshire South throughout planning period;
- Continuation of small existing bulk export to Wessex Water from Hampshire Andover through planning period; and
- Use of existing cross-Solent main to supply the Isle of Wight (from Hampshire South).

The Hampshire South and Isle of Wight WRZ's are at risk of large supply deficits (baseline forecasts). As part of the WRMP calculations a solution is necessary to meet the deficits in each planning scenario and for each year of the 25-year planning period simultaneously. Southern Water have provided details in the WRMP14 of the options to be actioned to remove this supply deficit throughout the planning period, as described by WRZ in the following sections. Further discussions with Southern Water (pers. Comm 2017) have allowed a further understanding on the development of these schemes, and an initial scope on future schemes likely to be considered in the future WRMP19.

Hampshire South

The baseline supply demand calculations showed a significant deficit for the planning period. The Hampshire South Water Resource Zone has three primary schemes planned in order to meet the demand of its customers over the WRMP period.

- Portsmouth Water Transfer Scheme: The proposal in the Water Management Plan had been to maintain the 10 Ml/d bulk transfer from Portsmouth Water to Hampshire South until 2024 however, recent negotiations will see this increase to a bulk transfer of 15 Ml/d from August 2017. Referred to as the "T-HSO-3 bulk supplies from PWC" in WRMP14. However, recent information from the EA has indicated that since WRMP14 Southern Water have reported a 16% reduction in demand based on metering programme results, which is equivalent to 27ml/day. This suggests that there is unlikely to be a measurable deficit in water resources in Hampshire South.

There are two schemes which are currently proposed for when abstraction from the Lower Itchen is curtailed. These include:

- Testwood Abstraction Scheme: A network link between the River Test at Testwood and the Lower Itchen at Otterbourne. This raw water transfer will be permitted when the Itchen Sustainability Cessation is in place and will allow abstraction, treatment and pumping to the Lower Itchen WSW. The final draft application is currently ready to submit and is currently awaiting a decision on the application of the Testwood Licence which is due imminently. Should any conditions be added to the Testwood licence, then Southern Water are aware that they will need to find additional sources to cover any shortfall. It is likely that there will be a time limit to the licence (2027). This scheme is referred to as the "HSL3+HST2 Conjunctive use" in the WRMP14.
- The Candover Valley Scheme: The WRMP had planned on adopting or acquiring the groundwater river support scheme in the Candover Valley and using the additional upstream discharges to reduce the likelihood of the River Itchen Sustainability Cessation being enforced. This scheme is currently on hold and awaiting approval as in July 2016 the Environment Agency's licence application included a reduced licence quantity. Currently it is understood that there will be no decision on this matter until the end of 2017. Referred to as the "JO3a MDO groundwater scheme for river augmentation" in the WRMP14.

If either options 2 or 3 are not granted Southern Water will continue to investigate additional potential measures. These had been outlined in the WRMP14 and so it is likely that for the Hampshire South Water

Resource Zone Southern Water will most likely look at an effluent reuse scheme located within the zone, or an investigation into the construction of a desalination plant on the Isle of Wight to reduce or eliminate the need for the current bulk transfer scheme. At the time of writing, effluent reuse is currently the preferred option by Southern Water to meet a shortfall in demand, and is being investigated as part of the WRMP19. Another option currently being investigated is the increased use of bulk transfers into the area – Southern Water are currently investigating the feasibility and viability of transfers from Bournemouth Water, Portsmouth Water, Thames Water and/ or Wessex Water as part of the development of the WRMP19.

Smaller schemes include

- Continued investigation into leakage management and demand management, although given Southern Waters good current track record, the benefits from these schemes may be limited.
- Continuing to investigate any potential catchment management schemes to offset deployable output reductions (particularly relating to nitrate pollution) or to identify whether there may need to be improvement in the treatment of these sources. This will continue until 2025 as outlined in the current WRMP14.
- Further demand management schemes include a trial scheme – small intensive water scheme currently implement at Alresford near the Candover Valley. This is a reward scheme that will allow residents to earn up to £50,000 towards a community project for reducing water consumption across six selected parishes. The six parishes encompass 560 homes and this area has been specifically targeted to reduce the demand on the Totford abstraction located in the Candover Stream valley.

