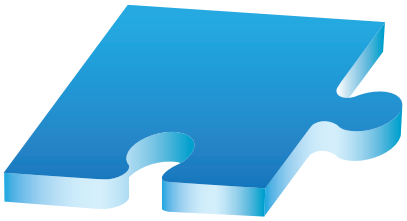
south east water



Water Resources Management Plan 2014

Appendix 7 : Optioneering

Executive Summary

1. Option identification and appraisal are important stages in the development of the Water Resources Management Plan 2014 (WRMP14). The key steps were:

    - Identify an extensive **Unconstrained Options List**, which either increases the water resource or reduces the water supply demand.

    - Condense the Unconstrained list down to a more manageable **Constrained Options List** of the most promising options which can be studied further and be considered for selection in WRMP14.

    - Further refinement to develop a **Feasible Options List**.

    - Using detailed economic modelling, environmental impacts and risk considerations to develop a **Preferred Options List** for inclusion in the WRMP14.

2. To ensure that the detailed options study is focused in the right areas, a careful filtering process was undertaken to remove options. This filtering process is known as Screening and is an approach recommended in the relevant guidelines for developing water resource plans.

3. This appendix summarises how we have undertaken the screening process up to and including the feasible options list. Section 8 and appendix 8 outline the modelling approach and how we have taken our feasible options list to a preferred options list.

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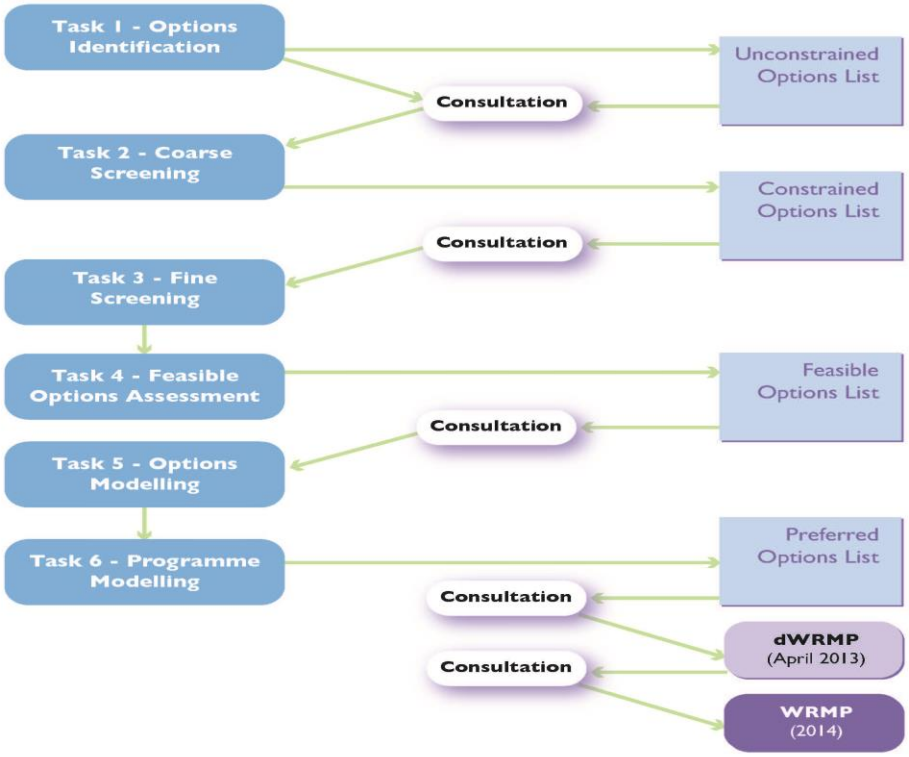
Overview of Options Appraisal Process

Background

4. Option identification and appraisal are important stages in the development of the Water Resources Management Plan 2014 (WRMP14). The key steps are illustrated in Figure 1.

Figure 1: Options Appraisal Process



Key Objectives

5. The key objectives of the screening approach were to:
    - Actively involve stakeholders and customers;
    - Comply with relevant WRMP guidance;
    - Meet the requirements of Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment (HRA);
    - Provide a simple, transparent and fully recorded process with trackable screening decisions and key assumptions and judgments made clear and any uncertainties identified;
    - Ensure a consistent approach of avoiding bias against options where less information is available (or more needed);
    - Provide flexibility to allow future revisions, iterations and additions;
    - Apply lessons learned from WRMP09; and
    - Contribute to meeting the overarching objectives of the WRMP14.

Consultation

6. Stakeholder and customer communication and engagement is considered to be an important part of screening of options. We consulted with stakeholders on an on-going basis throughout the process. Our consultees have provided constructive input into each step outlines in Figure 1. Further details on our engagement strategy can be found in section 2 and appendix 2.

7. The flow chart in Figure 1 indicates how consultation was incorporated into the process. Option lists and methodologies presented to stakeholders during the consultation were as draft documents for their consideration and input.

8. Consultation was principally through the Environment Focus Group (EFG), but also included statutory consultees and wider consultees during the Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment (HRA) process as well as members of the Customer Challenge Group and Ofwat Advisory Panel.

Option Types

9. As part of our twin track approach to balancing supply and demand, a range of supply and demand side options have been investigated as part of the optioneering process. Table 1 provides an overview of the types of options investigated.

10. Compared to WRMP09 two new options types have been added, catchment management and network reinforcement.

11. Network reinforcement options are currently under study and are influenced by the other resource options to be implemented. Such network options can therefore only be determined later.

12. Catchment management is an area for action that is being investigated currently through the Adur and Ouse catchment management pilot study involving a wide range of organisations. Actions can include the re-creation of wetland systems to reduce run-off, support springs and smooth river flow which can in turn help to sustain abstraction for longer periods. Increased natural water storage in the catchment can improve resilience to climate change,

and improve water quality downstream. Also initiatives through planting and wetland creation can be linked to carbon off-setting. The role of catchment management initiatives was considered further alongside the development of the WRMP14 supply side and demand management options.

Table 1: Option Types

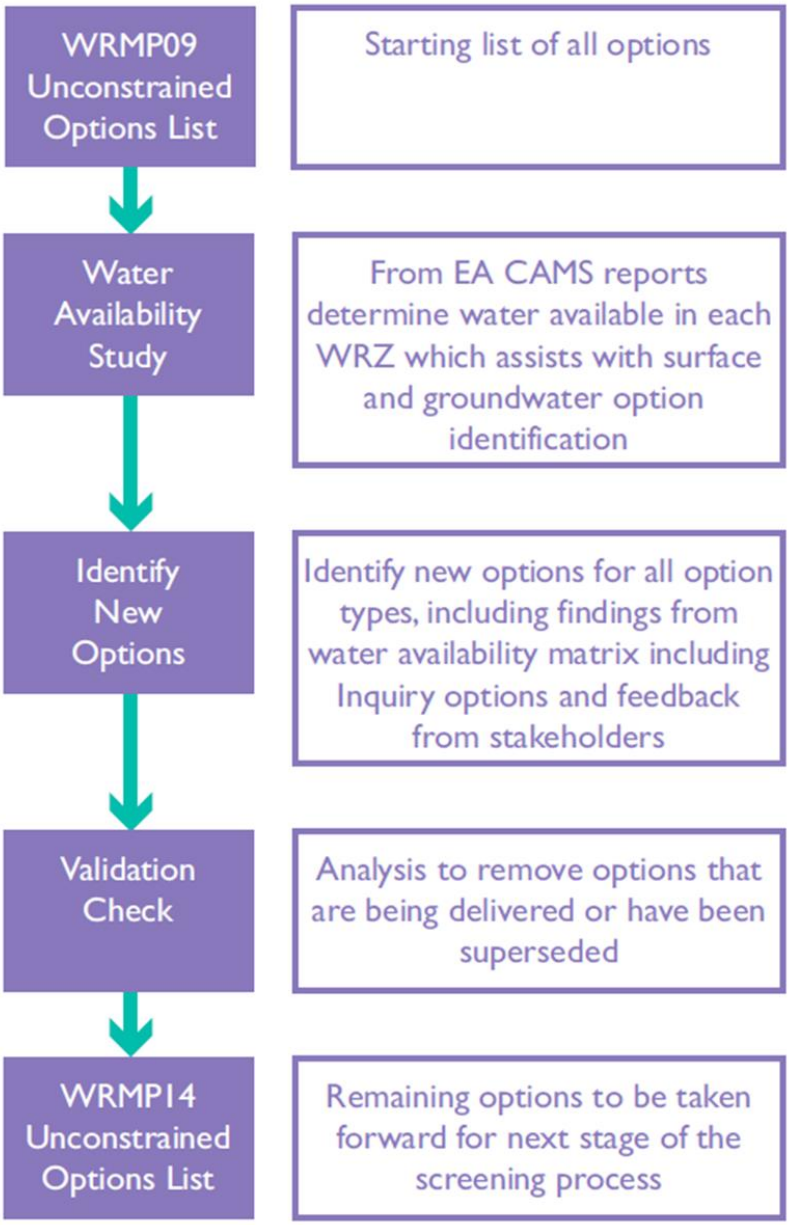
Option Group	Option Type	Further breakdown of option types into sub types
Groundwater	Groundwater Enhancement (EGW)	'Closing the gap' - Increasing abstraction to the level allowed within a current licence by addressing an existing constraint
	New Groundwater (NGW)	'Beyond the licence' - extend an existing licence to allow for further abstraction (new licence required)
		New groundwater source (new licence required)
	Aquifer Storage and Recovery (ASR)	Storing of water in groundwater aquifers for extraction during increased demand periods e.g. in the summer
Surface Water	Surface Water Enhancement (ESW)	Increasing abstraction from an existing source
	New Surface Water (NSW)	New locations for surface water abstractions – either from a gravel pit or a river
	Storage Reservoir (RES)	Bunded – man made banks all round
		Bankside – partially bunded with natural topography
		Impoundment – dam and natural topography
		Existing reservoir – extension or raising
Licensing	Licence Trading (LIC)	Underused abstraction licences or licences no longer required by licensee – potentially available
Water Re-use	Water Re-use (EFF)	Reverse Osmosis - a membrane-technology filtration process normally used for desalination but which can also be applied to effluent
		Conventional wastewater treatment - consists of a combination of physical, chemical, and biological processes to treat effluent
Desalination	Desalination (DES)	Estuarine – taking estuary water
		Coastal - taking coastal water
		Brackish water abstraction – boreholes near the coast or estuaries
Water Transfers	Company Transfer (CTR)	Transfers of water within the SEW company area
	Inter-company / Regional Transfer (RTR)	Transfers of water from/to outside the company on an inter-company or regional scale
	National Transfer (NTR)	National bulk transfers
	International Import (INT)	International importing of water
Conjunctive Use	Conjunctive Use (CON)	Combining surface water abstraction and groundwater abstraction to allow periods for aquifer recovery and avoid surface water abstraction in low flow periods.
Water Treatment Works	WTW Expansion (WTW)	Improving the water treatment works capacity to remove constraint on abstraction within licence
	WTW Process Losses (PRO)	Improving the water treatment works efficiency to reduce water losses
Demand Management	Water Efficiency (WEF)	Methods of reducing water usage
	Metering (MET)	Installation of water meters
	Leakage Management (LEA)	Assessment and repair of pipelines to reduce leakage from existing network
Catchment Management	Catchment Management	A range of long term management activities with other parties to improve water quality and water retention in a catchment combined with contributions to Water Framework Directive and flood management objectives
Network Reinforcement	Remove Network Constraints (RNC)	Network infrastructure or operational improvements to remove constraints and facilitate better water distribution and avoid network limitations

Task 1 Options Identification

13. The initial task was to identify an extensive list of potential options, which either increase the water resource or reduce the water supply demand.

14. The initial unconstrained list was derived through the activities detailed in Figure 2.

Figure 2: Process to determine Unconstrained List of Options



15. The next section of this appendix takes you through each of the steps above.

Unconstrained Options

16. The unconstrained options list was derived be following the five steps outlined in figure 2.

17. Options were identified for inclusion in the list according to the main option group categories shown in table 1.

Groundwater Options

18. In identifying new potential groundwater sources consideration was given to the status of water availability, enhancing or optimising existing sources to increase their deployable output, conjunctive use, and Aquifer Storage and Recovery (ASR) schemes as well as developing sources around wastewater treatment works discharge sites.

19. A water availability assessment was carried out based on the CAMS report to establish the status of water availability for a number of groundwater units in our area. By comparing the rate of recharge and abstraction the status of water availability for a Groundwater Management Unit (GWMU) is classified as either ”Water available”, “No water available”, “Over Licence” or “Over Abstracted”. This status however does not take into account the impact of abstraction from the GWMU on downstream river low flow. The final water availability status considers groundwater and surface water interaction. Therefore the final water availability may be different from the GWMU-only availability. In order to identify all possible options the GWMU-only water availability status map were prepared using Geographical Information Systems (GIS) software to overlay the groundwater scheme locations on a map of the areas with the GWMU status. The map is used to identify new groundwater sources options in areas where water is available.

20. Additional groundwater enhancement options were identified based on deployable output assessment studies carried out in 2007.