Figure B.5 Hampshire South Final Planning Supply Demand Balance Dry Year Minimum Deployable Output (MDO)

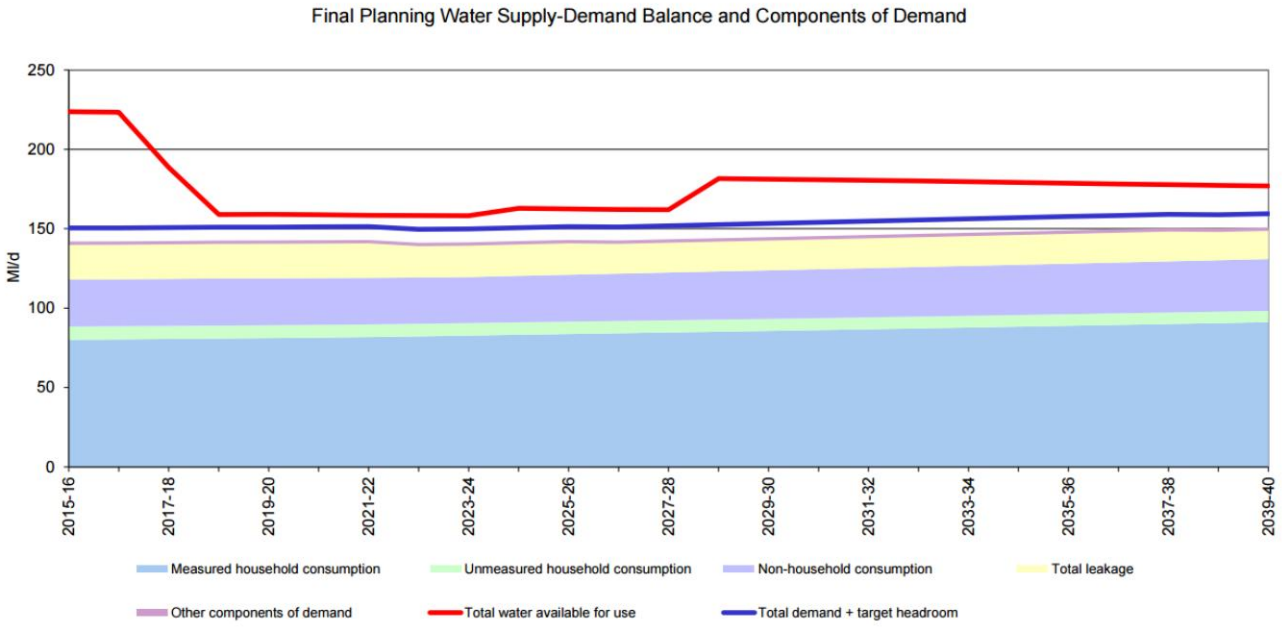
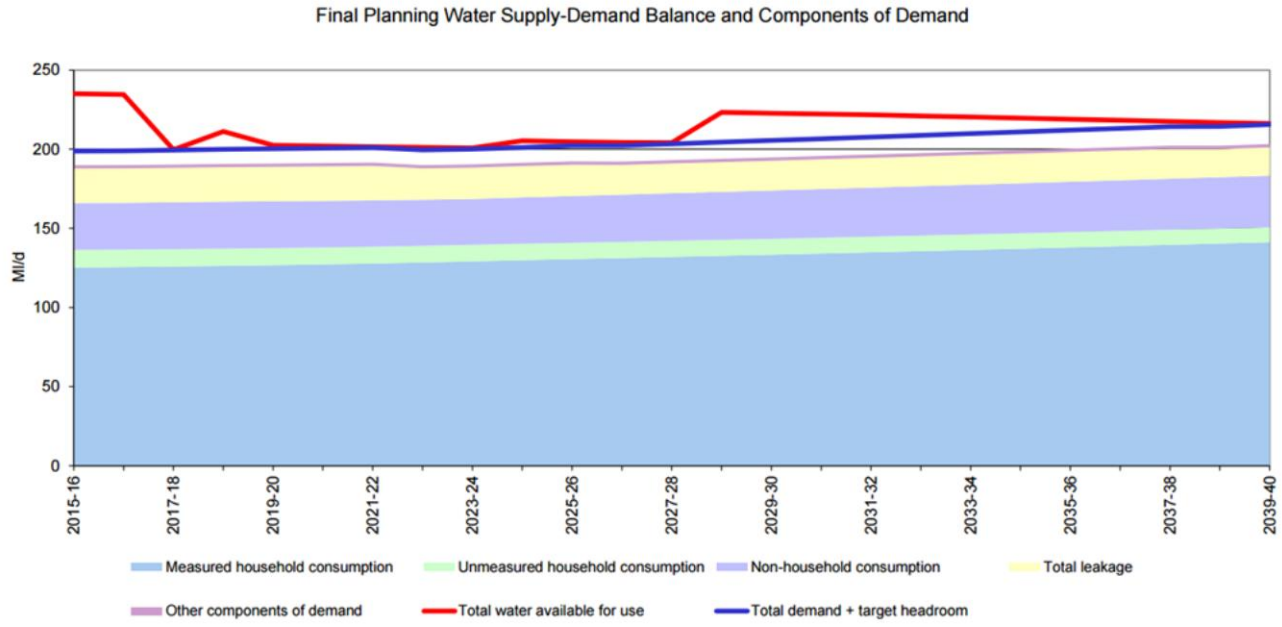


Figure B.6: Hampshire South Final Planning Supply Demand Supply Demand Balance Dry Year Critical Period Planning Scenario (PDO)



Isle of Wight

The baseline supply - demand scenario suggested a significant deficit for the planning period. The options selected to meet the demand deficit include:

- The IWL6 Groundwater rehabilitation on Isle of Wight which is an option to bring back online a groundwater source on the Isle of Wight. There is an existing service reservoir and associated supply mains so any required pipelines will be of minimal length, and booster pumps will not be required as the site currently pumps to the service reservoir. This scheme is likely to have only marginal deployable output benefits.
- The IWL7 scheme as documented in the WRMP14 planned to utilise full capacity of existing cross-Solent main. The scheme involved the upgrade of infrastructure to allow the full capacity of the cross-Solent main to be used so that the mainland could provide up to 20Ml/d to the island. Following discussion with Southern Water it is evident that the IWL7 scheme which was due to utilize the full capacity of existing cross-Solent main may be increased if necessary – this will be fully reviewed in the next WRMP19 especially if the Testwood licence is either rejected or is time limited.

Smaller schemes also include:

- Leakage reduction – Southern Water has some of the lowest leakage rates in the country so have limited opportunity to reduce leakage significantly. As technology improvements come through, then it may result in future leakage reductions.
- Demand management – Southern Water currently has one of the lower water per capita consumption rates and thus have limited opportunity to reduce demand. As knowledge and awareness improve it is anticipated that there may be some decrease in water demand.

Going forwards, desalination is the preferred option in the IOW WRZ to meet any large shortfalls in water availability. Effluent reuse is also being considered by water resource managers in the area as the Environmental Improvement Plan for the island is likely to result in less water availability. Southern Water are currently investigating various options which they will publish in their WRMP19 plan.

Figure B.7: Isle of Wight South Final Planning Supply Demand Balance Dry Year Minimum Deployable Output (MDO)