21. Under this study additional ASR schemes were also identified considering regional hydrogeology. The ASR scheme would be used to store water from either poor yield sources, or surface water, to meet peak demand, using the hydrogeology expertise and good knowledge of the water resource zones. Conjunctive surface water and groundwater options were also considered as part of this work. These options involve resting groundwater sources during winter, when there is enough water to abstract surface water and to meet peak demand in summer from enhanced groundwater abstractions.

22. Further options were identified based on the location of existing wastewater treatment works discharge sites. These options involve developing boreholes around the discharge sites to tap the effluent that infiltrates to the ground.

Groundwater Options Validation Check

23. A preliminary validation check was carried out on the identified options based on the following criteria:
    - Implemented and/or Commuted Projects – options that are known to have been implemented between 2005 and 2010 or are due to be implemented between 2010 and 2015 are taken out of the initial unconstrained list, and;
    - Options identified as being superseded by, or duplicating, other options already included.

Summary of Unconstrained Groundwater Options

24. Table 3.1 provides a summary of options taking into account the initial unconstrained list from WRMP09, the determination of new options and the removal of superseded options.

Table 2: Groundwater Options Summary

Option Description	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
Groundwater Enhancement	58	55	52	61
New Groundwater	31	62	10	83
Aquifer Storage and Recovery (ASR)	26	4	18	12
Total	115	121	80	156

Surface Water Options

25. The surface water unconstrained options list was determined from the following:
    - WRMP09 list of surface water reservoir options;
    - Identification of catchments, within each water resource zone, where surplus surface water is known to be available, as indicated in the CAMS water management units (SWMUs);
    - Produced GIS maps showing the location of potential schemes;
    - Including any new options identified through the WRSE group; and
    - Inclusion of any new options, raised by customers, stakeholders (including the EFG), and private licence holders.

26. Surface Water Enhancement and New Surface Water options refer to abstractions (from an existing or new source respectively) without the need for the provision of new storage reservoirs.

27. In addition to river abstractions, various gravel pits were investigated for options involving direct abstraction of water from disused gravel pits along major rivers. The gravel pits store water through a combination of groundwater and surface water inflows. The gravel pits can also be utilised as storage reservoirs by providing embankments around the pits and the inclusion of lining to reduce leakage.

28. General locations for new impounding storage options were identified by inspection of the topography using contour maps with preliminary considerations of suitable geology and absence of settlements using OS and British Geological Survey (BGS) maps. Locations were examined systematically in all river systems within and adjacent to our water resource zone boundaries starting at the top of each catchment.

29. Locations were sought in river valleys that provided large reservoir storage areas with limited embankment length (e.g. narrow river valleys at the downstream end widening further upstream). Minimum embankment heights in the order of 5m to 10m were investigated to determine the reservoir storage area/volumes. During this process the previously identified locations were examined to confirm their suitability and the appropriateness of the embankment alignment.

30. Options for fully bunded reservoirs were identified in relatively open and flat areas where the topography was not suitable for impounding or bankside storage reservoir options. The locations were in areas of impermeable geology and have the least impact on strategic infrastructure.

31. Bankside storage options were identified as reservoirs that are constructed by utilising the river valley sides in place of a section of reservoir embankment, which reduces the quantity of earthworks required compared to a fully bunded option.

Surface Water Validation Check

32. The locations identified using the process defined above were subjected to an initial check to determine their suitability.

33. A reservoir footprint sufficient to hold more than 5m deep water and extending up to 2 km upstream of the dam site was assumed.

34. The main reasons for elimination at this stage were: unsuitable geology following closer examination of the geological mapping; the flooding of communities, or the flooding of strategic roads or railway lines.

Summary of Unconstrained Options

35. Tables 3 and 4 summarise the surface water options taking into account, the initial unconstrained list from WRMP09, the determination of new options and the removal of superseded options, as determined by the validation check.

Table 3: Surface Water Options Summary

Option Type	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
Surface Water Enhancement (ESW)	1	0	0	1
New Surface Water (NSW)	13	22	0	35
Storage Reservoir (RES)	67	198	46	219
Total	81	220	46	255

Table 4: Details of Surface Water Options

Option Type	Option Sub-Type	No. of options
Surface Water Enhancement	Licence Alteration	**1**
New Surface Water (NSW)	River Abstraction	**18**
	Gravel Pit Abstraction	**17**
	Bunded Reservoir	**125**
	Bankside Reservoir	**13**
Storage Reservoir (RES)	Impounding Reservoir	**77**
	Licence Alteration	**1**
	Reservoir Raising	**3**
Total Surface Water		**255**

Licensing Options

36. The unconstrained licence trading options were determined by identifying any existing private abstraction licences that may be suitable for licence trading. This was determined by firstly obtaining a complete list of existing abstraction licence holders in the region from the Environment Agency and then identifying all licences within 10 km of our supply area. From these the following potentially suitable licence trading options were identified:
    - Licences with an abstraction capacity greater than 1 Ml/d; and
    - Licences where, according to returns submitted to the Environment Agency, there is an unutilised abstraction in excess of 0.5 Ml/d.

37. Licences currently utilised by neighbouring water companies or power utilities have been excluded from the analysis as being deemed to be unavailable for licence trading, although a direct approach to such companies can be made later if appropriate.

38. Licences that fitted either of the above two criteria have been identified and are indicated as 'new' options in Table 3.4 and have been taken to supersede or duplicate the earlier trading options identified during WRMP09.

Table 5: Licence Trading Options Summary

Option Type	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
Licence Trading (LIC)	27	31	25	33

Water reuse Options

39. Water reuse options focus on making use of effluent which is not currently contributing to or supporting river abstractions. Thus marine discharges provide the most potential, whereas the majority of existing river discharges are usually already supporting downstream abstractions and are therefore not available for further exploitation.

40. The unconstrained water reuse options list was determined from the following:
    - Unconstrained options from WRMP09;
    - Additional options identified from the Environment Agency's Effluent Reuse Study Final Report (Phase 2), December 2008;
    - Updated information on Wastewater Treatment Works (WwTW) flows (e.g. Weatherlees WwTW now includes flows transferred from Margate and Broadstairs in 2008; proposals to divert Hailsham South into new WwTW);
    - Discussions with Southern Water;
    - New options identified through the WRSE group; and
    - New options, raised directly with the company by customers, stakeholders including the EFG and Environment Agency, and private licence holders.

Water Reuse Options Validation Check

41. A preliminary 'Validation Check' was carried out on the identified options, essentially to identify any duplicate or superseded options. Such options were removed and the remainder carried forward to the unconstrained option list for later screening.

Summary of Water Reuse Options

42. A total of 56 options were carried forward to the unconstrained options list.

Table 6: Water Reuse Options Summary

Option Type	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
Water Reuse (EFF)	46	19	9	56

Desalination Options

43. The unconstrained desalination options list was determined from the following:
    - Unconstrained options from WRMP09; and additional locations that had not been investigated previously including river estuaries.
    - New options identified through the WRSE group;
    - New options, raised directly with the company by customers, stakeholders including the EFG and private licence holders;
    - Review of other companies options both national and international; and
    - A review of the current literature to identify options.

Desalination Options Validation Check

44. All options included in the WRMP09 list were examined to verify that they remained sensible and relevant.

45. Additional options have been identified. These additional options, by virtue of their selection, were deemed to be valid and carried forward to the screening stage, except for two options which were duplicated.

Summary of desalination options

46. A total of 24 desalination options were taken forward to the unconstrained options list.

Table 7: Desalination Options Summary

Option Type	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
Desalination (DES)	13	13	2	24

Water Transfer Options

47. The unconstrained water transfer options list was determined from the following:
    - Review of the WRMP09 list of water transfer options;

- Discussions and findings from meetings with the neighbouring water companies and the WRSE group; and
- Including any new options identified through the WRSE group or as agreed with neighbouring water companies.

Water Transfer Options Validation Check

48. A complete review of all water transfer options was carried out to check the validity of all existing WRMP09 water transfer options and to identify any suitable new transfer options. This was carried out by reviewing the rationale for all proposed water transfer options with neighbouring water companies (Southern Water, Veolia Water (now Affinity Water), Sutton and East Surrey Water, Portsmouth Water and Thames Water) and with our Assets Department.

49. This review involved identification of revised points of connection to neighbouring water company systems and breaking down any existing long transfer options into their component parts to aid optimisation modelling of the overall transfer system and removing components of those transfers which were agreed to be exclusively the responsibility of neighbouring companies. This included the identification of any missing transfer links in order to provide sufficient options to provide a water transfer 'ring', with sufficient interconnections to neighbouring water companies to enable transfers to be made both in an east/west and north/south direction, with bi-directional flow as appropriate.

50. This review involved not only restructuring certain existing transfer options, but also introduction of certain new options and removal of agreed superseded options.

51. This review of the rationale of water transfer options was carried out in conjunction with neighbouring water companies and in consultation with the WRSE Group and the Environment Agency.

Summary of water transfer options

52. A total of 70 water transfer options were taken forward to the unconstrained options list.

Table 8: Water Transfer Options Summary

Option Type	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
Company Transfer (CTR)	38	15	29	24
Inter-company / Regional Transfer (RTR)	30	54	47	37
National Transfer (NTR)	5	0	0	5
International Import (INT)	4	0	0	4
Total	77	69	76	70

Conjunctive Use Options

53. The unconstrained conjunctive use options list was determined from the following:
    - Review of existing conjunctive use options from WRMP09;
    - Potential new groundwater/surface water conjunctive use options;

- New options identified through the WRSE group; and
- Carrying out a wide ranging review across all river catchments of the potential for the conjunctive use of surface water abstractions and existing groundwater sources.

54. Generic groundwater/surface water conjunctive use schemes can be achieved by use of increased surface water abstractions (with reduced groundwater abstractions) in winter, to enable increased groundwater abstractions in summer, resulting in an overall increase in deployable output. The potential for conjunctive use between water reuse and desalination with other sources was also examined.

55. Catchments where water is available and there are water treatment plants and boreholes in the vicinity were used to identify potential sites. In addition to the conjunctive use sites identified in WRMP09, potential additional schemes have been identified in the Whitewater and Lower Loddon catchments in WRZ4, the River Arun catchment in WRZ5, the Upper Medway in WRZ1, River Adur and River Ouse in WRZ2, Upper Rother and Wallers Haven in WRZ3, Lower Medway in WRZ6, Lower Rother in WRZ7 and the great Stour in WRZ8.

Conjunctive Use Options Validation Check

56. Generic conjunctive use schemes by groundwater source were grouped by water resource zone, thereby reducing the number of generic schemes for the WRMP14 options.

57. Having derived a new set of generic conjunctive use options, by river catchment, any duplicate options were deemed to be superseded and thus removed from the unconstrained list.

Summary of conjunctive use schemes

58. A total of 13 conjunctive use options were taken forward to the unconstrained options list.

Table 9: Conjunctive Use Options Summary

Option Type	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
Conjunctive Use (CON)	35	14	36	13

Water Treatment Works (WTW) Options

59. Water treatment works options were based on the unconstrained options from WRMP09 with two additional new WTW expansion schemes for the WRMP14 options.

Summary of WTW options

60. A total of 17 WTW options were taken forward to the unconstrained options list.

Table 10: WTW Options Summary

Option Type	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
WTW Expansion (WTW)	4	2	0	6
WTW Process Losses (PRO)	11	0	0	11
Total	15	2	0	17

Demand Management Options

61. The unconstrained demand management options list was determined from the following:
    - Unconstrained options from WRMP09;
    - Our customer metering programme;
    - Recent Waterwise / EA publications;
    - Experience of techniques on leakage management improvements;
    - New options identified through the WRSE group;
    - New options, raised directly with the company by customers, stakeholders including the EFG, and private licence holders;
    - Review of other companies options both national and international; and
    - A review of the current literature to identify options including new products.

62. The Environment Agency's comments on developing more specific demand management options, such as focusing on different user groups, was noted and was incorporated into the detail of the demand management options as they progressed.

63. New demand management options are included in the optioneering process in addition to those already included in the baseline. Appendix 7A describes the baseline water efficiency and metering activities and appendix 7B outlines the leakage control options.

Demand Management Options Validation Check

64. Existing demand management options were reviewed against the revised new set of options and any duplicate or superseded options were removed from the unconstrained list.

65. Superseded options include demand management options already implemented across each water resources zone during AMP4 (2005 to 2010) and currently being implemented during AMP5 (2010 to 2015) including the customer metering programme, pressure management, compulsory metering of new properties and rapid leakage detection techniques.

Summary of demand management options

66. A total of 288 demand management options were taken forward to the unconstrained options list.

Table 11: Demand Management Options Summary

Option Type	WRMP09 Unconstrained Options	New Options	Superseded Options	WRMP14 Unconstrained Options
Water Efficiency (WEF)	127	183	86	224
Metering (MET)	40	16	40	16
Leakage Management (LEA)	48	32	32	48
Total	215	231	158	288

Unconstrained Options List

67. In total there are 912 options on the unconstrained options list for WRMP14. Table 12 below shows the breakdown by option type and WRZ.