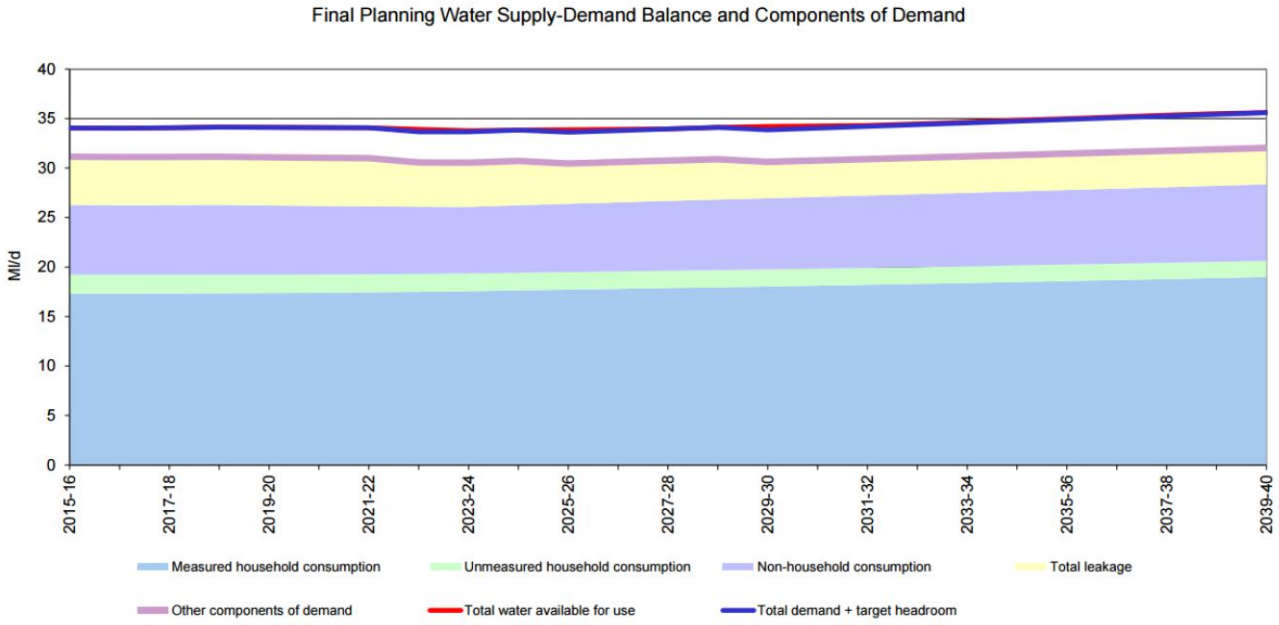
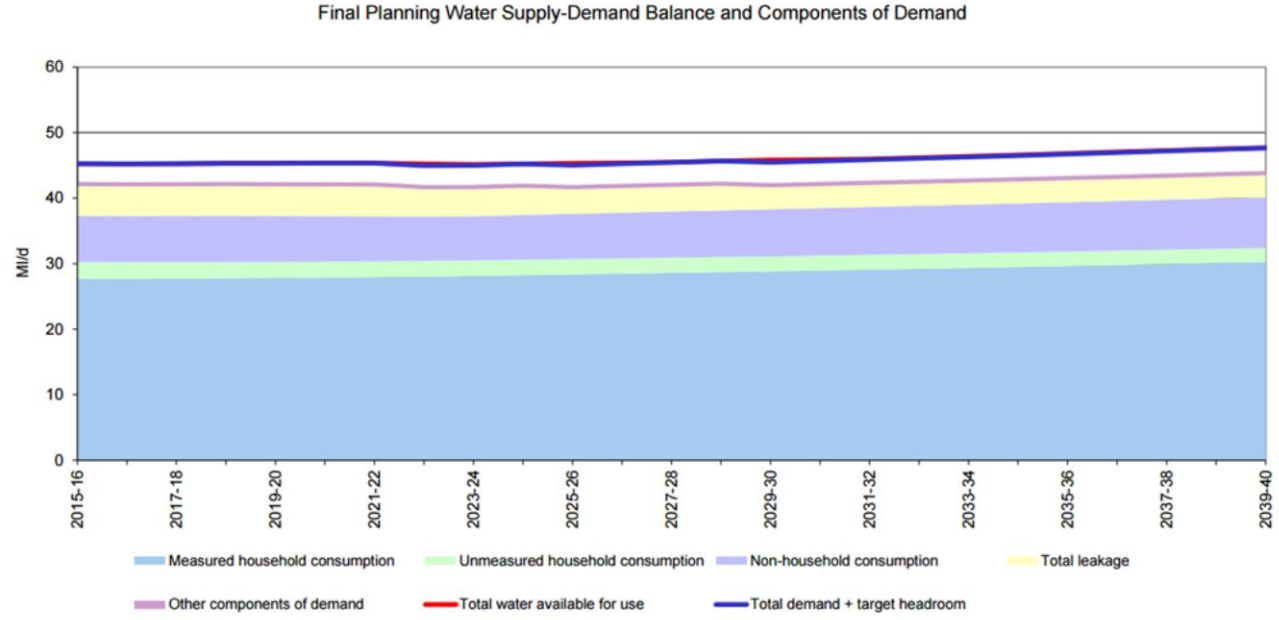


Figure B.8: Isle of Wight Final Planning Supply Demand Supply Demand Balance Dry Year Critical Period Planning Scenario (PDO)



Hampshire Kingsclere

Final supply demand calculations have been considered for the Hampshire Kingsclere WRZ. The baseline supply - demand calculations showed no deficit for the majority of the planning period and thus no new supply-side options planned for this WRZ. The strategy to reduce the deficit is to implement demand management, leakage reduction and water efficiency options which will enable the best use of the existing resources. The final supply demand calculations from Southern Waters WRMP are presented in Figure 5.6a and 5.6b. The water efficiency measures will include audits of schools (HK-WE-B planned for 2033), large business (HK-WE-D planned for 2033) and SMEs (HK-WE-C planned for 2035).

Hampshire Andover

The baseline supply demand calculations showed no deficit for the planning period, thus there is no requirement for a final planning solution in this WRZ.

Potential to accommodate growth

It is clear from the forecast supply-demand balance and the main Water Resources Management Plan (WRMP14) that the resource situation in this area is constrained by environmental water availability, and that with growth forecast, if there were no interventions security of supply would be at risk. The options put forward in the final planning options by Southern Water area include:

- Water efficiency measures;
- Bulk transfers;
- Increased abstractions; and
- Leakage reduction

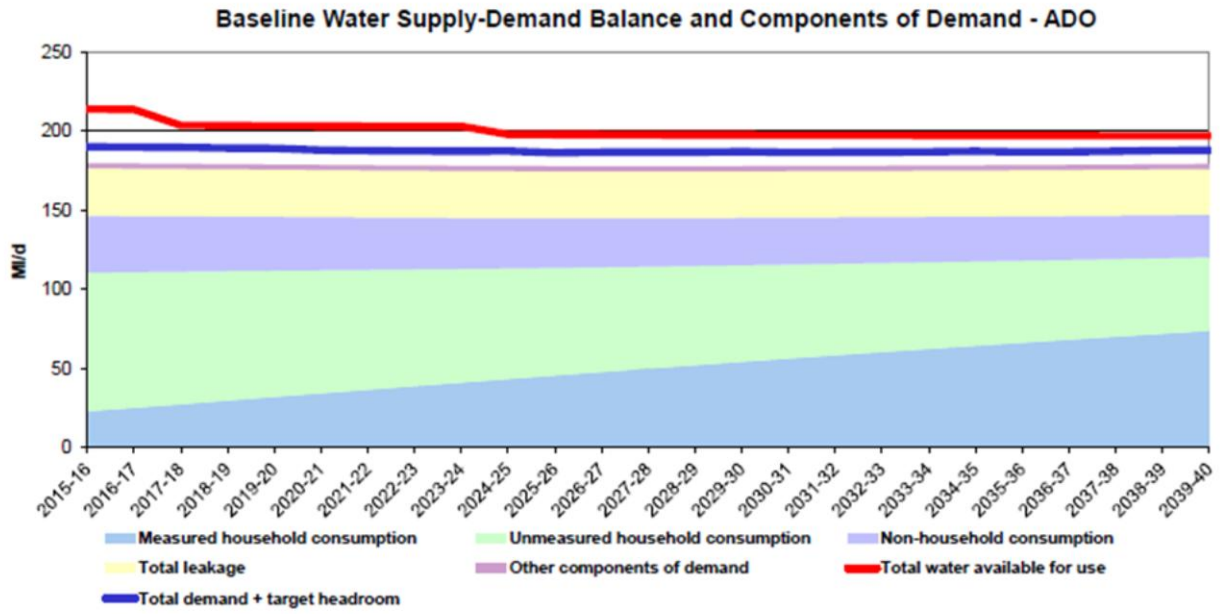
The forecast takes into account that over 12,792 and 54,571 new properties will be built in the Hampshire Isle of Wight and Hampshire South WRZ, respectively, by the end of the planning period in 2040. As of the WRMP14 Southern Water had fulfilled their requirements to meet future water demand, but it is evident that with uncertainty surrounding the Testwood to Otterbourne transfer scheme and the Candover Valley scheme, alternatives will need to be considered. Southern Water have suggested that Effluent Reuse, Desalination and External Transfers are the most likely sources of additional water to be considered in the WRMP19 and to meet future demand.

Phase 2 examines in more detail the implications of and for growth as constrained by water resources and supply availability the assumptions made by Southern Water do not correlate with those assumptions made by the individual councils in the PUSH area. At this stage, it is sufficient to note that whilst Southern Water has identified a supply-deficit it has also identified its strategy to resolve that whilst supporting significant growth in the zone.

Portsmouth Water – Water Resource Management Plan

Portsmouth Water has forecast 'baseline' demand and supply across the supply network for the period 2015 to 2040. The baseline forecast is developed excluding any policies or other interventions beyond what the company is already doing or has already committed to. Figure B.9 shows Portsmouth Water's baseline forecast of the supply-demand balance for the network. The red line is the supply forecast and this includes all water that is available for use, including water imported from other zones. The blue line is the forecast demand, including a buffer (headroom) to allow for and increase resilience to any uncertainties in the forecasts. It shows there is surplus in water supply for the whole of the planning period.

Figure B.9 Baseline annual average forecast supply-demand balance



NOTE: Taken from 2014 WRMP (Portsmouth Water, pp.95)

Understanding Sources of Supply

Portsmouth water abstracts from various groundwater abstractions, spring sources and one surface water abstraction from the River Itchen. A number of the groundwater abstractions are part of group licences, and these are as follows:

- Source B;
- Source C and Source D;
- Source F and Source G;
- Group 1 (Source T, Source Q, Source R and Source S); and
- Group 2 (Group P, Source O, Source L, Source M, Source N and Source U).

5.1.4 The WRMP plan noted that the company abstracts an average of around 180 Ml/d from boreholes. The company has no significant raw water storage and consequently is reliant on the recharge of groundwater over the winter period. Portsmouth water has historically been a “peak driver company because of its groundwater supplies and lack of raw water storage” (Portsmouth Water, 2014 pp. 31). The source constraints on each source works has been summarised in Table B.1 below.