Table 12: Unconstrained Options List

Option Type	WRZ1	WRZ2	WRZ3	WRZ4	WRZ5	WRZ6	WRZ7	WRZ8	Total
Groundwater	14	15	21	31	17	16	7	25	156
Surface water	13	51	53	16	9	28	26	59	255
Licensing	1	2		10	1	11		8	33
Water reuse		11	9			17		19	56
Desalination		3	5		1	3		12	24
Water transfers	9	18	4	5	8	7	4	15	70
Conjunctive use	1	2	3	2	2	1	1	1	13
Water treatment works				1		6	7	3	17
Demand management	36	36	36	36	36	36	36	36	288
Total	74	138	131	101	84	125	81	178	912

Task 2 Coarse Screening

68. The purpose of the coarse screening process is to reduce the unconstrained list of possible options to a shorter list of options for further study and fine screening. The aim is to ensure that the options taken forward are:
    - Feasible;
    - Promotable/implementable or deliverable; and
    - Environmentally acceptable.

69. Coarse screening was carried out on the unconstrained options list to screen-out options with known 'show-stoppers' which indicate that the option would not be promotable or acceptable. The screening criteria for each option group are outlined below.

70. All of the unconstrained options in the following types were taken forward to the constrained option list:
    - Licence trading;
    - Company transfers and inter-company/regional transfers (this includes all the Water Resources in the South East (WRSE) group water transfers;
    - Conjunctive use;
    - Demand management (water efficiency, metering and leakage management); and
    - Water treatment works (expansion and process losses).

71. These option types were excluded from the coarse screening process either because 'show-stoppers' could not be identified or because further option definition is required.

Groundwater Options

Coarse Screening Approach

72. There is a level of uncertainty for the groundwater options related to details of local geology and hydrogeology, as well as connectivity and level of influence on river flow and quality. The locations of boreholes and associated infrastructure are often indicative and there is usually considerable flexibility with their detailed siting and therefore often potential to avoid environmental and planning constraints. Given these issues, specific clear cut criteria were proposed for screening groundwater options out, as follows:
    - Water availability based on Catchment Abstraction Management Strategies (CAMS) – new sources and beyond the licence options located in an already over abstracted zones were rejected unless mitigating factors apply (reasons for exceptions were recorded).
    - High level of technical difficulty with excessive cost and combined with low target yield/ high yield uncertainty or environmental unacceptability (defined as conflict with significant unmitigatable impacts to high level designated areas).
    - Conflict with confirmed sustainability reduction areas.
    - Duplication or interference with other options.

<u>Water Availability</u>

73. The Environment Agency's Catchment Abstraction Management Strategy (CAMS) report provides the water availability status of groundwater and surface water management units separately. The final licensing strategy, however, is based on the combined water availability which takes into account the interaction of surface water and groundwater management

units. Nonetheless, there is an intrinsic uncertainty in the interaction of surface water and groundwater. This uncertainty is compounded by the large spatial scale considered in the CAMS report. For this reason, the option identification and screening of groundwater options was undertaken based on the water availability of Groundwater Management Units (GWMU) only. That is, groundwater options were screened without considering the impact of abstracting from groundwater sources on the low flows (or baseflow) downstream. This impact was considered in the later fine screening and feasible option appraisal stages.

74. By comparing the abstraction from, and recharge rate into, a Groundwater Management Unit (GWMU) the CAMS report defines the water availability status in a catchment as either: *water available; no-water available; over-licensed;* or *over-abstracted*. In general there is a 'presumption against' licensing of new groundwater sources for consumptive use by the Environment Agency in over-licensed and over-abstracted GWMUs.

75. However, there is some level of uncertainty stemming from the designation of CAMS status compared with the spatial scale considered in the option screening study. In some GWMUs, there are major abstraction licence-holders who are only using a portion of their licence. Where the CAMS status of a GWMU is over-licensed, there may be still be a possibility of trading licence volumes to enable a more favourable abstraction licence application. It may not be justifiable, therefore, to screen-out these options based on the water availability status and a decision was made to screen-out options that are in over-abstracted GWMUs only at the coarse screening stage.

76. The intrinsic complexity of groundwater sources means that it is not feasible to apply a blanket approach of screening without making a few exceptions. For instance some options, though they are geographically located in GWMUs which are categorised as over-abstracted, would tap water from deep confined aquifers below with no hydraulic connectivity with the overlaying GWMU. Therefore, deep confined aquifers are not screened-out solely based on the water availability status at the location of the option.

77. Therefore in addition to the water availability status, the following issues were considered before screening options in over-abstracted GWMU:
    - Hydraulic connectivity between the aquifer that the option is anticipated to abstract from, and the GWMU the option is located in; and
    - Potential for licence-trading with major abstraction licence-holders in the area.

<u>High Level of Technical Challenge</u>

78. The technical difficulty of developing an option was assessed based on practicality of the option, the level of uncertainty in the yield and potential cost of developing the source based on available information and hydrogeological knowledge of the area.

79. A number of Aquifer Storage Recovery (ASR) schemes have been proposed historically. Some of these, along with the options identified in PR14, have been included in the unconstrained options list. Though a number of desk studies have been carried out in the past to identify suitable location for ASR schemes, the studies have not been followed up by pilot studies. Therefore, uncertainty regarding the success of ASR schemes remains. This level of uncertainty will be the same for ASR schemes in similar aquifer types and geographical locations. As a result, it will not be possible to distinguish one scheme from another. Therefore, if there is more than one ASR scheme within a similar aquifer and in the same geographical region the additional options have been screened-out.

Option Conflict with existing sources

80. Under this criterion, the following questions were asked to screen-out options:
    - Does the option conflict with existing sources?
    - Is the option outside our supply area? If it is, would it be impossible to promote the option?

81. Where the answer to the above questions is 'yes' for a given option, that option has been screened-out.

Environmental Acceptability of Options and Conflict with confirmed sustainability reduction areas

82. Options with known unacceptable and unmitigatable environmental conflicts were looked for as part of the screening stage. However, assessing the potential impact of groundwater options on designated environmental sites and river low-flows requires a good understanding of the hydrogeology to determine the hydraulic connectivity between the aquifer and the designated sites. This was considered further in the fine screening stage.

83. Furthermore, the outcome of the six ongoing National Environmental Programme (NEP) studies to screen-out options which could be in conflict with sustainable reduction requirements were taken into account during the feasible options stage when findings were available.

Summary of Results

84. A total of 38 options were screened out of the unconstrained options list, leaving 118 to be taken forward to the constrained options list.

Table 13: Groundwater Options Summary

Option Type	Unconstrained Options	Options screened out	Constrained Options
Groundwater Enhancement (EGW)	61	15	46
New Groundwater (NGW)	83	19	64
Aquifer Storage and Recovery (ASR)	12	4	8
Total	156	38	118

Surface Water Options

Coarse Screening Approach

85. Two sets of criteria were applied within the Coarse Screening process. Firstly engineering criteria were applied and secondly environmental criteria were applied.

Engineering criteria

86. Engineering criteria were applied to ensure that the resource could supply a useful increment of yield as indicated in the Table 14.

Table 14: Engineering Criteria to Define Minimum Reservoir Size

Coarse filter test	Criterion	Comment
Minimum depth	7m *	**The existing Barcombe reservoir has a depth of 5m and has many water quality problems.**
Minimum reservoir capacity	**1.5 MCM**	**Bevan Stream was identified under PR09 in the unconstrained list as a potential source with a capacity of 1.5MCM and a reservoir yield of 6Ml/day.** **The smallest reservoir considered in the WRSE Options is Kent Ditch with a capacity of 2.7MCM.**

* As the coarse screening exercise was based on 5m contour mapping, a 5m minimum depth was adopted in practice.

Environmental Constraints

87. A range of environmental criteria were applied to remove options that would clearly not be environmentally acceptable or promotable. The criteria applied are described in more detail below.

88. Environmental designations and valuable habitats cover a good proportion of our supply area and can be difficult to avoid completely, especially along river valleys.

89. At this coarse screening level the aim was to screen-out options that can clearly be shown as having unacceptable, unmitigatable environmental impacts for which there is no scope to avoid by reducing size or making detailed adjustments. For this initial assessment therefore only high level designations/values have been used:
    - Ecologically designated areas of international and national importance;
    - Ancient woodland;
    - Stretches of river supporting important fisheries;
    - Agricultural Land classification Grade 1 and 2, where there is a high potential for loss of the best and most versatile land;
    - Areas of Outstanding Natural Beauty, National Parks, or Heritage Coasts where visual impacts and/or recreational land loss are expected to be unacceptable;
    - High level heritage designations such as World Heritage Sites and Scheduled Monuments;
    - Settlements, or strategic infrastructure conflicts;
    - Registered parks and gardens; and
    - Loss of listed buildings.

90. Impounding Reservoir Sites
    The site locations for impounding reservoir sites are relatively fixed as they are determined by suitable topography for the dam site together with natural storage for the reservoir within a river valley. The main scope for reducing direct impacts on environmental designations and valuable habitats is therefore largely limited to reducing the dam height and the size of the reservoir although some detailed adjustments are possible during the reservoir design.

91. Bunded Reservoir Sites
    Bunded reservoir sites are less dependent on site topography, as a constructed bund can completely contain the reservoir. There is therefore much more scope to locate a bunded reservoir to avoid impacts on environmental designations and valuable habitats. In addition

to the higher level sites/issues listed above, the bunded reservoir sites were also screened against Biodiversity Action Plans (BAP) priority habitats and areas managed in agri-environmental schemes as indicators of ecological value as well as the potential for loss of large areas of flood plain storage.

To undertake the coarse screening of bunded reservoirs, a relationship has been developed between reservoir capacity and surface area based on the information available on existing bunded reservoirs in Southeast England. Based on that relationship, the footprint of the bunded reservoirs corresponding to various storage capacities has been calculated.

The most efficient and cost-effective bunded reservoirs are circular in shape. Hence the reservoir footprint used and the different sizes examined are a series of concentric circles corresponding to storage capacities of 1.5 Million cubic metres (MCM), 5, 8, 10, 15, 20, 30, 50, 100, 150 and 200MCM.

Method of Applying Screening Criteria using GIS

92. With the exception of fisheries information, all the environmental designations used were available to be mapped as Geographic Information System (GIS) layers. The over-lapping areas of the reservoir outline and environmental layers were identified to assess the potential direct environmental impacts from each potential reservoir.

93. The screening process was based on limiting the intersection of the reservoir outline with the environmental designations and by making the reservoir smaller wherever there was a possibility to avoid direct impacts.

94. The process and thresholds for each type of surface water storage option is set out below.

95. Impounding and Bankside reservoirs
    - The largest reservoir size identified at the Unconstrained Options stage was compared to losses of high level environmental interests;
    - Where the site overlaps with these interests the size and water level was reduced (in 5m increments on water level) until the site avoids major losses;
    - The acceptance threshold of a site considered the location of the conflicts – where there were small areas of conflicts along the edge of the reservoir, impacting a combined area of less than 5 ha for Ancient Woodland, or less than 2 ha for SSSIs or up to 3 listed buildings, these options were allowed through so that potential for further avoidance could be assessed at later stages;
    - If the site could not meet the criteria of a minimum water depth of 5m, the site was rejected;
    - Throughout the process engineering judgement was also used to identify where mitigation measures could be applied to avoid environmental constraints; and
    - Fishery impacts were included as an additional consideration where these interests were known.

96. Raising Existing Reservoirs
    - Increase the reservoir level by 5m and interpolate to provide an increment in reservoir capacity of 2 MCM; and
    - The increased areas were compared to the environmental designations and reduced to a maximum size corresponding to minimum environmental conflicts. However given that the losses would be around existing reservoirs and total impacts might be much

less than those associated with establishing a completely new reservoir, it was determined that all existing reservoirs should go through with at least a minimum size increase to be looked at in further detail at the next stage.

97. Bunded Reservoirs
    - Previously identified bunded reservoir locations were examined. General areas of suitability for bunded reservoirs were also identified and specific reservoir site locations chosen in each river catchment which would minimise potential conflicts with environmental designations;
    - Using the reservoir capacity *versus* surface area relationship established for bunded reservoirs the largest area which avoided conflicts with designations was selected to go through. The criteria used were stricter than those applied for impounding reservoirs at this stage, as there is more choice for bunded reservoir siting compared with impoundment reservoirs. This was taken down to a potential loss of 2 ha of Ancient Woodland which would need to be examined further at the next stage to determine if further detailed siting considerations could avoid the impact; and
    - Identify the reservoir capacity associated with the above surface area and if the resulting reservoir capacity is less than 1.5MCM the site should be rejected.

Summary of Results

98. A total of 124 options were screened out of the unconstrained options list, leaving 131 to be taken forward to the constrained options list.

Table 15: Surface Water Options Summary

Option Type	Unconstrained Options	Options screened out	Constrained Options
Surface Water Enhancement (ESW)	1	0	1
New Surface Water (NSW)	35	2	33
Storage Reservoir (RES)	219	122	97
Total	255	124	131

Table 16: Details of Surface Water Options

Option Type	Option Sub-Type	Unconstrained Options	Options Screened Out	Constrained Options
ESW	Licence Alteration	1	0	**1**
NSW	River Abstraction	18	2	**16**
	Gravel Pit Abstraction	17	0	**17**
	Bunded Reservoir	125	51	**74**
	Bankside Reservoir	13	9	**4**
RES	Impounding Reservoir	77	60	**17**
	Licence Alteration	1	1	**0**
	Reservoir Raising	3	1	**2**
Total Surface Water		255	124	131

Licensing Options

99. Due to the nature of these options no coarse screening filter was applied to this option group and all 33 licence trading options identified in the unconstrained options list were taken through to constrained options list.