Table B.1 Source Works Constraints

Source Works	Abstraction Licence (Ml/d)	
	Average	Peak
River Itchen	45.50	45.50 (41.1 in July)
Source C and Source D	20.51	31.50
Source E	0.46	0.46
Source F and Source G	9.02	15.00

Source Works	Abstraction Licence (Ml/d)	
	Average	Peak
Source H	9.12	13.64
Source I	6.83	7.96
Source J	22.73	25.20
Source K	11.37	13.64
Source B	98.00	137.00
Group 2	65.04	94.60
Group 1	28.38	41.00
Company Total	**316.96**	**425.46**

NOTE: Taken from 2014 WRMP (Portsmouth Water, pp.32)

Water transfer can be utilised to make better use of resources. Portsmouth Water does not receive any bulk supply imports, but does have a bulk supply export to Southern Water from Whiteways Lodge. In peak conditions this can reach 15 Ml/d, but averages 1 Ml/d. The existing transfer was due to end, but is currently in the process of being extended. In addition there are plans to export water to south east water (10 Ml/d) to be commissioned in 2040.

Plan for Water Resource Zone

The 2014 WRMP has calculated that the WRZ remains in surplus at average, peak week and minimum deployable output throughout the planning period from present to 2040. The calculation included bulk supplies requested as a result of the collaborative approach of the Water Resources in the South East (WRSE) process. The WRSE include six water companies, the Environment Agency, Ofwat, Defra, the Consumer Council for Water and Natural England and was set up to determine a regional water resources strategy “comprising a range of strategic options to find the best solution for customers and the environment in the South East of England” (Portsmouth Water, 2014 pp. 25).

Given that that Portsmouth water area is in surplus, there are currently no actions to address in order to meet projected supply deficits. Despite this, Portsmouth Water have looked into various options for increasing supply. The options appraisal process assessed unconstrained options then feasible options, undertook economic appraisal, programme appraisal, strategic environment assessment and habitats regulation assessment before concluding the preferred programme of options.

Portsmouth Water originally considered 132 unconstrained options, which went on to create 35 feasible options are outlined in Table B.2 below. The WRMP also considered the average incremental social costs (AISC) for each option. A negative AISC would mean that the benefits of the scheme would outweigh the costs. As none of the schemes achieved a negative AISC, none of the options will be progressed at present.

Table B.2: Summary of Portsmouth Water Strategy Options

Option Type	Scheme description	AISC at Average Deployable Output (p/m3)	Assumed benefit
Production	Farlington WRW Recover Plant (existing Works B)	33.91	3.6 Ml/d
	Farlington WTW Washwater Recovery Plant Option B (with Havant Thicket)	36.04	4.8 Ml/d
Resource	Havant Thicket Winter Storage Option A	31.69	23 Ml/d

Option Type	Scheme description	AISC at Average Deployable Output (p/m3)	Assumed benefit
Resource Sharing	Cessation of bulk supply export to Southern Water from Whiteways Lodge	Not given	1 Ml/d (average) 15 Ml/d (peak)
	Share in new WRSE bulk transfer options	Not given	Not given
	Import from Petersfield to Clanfield service reservoir from South East Waters	Not given	10 Ml/d
Increase Abstraction and Maximise Deployable Output	River Itchen Abstraction (10 Ml/d) moved from Source A to tidal limit	8.66	10 Ml/d
	River Itchen Abstraction (20 Ml/d) moved from Source A to tidal limit	8.57	20 Ml/d
	River Itchen Abstraction (30 Ml/d) moved from Source A to tidal limit	7.78	30 Ml/d
	Group 3 – maximising deployable output	4.95	9 Ml/d
New Technology	Portsmouth Harbour Desalination Plant on Whale Island	22.55	25 Ml/d
	Budds Farm Effluent Re-use Scheme	42.12	20 Ml/d
Distribution Options (Leakage Management)	Installation of direct meters	Not given	Not given
	Additional pressure management	Not given	Not given
	Mains replacement	Not given	Not given
	Increasing find and fix leakage control activity on trunk mains and distribution mains	Not given	Not given
	Increasing find and fix leakage control activity on communication pipes	Not given	Not given
	Deployment of permanent noise loggers	Not given	Not given
Distribution Options (Customer Side)	Rising block tariffs	152.0	5.9
	Charging only above a defined “subsistence” level of service	168.81	5.2
	Meter remaining unmetered non households	101.27	0.2
	Meter all households within a water stressed area	297.36	2.9
	Metering on change of occupancy	224.0	3.1
	Seasonal tariffs	146.11	5.7
Water Efficiency Options	Targeted water efficiency advice for industrial/ commercial/ public sector customers and recreation facilities	5.34	0.8
	Household water efficiency programme (partnering approach, home visit)	30.58	1.4
	Water saving devices – low flow showerheads	46.81	0.8
	Water saving devices – flush controllers for urinals	36.71	0.2