Water Reuse Options

Coarse Screening Approach

100. Options have been screened-out on the basis of the following four criteria:

101. Criteria 1 - Direct water reuse was considered not acceptable to the public. It is not considered acceptable to supply effluent, at any standard of treatment, directly into service reservoirs or any other parts of the potable water network. The effluent must be discharged either to a river for re-abstraction, or to a raw water reservoir upstream of a water treatment works. The industry view is that direct reuse for potable supply is not currently promotable and this is why we excluded this option type. The following sources can be referred to:
    - **EA Policy Statement on Effluent Reuse**, June 2011. This notes that direct effluent reuse is only appropriate for industrial supply. We had an option at PR09 for such a scheme where effluent was to be provided to a Paper factory near Medway in return for them giving up some of their groundwater resource, but the factory rejected this proposal on the basis that they need high quality water.
    - **CIWEM Website**
      http://www.ciwem.org/policy-and-international/currenttopics/water-management/water-reuse/potable-water-reuse.aspx
      This notes that direct water reuse "is very rare because of the increased potential risk to public health and the negative public perception. Even though the technology is well proven, direct potable reuse is only justifiable when there is no other option for example in the desert or outer space."

    Given the wide range of indirect water reuse schemes potentially available, it was difficult to see how direct reuse could be justified (or promoted), especially given the additional public health risks associated with direct supply e.g. in the event of a failure in the treatment system.

    The direct reuse options were therefore removed from the constrained options list and the focus for water reuse options was on option types that have more potential to be acceptable to the public. Water reuse options taken forward, with some exceptions, were focused on identifying where effluent could be reused that would otherwise be discharged to the sea.

102. Criteria 2 - Duplication with other water company options. In order to avoid the duplication of effort, the water reuse schemes for WwTWs which are being developed by other Water Companies were not progressed. This does not preclude the inclusion of such resources within WRMP14 as they may be provided as bulk transfers from other water companies. The only works that this applies to is Aylesford which is being progressed by Southern Water.

103. Criteria 3 - Resource availability. Resource availability must be adequate because of the potential variability of flow. As very low flows would create technical treatment and viability problems, this must take into consideration: (a) reliability of flow; and (b) losses through tertiary treatment which can be significant with Reverse Osmosis (RO) systems. A threshold of 5 Ml/d of deployable output was initially proposed. Taking into consideration variability in effluent dry weather flow, combined with potential losses through tertiary treatment (notably Reverse Osmosis where losses can be anything from 15 to 50% depending on the degree of recycling employed at each treatment stage) a minimum of 7.5 Ml/d effluent dry weather flow should be available at WwTWs was adopted as a threshold for options to be progressed.

104. Criteria 4 - Technically difficult and would entail excessive engineering cost. Some judgement was required in relation to what is perceived to be excessive engineering cost. For a given WwTW, an option which required a longer transfer pipeline route to access the receiving water compared to another, was not used to exclude an option. It may be that, for such options, other factors, including resource zone deficit, could outweigh the additional transfer costs. Such factors played an important part in the subsequent Multi Criteria Analysis (MCA) screening stage. The following have been used to exclude options on the basis of excessive engineering cost:
    - WwTW is too inaccessible: the only works that this has been applied to in the coarse screening process is Eastbourne. This works is located below ground within the town centre. It would therefore be difficult to gain access to the effluent and to construct a new transfer pipeline route through the busy town centre. It would also require a new tertiary treatment facility located remotely from the existing main works. Further information was obtained on some other WwTWs to confirm their viability. For example, the Peacehaven works is nearing construction completion with commissioning expected in 2013. This works is reported to be highly constrained with construction integrated into a hillside and there may be limited opportunities to install adjacent tertiary treatment; but for this works passed through the coarse screening process.
    - Hailsham South WwTW was excluded as it is understood that this works is to be decommissioned anyway, and a new works constructed for the combined flows from Hailsham North and South. The effluent would be discharged to the River Cuckmere and thus this flow would become available anyway (currently the effluent is discharged to the Pevensey Levels with no downstream abstraction). In view of Southern Water's plans for this works, development of a water reuse option is not considered worth pursuing; however the inclusion of this resource within the Cuckmere modelling should be considered.
    - Geographical constraints have only been applied in relation to one WwTW, namely Queenborough which is located on the Isle of Sheppey where there are no viable options to reuse the effluent locally.
    - A number of potential industrial water reuse options were identified by the Environment Agency at PR09. However several of these comprise dredging operations or other coastal operations where the discharged water is saline. These should, therefore, not have been identified as potential options in the first place and have been excluded.

Summary of Results

105. A total of 26 options were screened out of the unconstrained options list, leaving 30 to be taken forward to the constrained options list.

Table 17: Water Reuse Options Summary

Option Type	Unconstrained Options	Options screened out	Constrained Options
Water Reuse (EFF)	56	26	30

Desalination Options

Coarse Screening Approach

106. Options were screened-out on the basis of the following criteria:
- Potential impacts on environmental/planning designations or sensitive sites;
- For estuarine options – insufficient water availability; and
- Risk of increasing groundwater saline intrusion (relevant for brackish water abstraction).

Note: Estuarine options extract water from the "mixed" fresh/saline zone which explains the availability constraint.

107. New desalination options locations are only indicative and need to be subject to detailed siting studies at later stages. Brownfield site locations for the desalination plant were sought to minimise potential for conflict with environmental and planning designations. In terms of applying the first criteria, this was limited to identifying where there is no scope for relocating the option to avoid significant impacts on high level designations.

108. Options were removed where unavoidable conflicts with high level environmental and planning designations were identified or there is insufficient water availability during the expected operating periods or the risk of increasing saline intrusion is considered high.

Summary of Results

109. A total of 13 options were screened out of the unconstrained options list, leaving 11 to be taken forward to the constrained options list.

Table 18: Desalination Options Summary

Option Type	Unconstrained Options	Options screened out	Constrained Options
Desalination (DES)	24	13	11

Water Transfer Options

Coarse Screening Approach

110. There is some flexibility in routing pipelines so that it can be possible to avoid some impacts. Many of the impacts from pipelines are also temporary and construction-related, which can largely be managed and mitigated through good construction practice. However, construction can cause long term and permanent impacts on some types of habitat e.g. through disturbance of ancient woodland. In some cases the routes identified are

preliminary and will have considerable scope for improvement. The source of the water and particular issues associated with the transfer of raw water was covered in later stages.

111. Given these factors:
- Inter-regional / inter-company options were not screened-out at this stage and were taken forward to the feasible options;
- Intra-zone transfer options were included as required to support options; and
- International imports and national transfers were subject to coarse screening and were screened-out where they were considered unfeasible, environmentally unacceptable or unpromotable, that is where previous available studies concluded that there was a:
    - High level of unreliability or impracticality and technical difficulty with excessive costs; and /or
    - Likelihood of significant unmitigatable environmental impacts such as inter-basin raw water transfers.

Summary of Results

112. A total of 9 options were screened out of the unconstrained options list, leaving 61 to be taken forward to the constrained options list.

Table 19: Water Transfer Options Summary

Option Type	Unconstrained Options	Options screened out	Constrained Options
Company Transfer(CTR)	24	0	24
Inter-company / Regional Transfer (RTR)	37	0	37
National Transfers (NTR)	5	5	0
International Import (INT)	4	4	0
Total	70	9	61

Conjunctive Use Options

113. Due to the nature of these options no coarse screening filter was applied to this option group and all 13 conjunctive use options identified in the unconstrained options list were taken through to the constrained options list. However further option identification work was completed following consultation, as outline below.

Water Treatment Works (WTW) Options

114. Due to the nature of these options no coarse screening filter was applied to this option group and all 17 options identified in the unconstrained options list were taken through to the constrained options list.

Demand Management Options

115. Due to the nature of these options no coarse screening filter was applied to this option group and all 288 options identified in the unconstrained options list were taken through to the constrained options list.

Impact of Consultation on Constrained Options

116. Following consultation with the EFG, comments were received highlighting potential issues for specific options. Of the exclusions described above 17 were screened out following EFG consultation. Table 20 outlines the options excluded and the reason for exclusion.

Table 20: Options screened out following consultation

ID	Option Name	Reason For Exclusion
GW-15	Deep Lower Greensand borehole at Stockbury (take water at Matt's Hill)	Keep the cheaper option of GW-15 and 16. Remove this option as GW-16 is cheaper.
GW-38	Bray Gravels	The gap in Bray Gravel has already been removed. Hence this option is not applicable anymore.
GW-44	Hythe Beds Confined Oakhanger - Infrastructure Improvement	There is no gap on licence. No gain in implementing the option.
GW-79	Farringdon Groundwater	There is no gap on licence. No gain in implementing the option.
GW-84	Sheet Closing the Gap	No benefit in trying to close the small gap. Hence it has been excluded from the constrained option list.
GW-148	Cornish bridging the licence gap	The source is part of the Eastbourne Chalk. Hence it has already been included under GW-133/134. Option was rejected as a duplicate.
GW-153	Halling redistribution of licence with other sources	There is no gap on licence. No gain in implementing the option.
GW-156	Harrietsham, Hockers Lane and Thurnham – increase in licence through Licence Trading	This option is a duplicate of options GW-11, GW-12 and GW-13. Hence it has been excluded from the constrained option list.
SW-27	New surface water abstraction from the River Stour downstream of Ashford	Winter abstraction without storage is not viable. Other options cover abstraction at Plucks Gutter with storage.
SW-31	Beech Hill – Blackwater	Duplicate of SW-33_ (SW-31 filled from Blackwater only)
SW-32	Beech Hill – Loddon	Duplicate of SW-33_ (SW-32 filled from Loddon only)
SW-64	Direct abstraction from gravel pits along Great Stour - Conningbrook Gravel Pits	Duplicate of option SW-28 -includes review of a group of gravel pits to identify and define possible option locations.
SW-65	Direct abstraction from gravel pits along Great Stour- Horton Gravel Pits	Duplicate of option SW-28
SW-66	Direct abstraction from gravel pits along Great Stour- Stodmarsh Gravel Pits	Duplicate of option SW-28
SW-67	Direct abstraction from gravel pits along Great Stour - Wickhambreux Gravel Pits	Duplicate of option SW-28

ID	Option Name	Reason For Exclusion
SW-101	Development of future gravel pits - Fleet Copse / Eversley Cross	Active/Operational gravel pits uncertainty over timing for any potential use too high to take forward now.
SW-104	Development of future gravel pits - Eversley to Eversley Cross	Active/Operational gravel pits uncertainty over timing for any potential use too high to take forward now.

117. Similarly following consultation, 53 options were identified for inclusion in the constrained options list. These are shown in Table 21 below.

Table 21: Options included following consultation

GIS ID	Option Name	Reason For Inclusion
DS-1 DS-3 DS-4 DS-5	Brackish Desalination Options	Concern remains over the legal implications from potential saline intrusion which is likely to result from coastal groundwater abstraction for desalination. However it is accepted that these options are worth investigating further.
TBC	Conjunctive Use Options	A total of 49 conjunctive use options have been identified for consideration at the fine screening stage and put back into the constrained options list for further investigation and screening. See below for more details.

118. The conjunctive use options identified were reconsidered as part of further option identification work.

119. Individual and groups of conjunctive use options were selected and evaluated on a resource zone, catchment and aquifer unit basis, establishing options for each. An initial coarse screening review of these groups of options led to their classification as 'confirmed' options for further consideration; 'possible' options, which have some merit but with notable constraints; and 'rejected' options where there was a clear reason for not continuing with the option – such as a notable environmental constraint; over-licenced or over-abstracted CAMS unit or repetition of a surface / groundwater option.

120. The aquifer geology, surface water source (such as a named river or reservoir), CAMS status of the respective groundwater unit and surface water unit, together with the average and peak deployable output compared with average and peak abstraction licence for sources that may be utilised as part of the conjunctive use option were identified. This information was used to define the options and check this filtering of options.

121. From a total of 73 conjunctive use options, 41 'confirmed' conjunctive use options; 8 'possible' conjunctive use options; and 24 'rejected' conjunctive use options were identified.

Constrained Options

122. Following the coarse screening task 210 options were removed from the unconstrained options list.

123. In total there are 702 options on the constrained options list for WRMP14. Table 22 below shows the breakdown by option type and WRZ.