Option Type	Scheme description	AISC at Average Deployable Output (p/m3)	Assumed benefit
	Water saving devices – retrofitting existing toilets	716.43	0.1
	Water saving devices – retrofitting spray fittings to taps	56.22	0.3
	Subsidiary to customers that purchase water efficient appliance – washing machines and dishwashers	93.63	0.1
	Subsidiary to customers that purchase water efficient appliance – showers and toilets	20.79	0.3
	Appliance exchange programmes	10.99	0.7

Potential to accommodate growth

Portsmouth Water projections have shown a supply-surplus between the 2014 WRMP and 2040. The forecast takes into account 67,670 new properties will be built in this resource zone by 2039/40, increasing property numbers from 288,150 in 2015/2016 to 347,762 in 2039/2040. In line with an increase in property numbers, the population is likely to increase by 151,668 to 806,911 by 2039/2040. Phase 2 examines in more detail if the 68,000 new properties have been fully taken into account by Portsmouth Water and the implications of and for growth as constrained by water resources and supply availability if it is not.

Appendix B Review of Pressures and Mitigation Measures

Data is provided in an attached excel workbook (Appendix B STW Summary info for PUSH xls.) available on request as a hard copy.

Appendix C
Planned housing and employment growth within the PUSH area, and receiving wastewater treatment works catchment

Southampton County Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	754	727	727	633	Woolston	Hampshire South
	485	468	468	407	Portswood	Hampshire South
	3331	3211	3211	2796	Millbrook	Hampshire South
Planned Employment (m2)	4154	4154	4154	5107	Woolston	Hampshire South
	3243	3243	3243	3988	Portswood	Hampshire South
	32602	32602	32602	40083	Millbrook	Hampshire South

New Forest District Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	191	715	627	612	Slowhill Copse	Hampshire South
	103	385	338	330	Ashlett Creek	Hampshire South
Planned Employment (m2)	4522	4522	4522	5426	Slowhill Copse	Hampshire South
	2435	2435	2435	2922	Ashlett Creek	Hampshire South

Test Valley Borough Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	715	715	715	838	Romsey	Hampshire South
	319	319	319	374	Millbrook	Hampshire South
	9	9	9	10	Chickenhall Eastleigh	Hampshire South
Planned Employment (m2)	1983	1983	1983	2380	Romsey	Hampshire South
	18082	18082	18082	21698	Millbrook	Hampshire South
	125	125	125	150	Chickenhall Eastleigh	Hampshire South

Eastleigh Borough Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings	1300	1300	1300	1560	Chickenhall Eastleigh	Hampshire South

(No.)	650	650	650	780	Portswood	Hampshire South
	1300	1300	1300	1560	Peel Common	Hampshire South
Planned Employment (m2)	11368	11368	11368	13642	Chickenhall Eastleigh	Hampshire South
	5684	5684	5684	6821	Portswood	Hampshire South
	11368	11368	11368	13642	Peel Common	Hampshire South

Winchester City Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	326	591	253	63	Bishops Waltham	Hampshire South
	908	1649	707	175	Peel Common	Hampshire South
	89	161	69	17	Chickenhall	Hampshire South
	78	142	61	15	Wickham	Hampshire South
	1438	1269	527	179	Budds Farm	Hampshire South
	7	6	3	1	Southwick	Hampshire South
Planned Employment (m2)	499	512	398	444	Bishops Waltham	Hampshire South
	5353	5488	4270	4763	Peel Common	Hampshire South
	6696	6696	6696	8035	Budds Farm	Hampshire South

Fareham Borough Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	2417	2552	2555	2874	Peel Common	Hampshire South
Planned Employment (m2)	33425	43225	43225	51870	Peel Common	Hampshire South

Portsmouth City Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	3636	3636	3636	4363	Budds Farm	Portsmouth
Planned Employment (m2)	41238	41238	41238	49485	Budds Farm	Portsmouth

Gosport Borough Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	773	773	773	928	Peel Common	Portsmouth
Planned Employment (m2)	18366	19475	19475	23370	Peel Common	Portsmouth

Havant Borough Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	2488	2952	2315	2246	Budds Farm	Portsmouth
Planned Employment (m2)	27222	27222	27222	32666	Budds Farm	Portsmouth

East Hampshire District Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	819	793	491	706	Budds Farm	Portsmouth
Planned Employment (m2)	2000	2000	2000	2400	Budds Farm	Portsmouth