124. This represents an increase of 150% compared to WRMP09.

Constrained Options List

Table 22: Constrained Options List

Option Type	WRZ1	WRZ2	WRZ3	WRZ4	WRZ5	WRZ6	WRZ7	WRZ8	Total
Groundwater	12	11	13	24	21	9	6	22	118
Surface water	6	23	27	11	3	18	13	30	131
Licensing	1	2		10	1	11		8	33
Water reuse		10	7			6		7	30
Desalination		1	1		1	3		5	11
Water transfers	6	16	4	5	8	6	4	12	61
Conjunctive use	1	2	3	2	2	1	1	1	13
Water treatment works				1		6	7	3	17
Demand management	36	36	36	36	36	36	36	36	288
Total	62	101	91	89	72	96	67	124	702

Task 3 and 4 Fine Screening and Feasible Option Assessment

125. The purpose of the fine screening process was to reduce the constrained list of possible options to a shorter list of feasible options for detailed study and costing. The fine screening process was designed to ensure that all the options within the feasible options list were:
    - Environmentally acceptable;
    - Technically deliverable;
    - Promotable;
    - Cost effective; and
    - Provide yield or savings.

126. For certain option types only limited consideration using the fine screening process was undertaken because further option definition was required before fine-screening could occur. For the purpose of this appendix, all of the constrained options in the following option types were taken forward to the feasible option list:
    - Licence trading;
    - Demand management (water efficiency, metering, leakage management);
    - Company water transfers and inter-company/regional water transfers.

Fine-Screening Methodology

127. The fine screening methodology was based primarily on Multi-Criteria Analysis (MCA) as detailed in *Multi-criteria analysis: a manual* (DCLG, 2009). Screening criteria for each option group are outlined further in appendix 7C. The approach has been further refined and developed to be tailored to each relevant option type.

128. The MCA methodology was used because it is an established approach which allows option performance to be measured across multiple objectives. The methodology is a well-structured approach which provides openness in the decision-making process and aims to remove subjectivity, as far as reasonably possible, from the fine screening process. MCA recognises that both monetary and non-monetary objectives may influence decisions.

129. By applying the MCA process to the constrained options list it was possible to rank the options in order to establish the best performing options and screen-out the worst performing.

Principles of Multi-Criteria Analysis

130. The first step in the MCA approach applied to the constrained options was to define a common set of objectives and measurable criteria aimed at measuring option performance against those objectives. The objectives selected reflect the informed preferences of the decision-making team and were measured against criteria which quantified the environmental performance, sustainability, public acceptability, promotability, technical feasibility and cost effectiveness for each option.

131. The objectives identified for the MCA process needed to be both measurable in some form, whether qualitative or quantitative, and to avoid 'double counting'. Although the objectives/criteria used could be applied across all the options types, at this stage not all objectives/criteria were considered equally relevant to all option groups. The overall objectives selected are shown in table 23.

Table 23: MCA Objectives and relevance to selection of feasible options

Criteria/Objectives	Objective relevance to main option types			
	Surface Water	Ground-water	Water Reuse	Desalination
1. Terrestrial biodiversity - Protect and enhance terrestrial biodiversity	**Yes**	**Yes**	**Yes**	**Yes**
2. Aquatic biodiversity and fisheries - Protect and enhance aquatic and marine biodiversity and fisheries	**Yes**	**Yes**	**Yes**	**Yes**
3. Landscape - Protect and enhance landscape character and minimise visual impact	**Yes**	**Yes**	**Yes**	**Yes**
4. Sustainability - carbon footprint - Contribute to sustainable energy use, reduced carbon dioxide emissions, and sustainable use of materials including waste minimisation	**Yes**	**Yes**	**Yes**	**Yes**
5. Climate change - Address climate change, improve climate change adaptability and minimise climate change vulnerability	**No**	**No**	**No**	**No**
6. Water quality - Avoid conflict with and promote the Water Framework Directive objectives	**Yes**	**Yes**	**Yes**	**Yes**
7. Water quantity – Protect and improve the sustainable management of water resources	**No**	**Yes**	**Yes**	**No**
8. Flood risk – Avoid the loss of flood plain, minimise risk from flooding and avoid increasing flood risk/sea level rises	**Yes**	**No**	**No**	**No**
9. Cultural heritage - Protect and enhance the historic environment	**Yes**	**No**	**Yes**	**Yes**
10. Public health and wellbeing and recreational access - Protect public health and contribute to amenity	**Yes**	**No**	**Yes**	**No**
11. Local economy and infrastructure - Protect property land-use, strategic assets and contribute to local economic activity	**Yes**	**No**	**No**	**No**
12. Community issues, public acceptability and equality - Avoid adverse impacts on communities, avoid inequality of distribution of effects and benefits especially on vulnerable groups	**Limited**	**No**	**Yes**	**No**
13. Land quality, geological diversity - Protect land quality and geological diversity	**Yes**	**No**	**No**	**No**
14. Technical feasibility and cost effectiveness	**Yes**	**Yes**	**Yes**	**Yes**
15. Financial uncertainty	**No**	**No**	**Yes**	**No**
16. Yield/savings uncertainty	**No**	**Yes**	**Yes**	**No**
Additional considerations				
Promotability/deliverability • Are the issues identified 'showstoppers' (on their own or in-combination)?				

• Are there additional deliverability issues?
Option contribution to meeting or reducing demand • Yield/ Savings (Ml/d) • Potential for flexibility in supply
Potential for mitigation • Potential for mitigation or improvement of options to reduce impacts?
Location - are there adequate options within the following categories? • Water resource zone/ proximity to demand • River catchment area • Sub-types
Strategic options and flexibility • Is there potential for option to provide a strategic resource outside the WRMP area?

The Method Applied for the Fine Screening Criteria Using GIS

132. To measure an option's performance as accurately as possible the MCA analysis was, wherever possible, carried out using Geographic Information System (GIS) datasets for each of the environmental and technical constraints. The MCA process, therefore, consisted of defining the datasets which could measure the impact of the options against each criterion. The resulting impact (either negative or positive) was recorded on a performance matrix using a visual 'traffic light' system (High, High-Medium, Medium, Low-Medium, Low and Neutral) (Table 24). This impact level was then converted to a numeric score in order to rank the performance of each option within each option type, from the best to the worst. A high score implies that a particular option has a high potential risk of a conflict with the objective or poor performance against that objective.

Table 24: Fine screening score for level of risk or risk of adverse impact/ poor performance

Traffic light score		Numeric Range of Scores
N	Neutral/not relevant	0
L	Low	5-20
LM	Low medium	25-40
M	Medium	45-60
MH	Medium/high	65-80
H	High	85-100

133. The direct impact of an option was undertaken by measuring the intersection of the option's footprint against each constraint in terms of linear metres (m), area (m^2) or numbers of features affected. This measurement could then be converted into one of the pre-defined categories, ranging from High to Low, and then finally into a numeric score. The MCA scoring was refined for each option type to meet the requirements of that particular option type.

134. The impact of any pipelines associated with an option could be measured in the same way although this was more important for some option types than others. Generally pipeline routes are adaptable and, in most cases, can be re-routed to avoid any environmental constraints by increasing the length of the pipeline. In addition, not all the pipeline routes were designed in detail across all option types and included some 'straight line' routes at this stage of the process. At this stage, therefore, the impact of the surface water option pipelines was measured as a penalty cost to the option, affecting the option's cost-

effectiveness, whereas the groundwater options were scored against the affected environmental constraint.

135. Where applicable, the details of the scoring applied for each option type are included appendix 7C.

Selecting Feasible Options for Each Option Type

136. The final MCA score of each option within an option type was used to assess its performance against other options of the same type and rank them in order of acceptability. To keep the ranking as simple it was proposed to avoid adding weighting and this was accepted by the EFG. The ranking established a relative scoring which allowed the worst and best performing set of options in each option group and subgroup options to be identified.

137. In some cases the various option types were then grouped to take into account other factors such as the proximity of the options to demand location within different water catchment areas, water zone and sub-option category to ensure these were sufficiently represented. It was important that the options going into the WRMP options model included a good mix of option types, locations and alternatives with overall sufficient yield to ensure that real choices can be made for meeting demand in the future.

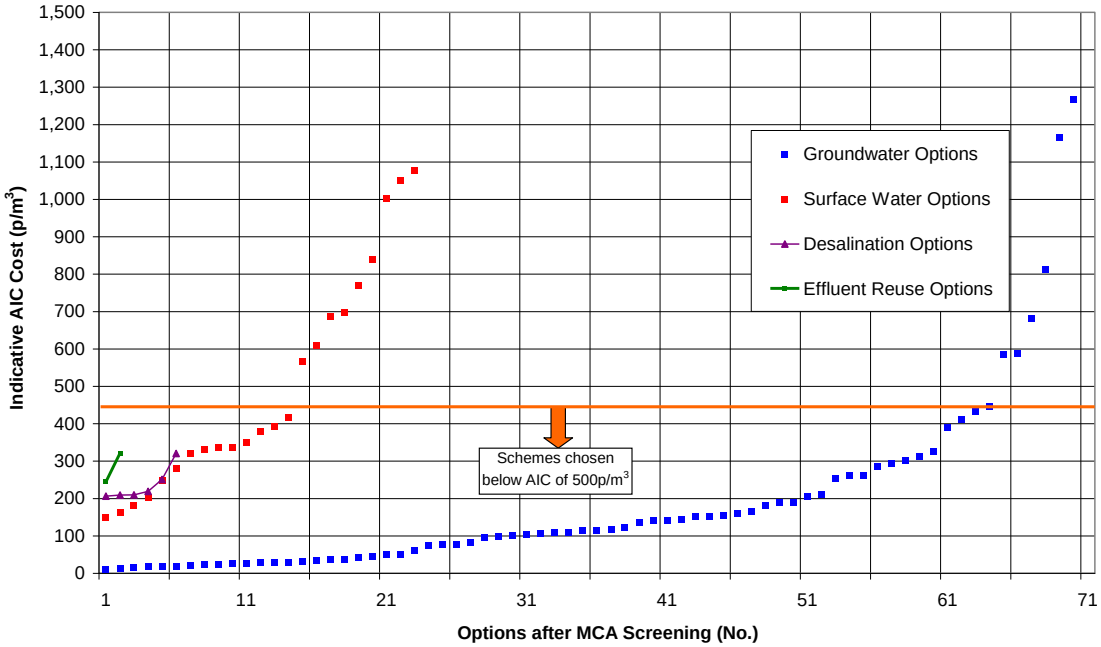
138. Taking into consideration these factors, the best performing set of options were added to a 'take forward' list for further study, whilst a number of other options were rejected outright and other options were retained on a 'reserve' list of options.

139. The 'take forward' options from each option type were then subject to internal and external review to allow 'whole picture' to be considered and to reflect the wider context and ultimate objectives for the WRMP14 process. This review focused on issues distinguishing between acceptable and unacceptable options, how the criteria used affected the ranking and analysis of the scoring methods used to rank the options.

Selecting the Feasible Option List

140. Finally the 'take forward' lists from each option type were amalgamated and subjected to a further level of analysis based on the unit cost of Deployable Output (DO). The ranking of options following the MCA process was a relative process which did not provide an absolute ranking across all option types. Therefore, for some option types (groundwater and particularly surface water) an additional arbitrary criterion was used to determine the final feasible options list which involved the application of an Average Incremental Cost (AIC) per cubic metre of water produced. Using these criteria those options with an indicative AIC greater than £5 per cubic metre were screened out leaving only the more cost-effective options in the feasible options list (Figure 3).

Figure 3: Ranked AIC costs after MCA screening



Groundwater Options

141. At the beginning of the WRMP14 study 236 groundwater options were identified. Following the validity check 156 options were progressed to the unconstrained options list. Further coarse screening was undertaken to screen out options with known 'show stoppers' and, subsequently, 118 groundwater options were progressed to the constrained options list. These constrained options were further reduced to 110 following discussions with hydrogeologist and following input from the EFG (appendix 7C).

142. In order to reduce the groundwater options to a more manageable number the fine screening used MCA against a set of environmental and technical criteria. The following section describes the fine screening approach adopted in determining the feasible groundwater options.

143. By applying the MCA process the performance of the groundwater constrained options were scored against the MCA criteria described in table 22. Further details of the process are provided in appendix 7C.

144. The options that met the following criteria were identified as the feasible groundwater options:

- Options in 'Water available' or 'No water available' GWMUs or Water Resource Management Units (WRMU) as defined in the relevant Catchment Abstraction Management Strategies (CAMS) report;
- Options with annual incremental cost less than 500p/m^3; and
- Options with average target yield >1Ml/d excluding ASR schemes.

Summary of Results

145. Table 25 summarises the results of the fine screening analysis for the groundwater options.

Table 25: Groundwater Options Summary

Option Type	Constrained Options (March 2012)	Excluded in addendum (May 2012)	Subject to MCA Screening	Options excluded due to:			Relegated to reserve list	Feasible Options
				Poor fine screening result	Excessive unit cost	Yield <1 Ml/d		
Groundwater Enhancement (EGW)	47*	4	43	16	0	8	4	15
New Groundwater (NGW)	64	4	60	22	2	11	7	18
Aquifer Storage and Recovery (ASR)	7*	0	7	1	4	0	1	1
Total	118	8	110	39	6	19	12	34

* Note: Option GW-69 has been re-classified as a Groundwater Enhancement project (option type EGW)

Surface Water Options

146. At the beginning of the WRMP14 study 255 surface water options were identified in the unconstrained options list. A process of coarse screening was undertaken to screen out options with known 'show stoppers' and, subsequently, 131 surface water options were included in the initial constrained options list. A total of 9 of these options were excluded following input from the EFG (appendix 7C).

147. In order to reduce the surface water options to a more manageable number, the constrained options list was assessed further for different option types as follows:
- For the 93 remaining Storage Reservoir constrained options a multi-stage approach was adopted consisting of:
  - further coarse screening, resulting in the exclusion of 12 conceptual large bunded reservoir options (on the Rother and Medway) for potential regional use and 3 others;
  - fine screening of the remaining 78 options using MCA against a set of environmental and technical criteria, ensuring that at least one option was carried forward in all river catchments;
  - cost-effectiveness criteria based on the unit cost of yield.
- The 17 Gravel Pit Abstraction options were not reduced at the earlier coarse screening stage, although 4 were excluded appendix 7C. The list included a generic option within each Water Resource Zone and 21 additional specific options were identified. A further coarse screening stage was applied based on the water availability in summer and conflicts with environmental designations. None of the gravel pit options identified passed these screening tests; and
- The 16 River Abstraction options were reconsidered based on a more detailed assessment of water availability.

148. A summary of the screening process adopted for reservoir storage and river abstractions is provided below. Further details of the screening process for the surface water options are provided in appendix 7C.

149. For the storage reservoir options an extra set of layouts were produced with the feasible options layouts which show the constrained options within each of three geographical areas together with the associated pipelines. The three geographic areas were based on the proposed river intake locations on the relevant river systems as follows:
- A - Loddon and Wey
- B - Adur, Medway (Penshurst), Ouse, Cuckmere, Wallers Haven, Rother (Upper)
- C - Medway (Kettle Corner), Rother (Thornsdale) and the Stour

150. A number of storage reservoir options were not subjected to MCA screening for the following reasons:
- 12 conceptual bunded reservoir options on the Rother (SW-227 to 232) and the Medway (SW-172 to 177) with a range of capacities up to 200 MCM had previously been included for evaluation by the WRSE group to be assessed as potential regional options to offset sustainability reductions. Initial feedback from the WRSE group indicated that these options were unlikely to be taken forward;
- The Medway Barrage option (SW-178) was rejected due to unsuitable geology; and
- The 4 bankside reservoirs (SW-101 to 104) included on the constrained options list all involve the utilisation of gravel pits adjacent to rivers. A total of 2 of these were excluded, see appendix 7C. Further consideration of gravel pits indicated all such options were unlikely to be feasible due to technical and cost issues related to the requirement for sealing the pits to prevent interaction with the local groundwater.

151. Excluding these 15 options resulted in 78 options going forward for MCA screening.

152. Following the performance matrix scoring a number of further considerations were made to reduce the environmental impact of a reservoir option to make a reservoir more selectable. In these cases the option was added to the 'take forward' list and then re-scored on the basis of the amended reservoir footprint. This was achieved by slightly re-locating a reservoir option, re-defining the shape of the reservoir bund or by reducing the size of the reservoir to avoid direct impacts. The other most promising options were retained on a 'reserve list' of options whilst the remaining options were rejected outright. An approximate estimate of the average incremental cost (AIC) per cubic metre was then determined. At this stage the reserve list comprised a total of 8 options (2 impounding and 6 bunded) which would pass the subsequent test of average incremental unit cost (AIC) of water produced being less than £5/m^3.

153. The results of the MCA process were reviewed and following that review it was decided that options with an AIC in excess of 500p/m^3 should be excluded from the feasible options list. One exception, at just over £6/m^3 is Option SW-245, a relatively large bunded reservoir site utilising the considerable potential for winter storage from the Medway which was retained as a possible regional resource.

154. At least one option was taken forward for each of 9 river intake locations. No likely feasible options could be identified on the Wey or from the Medway at Penshurst.

155. Site visits were undertaken on 4th and 5th July 2012 when a total of 13 potentially feasible storage reservoir sites were visited, with 5 further sites being considered as well. As a consequence of discussions during these site visits it was concluded that 7 of these options should be relegated to the 'reserve list', primarily for reasons of "deliverability", thus leaving 5 bunded reservoir options, 3 impounding reservoir options and 3 reservoir raising options on the Feasible Options List. Specific reasons for rejection of other sites or relegation to the "reserve" list are provided in Appendices B1 and C2.

156. The constrained options list included 16 river abstraction options. One of these options (SW-2: Forstal Link) was re-classified as a water transfer option with two variants (now numbered TR-56 and TR-56a). Similarly, a previous water transfer option (TR-56: Adur to Ardingly Reservoir) was reclassified as a surface water option (SW-278) and taken forward to the feasible options list.

157. On further investigation, the other 15 river abstraction options on the constrained options list were not taken forward for the following reasons:
- Winter-only abstraction schemes do not provide a reliable Dry Year Annual Average (DYAA) yield during summer (unless part of a reservoir storage or conjunctive use scheme);
- The potential resource from Internal Drainage Board areas which discharges upstream of the proposed river intake locations for the reservoir storage options is already taken into account in such options. In many cases the proposed abstraction location is at, or near to, the tidal limit;
- The potential resource from the remainder of the Internal Drainage Board areas is relatively small compared with the upstream catchments. It is unlikely that reliable yield can be obtained without the provision of storage; and
- Other new river abstraction schemes cannot provide reliable DYAA yield during summer without the provision of storage.

Summary of Results

158. There were a total of 131 surface water options within the constrained options list of which 78 were taken forward for MCA screening. A total of 13 surface water options were taken forward to the feasible options list as summarised in table 26 with a further 16 options relegated to the reserve list.

Licensing Options

159. None of the licence trading options have been subject to the fine screening filter at the present time. All 33 options identified in the constrained options list have been taken forward to the feasible options list.

160. We wrote to all 33 of these licensees to confirm whether any of the existing licences could be licence trading options could be developed to feasible option level and ensure they met the fine screening criteria applied to other similar options e.g. groundwater options.

Table 26: Surface Water Options Summary

Option Type	Option Sub Type	Constrained Options (March 2012)	Further Exclusions and Additions:		Subject to MCA Screening	Options excluded due to:		Relegated reserve list to	Feasible Options
			Addendum (May 2012)	Task 3 and 4		Poor fine screening result	Excessive unit cost		
ESW	Licence Alteration	1	0	0	n/a	0	0	0	**1**
NSW	River Abstraction	16	1	1 added but 15 excluded	n/a	0	0	0	**1**
	Gravel Pit Abstraction	17	4	21 added but all excluded	n/a	0	0	0	**0**
	Bunded Reservoir	74	0	12	62	38	9	10	**5**
	Bankside Reservoir	4	2	2	0	0	0	0	**0**
RES	Impounding Reservoir	17	2	1	14	5	0	6	**3**
	Licence Alteration	0	0	0	n/a	0	0	0	**0**
	Reservoir Raising	2	0	1 added *see note	2	0	0	0	**3**
Total Surface Water		131	9		78	53	9	16	13

* Option SW-4 (Raising of Bewl Reservoir) was not included in the constrained options list (along with other similar options involving the possible raising of Southern Water reservoirs). This option has now been carried forward to the feasible options list to reflect our interest in this option.

Water Reuse Options

161. A total of 30 options were identified in the constrained options list. Three of these options were subsequently considered to be variants of two of the other options (type of tertiary wastewater treatment to be used, and number of months of year the scheme would be in operation) and so the number of options was reduced to 27. An additional option, Aylesford WwTW, was subsequently added which had originally been rejected on the grounds that Southern Water expressed a commitment to develop this option. However a decision was taken to re-introduce this option in case Southern Water subsequently decided to shelve the option or wished to develop it at a much later date, beyond our projected implementation programme.

162. Thus a total of 28 water reuse options were taken through the MCA stage. These options were all identified as being capable of achieving the required objectives and consisted of:
    - Utilisation of effluent which is currently being wasted (primarily marine or estuarine discharge);
    - Technically feasible without excessive engineering cost; and
    - Capable of providing an adequate and reliable resource yield.

163. Further details of the fine screening process are provided in appendix 7C.

164. All the options comprised 'indirect' water reuse as defined in the recent Environment Agency position statement *Effluent Reuse for Potable Water Supply* (June 2011). Indirect water reuse consists of effluent which is discharged into a river or raw water reservoir, as opposed to 'direct' water reuse where effluent is supplied to the distribution network, downstream of a Water Treatment Works.

Components of Water Reuse Options

165. All the water reuse options potentially comprise the provision of the following common components:

- Tertiary wastewater treatment works (WwTW) facilities to upgrade an existing effluent to a quality suitable for discharge to the target receiving water; assessment of existing effluent quality during the MCA process showed that all options would require effluent upgrade;
- Transfer pipeline to take the upgraded effluent to the point of discharge to the receiving water;
- Upgraded water treatment works (WTW) to provide the necessary capacity to treat the additional flows when re-abstracted from the receiving water; assessment of WTW capacities during the MCA process showed that some options could be implemented without the need for any WTW upgrades.

Treatment Works

166. The following assumptions were made with respect to treatment works:
    - Wherever possible, the tertiary WwTW facilities would be located at the existing works as opposed to a new greenfield site; this was considered to be the optimum approach in relation to cost, achieving planning permission and subsequent operation of the works;
    - Reverse osmosis (RO) would be the required tertiary treatment technology (although the intention would be to re-examine other treatment technologies at a subsequent stage);
    - Where required, the additional WTW capacity would be provided within existing WTW sites; and
    - There would be no assessment of upgrades required to the distribution system downstream of the WTW (the assumption was that all types of options would be faced with similar network upgrades).

Transfer Pipelines

167. Transfer pipeline routes were selected based on the avoidance of the following constraints wherever possible:
    - Urban areas;
    - Major infrastructure; and
    - Significant environmental designations (international and national nature conservation and landscape designations, ancient woodland, scheduled monuments, registered parks and gardens).

168. As a secondary objective, routes were selected which avoided local nature reserves and designated BAP habitat.

Summary of Results

169. Although only 5 water reuse options were taken forward to the feasible options list, it should be noted that various sub-options can be identified in relation to each of these with respect to the following:
    - Type of tertiary treatment (RO or conventional);
    - Flow to be selected (water reuse options can be considered as modular with incremental flow increases up to the maximum effluent flow available; however increasing flow increments may have knock on impacts on infrastructure requirements e.g. the spare or 'headroom capacity' at a WTW might be exceeded triggering the need for a WTW upgrade); and
    - Number of months per year in operation (water reuse schemes may be most needed in the dry summer months, but having made the capital investment, year round operation of the asset would reduce the unit cost of water).

Table 27: Water Reuse Options Summary

Option Type	Constrained Options	With Sub-Options Removed	Aylesford added back	Subject to MCA Screening	Options Screened Out	Relegated to reserve list	Feasible Options
Water Reuse (EFF)	30	27	1	28	21	2	5

Desalination Options

170. The desalination options in the MCA process were assessed against the set of environmental, technical cost and risk criteria aspects, as described in table 23.

171. The screening process started with 12 options and the following changes came about from the MCA analysis:
    - 5 options were restored – 4 brackish water options (DS-1, DS-3, DS-4 and DS-5) plus DS-20 the Eastbourne seawater option;
    - 5 options were dropped at the MCA stage, because they either scored badly or they had major disadvantages compared to other desalination options; and
    - 7 options were amalgamated into 2 options, owing to similarities.

Summary of Results

172. The fine screening process left a total of 6 feasible options. Subsequently, 3 of these options were relegated to the 'reserve list', leaving 3 feasible options remaining.

173. Further details of the process are provided in appendix 7C.

Table 28: Desalination Options Summary

Option Type	Constrained Options	Options added back	Subject to MCA Screening	Options added back in	Options merged	Options screened out	Relegated to reserve list	Feasible Options
Desalination (DES)	11	1	12	4	7 options merged into 2	5	3	3

Water Transfer Options

174. The options identified at the constrained options stage have been carried through to the feasible option stage with only some minor variations in the routes, where required. No fine screening was carried out as all the transfer options were considered to be valid in accordance with the WRSE proposals of the options.

175. After the constrained options list was produced one surface water option (SW-2: Forstal Link) was re-classified as a water transfer option with two variants (now numbered TR-56 and TR-56a). Similarly, a previous water transfer option (TR-56: Adur to Ardingly Reservoir) was reclassified as a surface water option (SW-278) and taken forward to the feasible options list.

176. The water transfer options considered for WRMP14 were amalgamated by WRSE from historical options and following their own initial screening criteria for modelling. However, all the inter-company options were developed after discussions and agreements with the respective companies for each option, in accordance with the WRSE generic proposed transfer routes. Hence, it was not considered useful for further screening to be carried out for the water transfer options and all the 61 constrained options were taken through to the feasible option stage except for 4 which further information showed should effectively have been superseded at the Unconstrained Options stage.

177. A total of 34 additional options were added, many as variants of other options in terms of capacity and direction of supply.

178. Within the pipeline routes there is a degree of flexibility in routes proposed to avoid environmental impacts and in some cases the routes identified are preliminary and will have considerable scope for improvement to minimise impacts. In addition, since many of the impacts from pipelines would be temporary and construction-related, it is considered that some of these can be reduced or mitigated through good construction practice.