Isle of Wight Council

	2016-2020	2021-2025	2026-2030	2031-2036	Receiving WwTW	Water Resource Zone
Planned Dwellings (No.)	2793	2793	2793	3147	Sandown	Isle of Wight
	35	35	35	39	Shalfleet	Isle of Wight
	23	23	23	26	Shorwell	Isle of Wight
	59	59	59	66	St Helens	Isle of Wight
	75	75	75	85	Wroxall	Isle of Wight
	27	27	27	31	Brighstone	Isle of Wight
	23	23	23	26	Calbourne	Isle of Wight
	23	23	23	26	Chale	Isle of Wight
	23	23	23	26	Chillerton	Isle of Wight
	73	73	73	83	Godshill	Isle of Wight
	59	59	59	67	Roud	Isle of Wight
Planned Employment (m2)	4458	4458	4458	5350	Sandown	Isle of Wight

Appendix D
EA evidence. Source apportionment of nitrate loading of WwTW affecting designated areas

This table shows the output from modelling undertaken for the Water Framework Directive nitrogen investigations in 2013 and 2014. Some small percentage N contributions below 1% are not shown, as a result some totals do not quite add up to 100%)

Input	Hamble	Portsmouth Total	Langstone	Chichester Total	Eastern Yar	Medina	Newtown	Western Yar	
Christchurch Hbr Rivers	3	3		2	0.8	3	12	12	
Walkford Brook									
Danes Stream							1	1	
R.Lymington									
R.Beaulieu									
R Test Natural B/G	9	4	2	2		3	4	2	
R Test Urban	0.5	0.3	0.1	0.1		0.2	0.2	0.1	
R Itchen Natural B/G	3	2	1	1		1	1	1	
R Itchen Urban	0.9	0.5	0.4	0.4		0.4	0.4	0.2	
Monks Brook									
R.Hamble Natural B/G	37	2					1	1	
R.Hamble Urban	2								
Hamble Tribs	12								
R.Meon	1	2					1	1	
R.Wallington Natural B/G		6	6.9	5					
R.Wallington Urban		4	4.1	3					
Hermitage Natural B/G			0.8	0.2					
Hermitage Urban			2.2	0.4					
R.Lavant(Havant) Natural B/G		1	27.5	5.4					
R.Lavant(Havant) Urban			5.5	1.1					
R.Ems				5					
Ham Brook				1					
R.Lavant(Chi) Natural B/G				3					
R.Lavant(Chi) Urban Diffuse				1					
Chi Canal									
Fishbourne Stream				1					
R.W.Yar									
R. Thorley Brook Background								48	
R. Thorley Brook Urban								2	
R. Blackbridge Brook									
R.Medina (& Lukely Brook) Natural B/G						68			
R.Medina (& Lukely Brook) Urban						6			
R.E.Yar (Natural B/G)					51				
R.E.Yar Urban					8				
Broad Rife									
Pagham Rife									
Bremere Rife									
Caul Bourne (to Newtown)							13.5		
Ningwood Stream (to Newtown)							7		
Newtown Brook (to Newtown)							4		
Clamerkin Brook (to Newtown)							10		
Fleetlands Copse Stream (to Newtown)							1		
Rodge Brook (to Newtown) Natural B/G							5		
Other rivers (<1% each) *			5	2		2			
Pennington STW							1	1	
Soton Water STWs	3	2				1	2	1	
Bishop Waltham STW	8								
Bursledon STW	6								
Peel Common STW		2							
Budds Farm STW									
Bosham STW									
Chichester STW				2					
Thornham STW				3					
Lavant STW									
Fairlees STW									
Chale STW						2			
Chillerton STW						1			
Sandown		1			0.7				
Sidlesham STW									
Pagham STW									
Brading STW					3				
Roud STW					3				
Wroxall STW					3				
St Helens STW					3				
Godshill STW					2				
Thorley Brook STW								1	
Shalfleet STW							3		
Caulbourne STW							1		
Southwick STW		1							
Portswood STW									
Woolston STW									
Test STWs (mainly Andover 56%, Romsey 24%)	0.6	0.3	0.1	0.1		0.2	0.2	0.1	
Itchen STWs (Eastleigh 87%, Harestock 13%)	0.9	0.5	0.4	0.4		0.4	0.4	0.2	
Other STWs (<1% each) *			4	4					
Coastal Background	13	67	40	54	25	12	29	28	Coastal Background

Inputs from rivers (load from urban diffuse pollution shown in grey if signifcant)

Inputs from sewage works

* these sources may include specific inputs from other rows but grouped together for this waterbody as each one <1%

Freshwater diffuse	65	20	43	28	52	77	60	65
Coastal Background	13	67	40	54	25	12	29	28
STW total	18	7	4	9	15	5	8	3
Urban total	2	4.8	12.3	6.0	8.0	6.5	0.6	2.3
Total	**100**	**99**	**100**	**97**	**100**	**100**	**98**	**99**

Appendix E Main Water Quality baseline and modelled data.

Data is provided in an attached excel workbook (PUSH Appendix E Input Data and modelling outputs.xls) available on request as a hard copy.