Summary of Results

Table 29: Water Transfer Options Summary

Option Description	Constrained Options	Options superseded	Additional Options	Feasible Options
Company Transfer(CTR)	24	4	10	30
Inter-company / Regional Transfer (RTR)	37	0	24	61
Total	61	4	34	91

Conjunctive Use Options

179. To define more closely the conjunctive use options, a review was undertaken of all groundwater sources in the vicinity of the conjunctive use options on the unconstrained options list together with an analysis of the available surface water resources. The review of groundwater sources, as per appendix 7C, identified 49 sources for consideration as potential conjunctive use options. Subsequent analysis has grouped sources together and associated each group with river to form a smaller number of conjunctive use options.

180. Surface Water Sources

From the perspective of surface water, the concept is to make use of winter flows in the river from new surface water intakes which would be transferred to works designed to treat surface water abstractions. These would be either new WTWs or extensions of existing ones. The output from the WTW would be directed to an appropriate service reservoir on the network within the relevant WRZ, which need not necessarily be a service reservoir to which any of the associated groundwater sources deliver. It is assumed that the WRZ network would have the capacity to deliver the water to the demand centres as required from any service reservoir. The surface water abstraction would clearly require a new or revised abstraction licence and, in some cases, a new river intake, though some will be based on an existing river intake such as that on the River Ouse at Barcombe.

181. Groundwater Sources

Groundwater resources were assessed using the concept that, for the purposes of determining maximum achievable conjunctive use Annual Average Deployable Output (AADO), the existing licensed annual total volume would be abstracted from the aquifer at a rate up to the present licensed peak daily abstraction rate. Operating a groundwater source in this manner would lead to the licensed annual volume being used up in less than a year. Once the annual groundwater licence had been exhausted the supply would be met from new or increased surface water abstractions for the rest of the year. The aim would be to rest the groundwater resources during the winter period when rainfall is high and soil moisture deficits have been reduced to zero to maximise the opportunity for the aquifer to accept recharge at a time when river flows are high enough to support surface water abstractions.

182. In essence the concept is that the groundwater sources are optimised within their existing licences to make use of ephemeral winter flows in the river system thereby raising the overall Deployable Output (DO). The design is therefore based upon determining the critical design event in the river systems and identifying the specific groundwater sources to link in such that the overall DO is optimised. This approach addresses AADO only. Peak Deployable Output (PDO) will remain constrained by the groundwater PDO for practical purposes, though the introduction of additional surface water abstractions and treatment works would raise the possibility of more flexible operation during droughts or outages.

183. Consultation

The critical design event in this analysis is the driest winter as determined from the flow records. In undertaking this analysis some specific issues relating to the river flows, existing licensed river abstractions operated by third parties and environmental flow requirements emerged. A consultation was arranged with the Environment Agency to discuss these matters, to gain guidance on data to be used and residual flows to allow for, and further to gain confirmation on the general approach and design concept. This meeting was finally held on 15th June 2012 at which the Environment Agency confirmed that the design approach in general as being valuable and one that is being advocated elsewhere as a solution to NEP issues on selected sites. The Environment Agency agreed to provide additional data and specific hands off flow criteria appropriate for this study.

184. Results

The results of the analysis of potential surface water resources and existing groundwater sources provided a basis for deriving the increase in DO attributable to conjunctive use for each of the identified options. The options were screened on the basis of practicability using the following criteria:

Minimum river abstraction period during critical dry winter:	40 days
Minimum conjunctive use Deployable Output:	1 Ml/d
Maximum new WTW capacity required for surface water:	20 Ml/d

185. The schemes on the Loddon, Wey, Medway and eastern Rother were rejected as the periods of operation during the critical dry winter were too short (<40 days). A scheme on Wallers Haven was rejected because the associated groundwater sources had very limited capacity with a conjunctive use yield of less than 1Ml/d.

186. Following this review the three options listed in table 30 were carried forward to the feasible options list but require further design and costing.

187. These three conjunctive use options all make the best use of existing infrastructure (e.g. river intakes on Ouse and Cuckmere), are extensions to existing WTWs and use existing pipelines to service reservoirs if they have sufficient capacity. In addition they have the following characteristics in common:
- Intake pump to bankside storage;
- Bankside storage (1.5 days' intake capacity);
- Pump to WTW;
- WTW extension at 1.0 x intake capacity;
- Pump and delivery pipeline to a service reservoir; and
- Increase service reservoir capacity (1 day intake capacity)

Table 30: Conjunctive Use Options Summary

Code	Option CU-01	Option CU-08	Option CU-12
River	Cuckmere	Ouse	Great Stour
Intake and WTW	Arlington	Barcombe	Plucks Gutter
Intake and WTW capacity (Ml/d)	20	15	20
Minimum operating time (days)	44	127	99
Aquifer	Eastbourne chalk	Seaford chalk	Chalk and Hythe Beds
Groundwater sources -	Birling Farm	Cow Wish	Thannington
	Cornish	Poverty Bottom	Charing
	Deep Dean	Rathfinny	Westwell (and Henward)
	Friston	-	Newnham
	Filching	-	Wichling
	Waterworks Rd	-	Wineycockshaw
Groundwater combined capacity -			
ADO (Ml/d)	29.63	15.61	66.88
Peak licence (Ml/d)	48.42	37.75	98.66
Conjunctive use yield (Ml/d)	2.4	5.1	5.4

188. Options CU-01 and CU-08 are based at existing sites. Option CU-12 assumes an intake and WTW located at or near Plucks Gutter. There is an existing Southern Water surface water abstraction and WTW at this location. There may be the possibility of a joint development on this site which would be subject to negotiation. Should this not be possible, the WTW could be developed on a new site local to Plucks Gutter or at our Thannington WTW site with delivery of raw water from the intake on the Great Stour at Plucks Gutter via a new raw

water pipeline. A further possibility for CU-12 would be to concentrate all works on the existing Thannington site with the river intake on the Great Stour next to the works. This would reduce capital and operating cost with the penalty of a reduction in conjunctive use yield from 5.4 to 4.4 Ml/d and a reduction in the number of operating days in the critical dry winter from 99 to 80 days.

Water Treatment Works (WTW) Options

189. The water treatment works options identified in this study aim at expanding existing works or reducing production losses from existing works. They are grouped under two subcategories, WTW expansion and WTW process losses. In the constrained options there were 6 options in the first sub-category and a total of 11 sub-options in the second.

190. Water Treatment Works Expansion

In the constrained options list two options, conventional and reverse osmosis plant (RO), were considered to upgrade the Maytham Farm WTW. However, the feasibility study carried out as part of the drought relief plan indicated that the RO plant (option WT-2) is an expensive option and hence only the conventional WTW option (WT-1) has been considered as a feasible option.

The Ford WTW upgrade option (WT-3) includes the removal of fluoride concentrations. The removal process for fluoride can be onerous and expensive. Blending of water from Ford BH (3.9 Ml/d) with water from Hoplands Farm (3.9 Ml/d) is likely to be a better option as it is being done now. Hence, this option has not been considered as a feasible option and has been put in a reserve list.

The constrained list included two options for Bewl WTW expansion (WT-8 and WT9) with increased peak deployable outputs (PDO) of 14.6 and 10 Ml/d. An additional option (WT-10) has been added to cater for an increased capacity of 5 Ml/d PDO in line with the water transfer options considered. All three of these options have been included in the feasible option list as well as WTW in RZ4 extension (WT-4), giving a total of 5 feasible WTW expansion options.

191. Recovery of Process Losses

The 11 process loss sub-options in the constrained options list (identified under options WT-5, 6 and 7) were of a generic nature and have been excluded from consideration for the list of feasible options. Specific new process options were substituted, based on an initial deployable output study of process losses. For economic reasons it was considered that trying to retrieve losses less than 0.25Ml/d is not worth pursuing as an option per se and that this should be the focus of deployable output improvement initiatives to be updated in future WRMPs. As part of the deployable output assessment, production losses of about 100 WTWs were analysed. The WTWs with estimated losses of more than 0.25Ml/d are listed in table 31.

Summary of results

192. Due to the nature of these options MCA has not been carried out on the WTW options and they were not subject to MCA ranking. However, as for the groundwater schemes, options with a yield of less than 1 Ml/d have not been taken forward to the feasible options list which therefore includes a total of 9 water treatment works options (5 expansions and 4 recovery of process losses).

Table 31: Water Treatment Works: process losses summary

Zone	Option No.	Name of WTW	Estimated process loss (Ml/d)
RZ3	WT-11	Crowhurst Bridge	0.604
RZ4	WT-12	WTW in RZ4 (SW)	1.95
RZ8	WT-13	Wichling/ WCS / Newnham (total combined)	0.408
RZ2	WT-14	WTW in RZ2	2.0
RZ4	WT-15	Beenhams Heath, Hurley and White Waltham Group	1.17
RZ4	WT-16	WTW in RZ4 (Gravels)	0.76
RZ4	WT-17	West Ham Group	1.26

Demand Management Options

193. All constrained demand management options have been taken forward to the Feasible Options List. The feasible options list contains a wide range of measures covering:
    - Visits to customers' homes to undertake audits and/or undertake repairs/retrofits;
    - Provision of information to educate customers or to enable them to assess their usage and take action;
    - Provision or subsidising of water efficient products to customers;
    - Undertaking non-household audits and/or undertake repairs/retrofits;
    - Metering and tariffs; and
    - Leakage management enhancements.

194. In addition 3 new demand management options were added to the constrained list as shown in table 32 below. The options for the repair of leaking toilets have emerged out of a recent project commissioned by a number of water companies including us. The study estimated the occurrence and flow rates of leaking cisterns in toilets using valves rather than siphons.

195. The retrofitting of dual or variable flush systems has been split into two options for household customers and non-household customers.

Table 32: New Demand Management Options

Option Number	Option Title	Description
DM-New 18.1	Leaking toilets (domestic) - repair of	Domestic customers are encouraged to check if their toilet might be leaking; a remote assessment is carried out for those who respond. A technician then attends the customer's property to fix any leaking toilets, replacing parts as necessary.
DM-New 19.1	Leaking toilets (non-household) - repair of	Commercial customers are encouraged to check if their toilet might be leaking; a remote assessment is carried out for those who respond. A technician then attends the customer's property to fix any leaking toilets, replacing parts as necessary.
DM-New 20.1	Retrofitting of dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Commercial customers are vetted by trained call centre staff, with a technician attending the customer's property to install dual flush devices in any toilets sufficiently large enough as to benefit.

196. At this stage the options were largely listed as discrete measures. However, many options are complementary and therefore could be delivered more efficiently in combination. The next stage of this appraisal is described later in this appendix.

197. In total 38 demand management options for each water resource zone have been taken forward to the feasible options list.

Feasible Options List

Initial Feasible Options List

198. Following the fine screening and assessment of constrained options an initial feasible options list was distributed to the EFG in July 2012. This list contained 495 options, of which 304 represent 38 demand management options in each of the 8 water resource zones. The remaining 191 feasible options represent a reduction of more than 50% compared to that derived for the constrained options list (Table 22) of 414 options (excluding 288 demand management options). This initial feasible options list is summarised in table 33.

Table 33: Initial Feasible Options List (July 2012)

Option Type	WRZ1	WRZ2	WRZ3	WRZ4	WRZ5	WRZ6	WRZ7	WRZ8	Total
Groundwater	5	5	5	10	1	1	4	3	34
Surface water		6	3	1		1	1	1	13
Licensing	1	2		10	1	11		8	33
Water reuse		2	1			1		1	5
Desalination		1	1					1	3
Water transfers	9	23	4	17	10	9	6	13	91
Conjunctive use		1	1					1	3
Water treatment works		1		4			4		9
Demand management	38	38	38	38	38	38	38	38	304
Total	53	79	53	80	50	61	53	66	495

199. Following feedback from the EFG, consultation with stakeholders and further consideration, a number of supply options were excluded from the initial feasible options list as indicated in table 34.

Changes to the Demand Management Options

200. In the initial feasible options list in July 2012, there were 38 demand management options per water resource zone. Options were validated through the removal of duplicates and those options already implemented, such as new, optant, change of occupier and selective metering programmes. Table 35 summarises these options by sub-type.

201. These options were developed further to reflect how they would actually be rolled out as programmes of work. In particular we have established the following:

- Implementation methodology
- Size of potential target customer base
- Likely take-up rates
- Water savings
- Sustainability of savings.

Table 34: Exclusions from Initial Feasible Options List (July/Aug 2012)

Option Number	Option Title	Reason for Exclusion
GW-76	Increase actual to licence at Tonbridge	Already included in SEW deployable output (DO) baseline assessment.
GW-191	Abstractions at Faversham	Potential impact on North Kent Marshes
SW-10	Licence alteration at Springfield; take additional yield from Burham WTW	Currently being implemented by Southern Water
SW-33	Beech Hill - Loddon & Blackwater	Rejected by environment focus group (EFG).
SW-48	Clay Hill Reservoir, Lower Ouse - Option 1	Rejected by environment focus group (EFG).
Licensing	All 33 options	No positive response from Licensees
TR-97	PRT Farlington WTW to SEW Tilmore Reservoir - 10 Ml/d	10 Ml/d transfer variant of this option is less cost effective than alternate (mutually exclusive) option TR-54 - Clanfield SR (Portsmouth Water) to Tilmore SR (SEW)
CU-8	Conjunctive Use of Surface Water & Groundwater - River Ouse	Conflicts with existing river abstraction at Barcombe.
WT-12	WTW in RZ4 recovery of process losses	No CAPEX is required to implement this option so it is being progressed outside WRMP14.
WT-15	Beenhams Heath, Hurley and White Waltham Group	On further examination process losses are below economic level for recovery
WT-17	West Ham Group recovery of Process losses	On further examination process losses are below economic level for recovery

202. In deriving the demand management programme options we have consolidated a number of the original list. For example, to maximise the take-up of water efficient products (such as cistern displacement devices, aerated shower heads and tap inserts) an option that markets these most effectively to maximise take-up has been developed; this enables them to be provided together and hence most efficiently. Similarly, our audit and retrofit option will seek to maximise the measures the customers adopt by offering them within an integrated visit.

203. The roll out of universal metering will be completed during AMP6, whereby it is estimated that 90% of household customers will then be charged based on the quantity of water consumed. Our baseline demand forecast includes a reduction of nearly 11% due to sustained customer behaviour changes when metered. During AMP6 we propose to undertake tariff trials to assess whether there are acceptable options which could further incentivise customers to save water, especially during the summer months. The trials will be developed using data we are obtaining from our new meters and the increased customer datasets that we now hold. Therefore tariff options do not have any identifiable savings associated with them and so have been excluded from the feasible options list. The results of the trials will inform the inclusion of tariff options as part of the next round of WRMPs.

204. This has resulted in a revised total of 23 feasible demand management options for each zone, as shown in table 35. Further details relating to individual options are presented in appendix 7E

Table 35: Demand management Options Summary

Demand Management Sub-Type	Number of Options per WRZ	
	Initial Feasible List	Revised Feasible List
Leakage Management	6	6
Education/information provision	7	2
Water efficient product provision/subsidies	8	2
Household audits and retrofitting	4	4
Water recycling	3	2
Tariffs	5	
Non-household programmes	5	7
Total	**38**	**23**

Updated Feasible Options List

205. An updated feasible options list was distributed to the EFG in September 2012. This list contained 332 options, of which 184 represent the 23 demand management programme options in each of the 8 water resource zones. The remaining 148 feasible options represent a reduction compared to that derived for the initial options list (table 33) of 191 options (excluding 304 demand management options). The reduction of 43 options comprises the 10 source options and 33 licensing options listed in table 34. The updated feasible options list is summarised in table 36.

Table 36: Updated Feasible Options List (September 2012)

Option Type	WRZ1	WRZ2	WRZ3	WRZ4	WRZ5	WRZ6	WRZ7	WRZ8	Total
Groundwater	4	5	5	10	1	1	4	2	32
Surface water		5	3				1	1	10
Licensing									0
Water reuse		2	1			1		1	5
Desalination		1	1					1	3
Water transfers	9	23	4	17	9	9	6	13	90
Conjunctive use			1					1	2
Water treatment works		1		1			4		6
Demand management	23	23	23	23	23	23	23	23	184
Total	36	60	38	51	33	34	38	42	332

206. Following further feedback from the EFG, consultation with stakeholders and further consideration, 12 additional supply options (mainly groundwater) were excluded from the initial feasible options list as indicated in table 37.

Table 37: Exclusions from Feasible Options List (Sep/Oct 2012)

Option Number	Option Title	Reason for Exclusion
GW-13	Thurnham - increase output from existing BH	Review of yield indicates output will be below cut-off value of 1 Ml/d.
GW-41	West Ham (WH)/West Ham Park (WHP) - Increase Licence	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc. would be required to demonstrate sustainability.
GW-64	New sources Lower Greensand	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc. would be required to demonstrate sustainability.
GW-83	West Ham/West Ham Park - Increase DO to Aggregate Licence	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc. would be required to demonstrate sustainability, particularly in relation to Test catchment
GW-89	Lasham - Beyond the Licence	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc. would be required to demonstrate sustainability.
GW-90	Woodgarston - Beyond Licence	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc. would be required to demonstrate sustainability, particularly in relation to Test catchment
GW-96	Itchel - Closing the gap	Sustainability concerns on River Hart from current abstractions
GW-116	New sources Underhill Chalk	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc. would be required to demonstrate sustainability especially in relation to impact on chalk springs and headwaters of Adur.
GW-125	Monkwood - New licence within chalk	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc. would be required to demonstrate sustainability.
GW-131	Powder Mill - Beyond licence	Close to other sources e.g. SWS. A lot more investigation needed. Complex area and likely surface water /ecological effects.
GW-135	Tonbridge Gravels - Beyond the Licence	Doubt over yield linked to current EA "hands-off flow" constraint at Teston of 980Ml/d for new licences.
TR-106	Wallers Haven (river abstraction) to Darwell Reservoir via Hazards Green	Without Darwell raising (and/or change to Bewl-Darwell transfers) which is a Southern Water asset, this option is not feasible for SEW. Additional environmental concerns raised re inter-basin raw water transfers as well as potential impact of the abstraction on downstream flows in Wallers Haven and on to Pevensey Levels.

Revised Feasible Options List

207. In total there are therefore 320 options on the revised feasible options list for WRMP14. Table 38 below shows the breakdown by option type and WRZ. The principal reason for excluding each of the other options not included on this list is summarised in appendix 7E.

Table 38: Revised Feasible Options List (November 2012)

Option Type	WRZ1	WRZ2	WRZ3	WRZ4	WRZ5	WRZ6	WRZ7	WRZ8	Total
Groundwater	3	3	4	5			4	2	21
Surface water		5	3				1	1	10
Licensing									0
Water reuse		2	1			1		1	5
Desalination		1	1					1	3
Water transfers	9	23	3	17	9	9	6	13	89
Conjunctive use			1					1	2
Water treatment works		1		1			4		6
Demand management	23	23	23	23	23	23	23	23	184
Total	35	58	36	46	32	33	38	42	320

Modelled List for WRMP Preferred Plan

208. During the development of the preferred plan as described in appendix 8 a number of further constraints were applied to limit the selection of options. For completeness these constraints as applied to each option are summarised in the penultimate column of Appendix 7E with the adopted modelled list of options indicated in the column to the left. This modelled list represents the set of options which were offered to the least cost modelling in order to derive the preferred plan. Table 39 below shows the breakdown of this modelled list by option type and WRZ.

Table 39: Modelled List for WRMP Preferred Plan

Option Type	WRZ1	WRZ2	WRZ3	WRZ4	WRZ5	WRZ6	WRZ7	WRZ8	Total
Groundwater		2	1	1					4
Surface water		2	2					1	5
Licensing									0
Water reuse		2	1			1		1	5
Desalination		1	1					1	3
Water transfers	9	12	3	4	7	8	5	10	58
Conjunctive use			1					1	2
Water treatment works		1		1			4		6
Demand management	15	15	15	15	15	15	15	15	120
Total	24	35	24	21	22	24	24	29	203

Feasible Option Dossiers

209. This section explains the approach for producing the feasible option dossiers i.e. pre-feasibility studies of each of the feasible options as presented in this appendix.

210. Each Feasible Option Dossier contains:
- Scheme summary
- Technical description and location
- Social and Environmental Aspects
- Baseline conditions (on ecology, biodiversity flood risk etc.)
- Potential impacts, mitigation, enhancements
- Habitats Regulation Assessment screening (HRA)
- Potential development constraints
- Development history
- Development programme
- Option inter-relation
- Dossier Costs
    - includes yield peak deployable and average deployable output
    - Capital expenditure (CAPEX),
    - Operating costs (OPEX) and Replacement costs,
    - Environmental and Social Costs (E&S) & Carbon costs
    - Average Incremental Cost AIC (£/m^3)
    - Average Incremental Social Cost AISC (£/m^3)
- Drawings : Four maps per resource option (i.e. excluding Demand Management Options) showing details of option location, proposed pipeline routes etc. superimposed on the following background layers:
    - Map 1 Terrestrial Ecology
    - Map 2 Landscape and Public Recreation
    - Map 3 Cultural Heritage
    - Map 4 Flood Risk, Land Grade and Pollution

211. Draft versions of the dossiers were produced in early October 2012 for the EFG and Environment Agency with review comments received by November 2012. Updated versions of the dossiers were completed in March 2013.

212. The Dossiers are not included in the WRMP14 but are available for viewing on request at our head office, location details can be found in section 12.

Scheme Summary Technical Description

213. Typical designs have been prepared for each option category to systematically and consistently establish the scope and cost. A number of meetings were held with our Asset team, Production team and Water Resources team to incorporate any specific issues both during the option appraisal and while undertaking the cost estimate.

214. Each of the option categories was developed on its own but there were a number of design items which were common to several of the options. These items are considered individually below.
- Pipeline Design
- Pumping Stations

- Reservoirs
- Service Reservoirs
- Water Treatment Works
- Boreholes
- Reverse Osmosis Plants

215. Pipeline Design

Pipeline route (and hence the pipeline length) for an option was defined using ArcGIS software, such that the impact on environmental designated sites would be minimal.

The costs of laying pipe mains in urban, suburban and rural areas are different. Therefore, shape files of agricultural classification were obtained and used to determine the pipe lengths in different land uses. The number of pipe crossings with railways, rivers and streams, roads and motorways were calculated from the intersection files in ArcGIS to evaluate the costs for the crossings.

Pipe Size and Pump Capacity

Hydraulic analyses were carried out based on the following assumptions to determine the pipe size and pump capacity:

- The Colebrook White equation was used to determine friction loss in the pipeline
- Roughness factor of 0.05mm;
- For pressurized pipe an economic velocity of 1.3m/s was used to determine the pipe diameter for a peak flow. A detailed explanation on the pipe sizing is provided in appendix 7C. Where the peak flow is equal to the average, 30% peak factor was used to account for hourly variations;
- The required pump capacity was determined taking into account pipe friction losses and the static head. To establish the static head and suitable locations for pumping stations as well as booster pumps, a pipeline profile was generated in ArcGIS.

216. Pumping Stations

Depending on the outcome of the hydraulic analysis and pipeline profile, pumping stations were provided for transfer and surface water options;

For groundwater options borehole pumps were designed to pump up to WTWs. From WTWs it is assumed that highlift pumps would be used to pump water to distribution/service reservoirs.

217. Reservoirs

- Embankment side slope: The upstream and downstream embankment slope was determined taking account of geology in which the reservoir is situated and thus the available fill materials:
    - Embankment on clay geology (London and Weald) is homogenous type of embankment with upstream and downstream slopes of 1:6 and 1:5 respectively;
    - Embankment in Tunbridge Wells Sand geology is Zoned Embankment with imported clay for core, with upstream slope of 1:5 and downstream slope of 1:4;
- Embankments founded on clay have no cut-off. Those founded on Tunbridge Wells Sand allow for an average 5m deep perimeter cut-off to a mudstone/siltstone layer in the foundation
- Crest width of 6m was assumed for each option;

- Depth of cleared working area: 0.3m;
- Depth of excavation for embankment foundation: 1m;
- Freeboard: 1 to 2m;
- River intakes: Each reservoir scheme entails a river intake and intake main to facilitate delivery of raw water from a river to the reservoir;
- Spillways:
    a. for impounding reservoirs was assumed to be a bell mouth type with a capacity to cope with the Probable Maximum Flood (PMF);
    b. for a bunded reservoir was set equal to the intake pipe pumping capacity;
- The reservoir size was optimised to achieve the maximum possible storage with the minimum volume of embankment with adjustment to avoid sensitive environmental features.

218. Service Reservoirs

The requirement for service reservoirs for most options was determined in liaison with our Asset Management Team. Meetings were held during early 2012 with the Asset Team to identify where the demand for water was within particular Water Resource Zones and where existing service reservoirs could accommodate the DO from the transfer options. The capacities and the possibility of expansion of existing service reservoirs were also discussed and finalized.

219. Water Treatment Works

The need for additional WTW capacity was determined in liaison with our Production Managers and Asset Management team. Meetings were held with Production Managers as well as with Asset Management and Water Resources Planning team to define the WTW needs for each option. As part of the PR09 study typical process flow diagrams showing the major water treatment works components were prepared for the following sources:

- Surface water;
- Chalk Aquifer;
- Lower Greensand;
- Ashdown/Hastings Beds.

These typical designs were adopted in developing the scope and cost of water treatment works for each option.

- The WTW for each option was designed to cope with the peak DO. Where average and peak DO are the same 30% peak factor was used to account for hourly variation in flow.

220. Boreholes

- The number of boreholes required to achieve the target yield was determined based on hydro-geological information and experience in the past in a given type of aquifer and site;
- The borehole depth was determined based on the depth of existing boreholes.

221. Reverse Osmosis (RO) Plants

A similar arrangement was used both for water reuse and desalination option RO plants. Deep bed multi-media filtration was provided prior to the RO plant for filtration for water reuse schemes. In addition the recovery rate for water reuse options was assumed to be 46% whereas the recovery rate for desalination was assumed to be 35%.

Consultations with Neighbouring Water Companies

222. The inter-company options (60 No. options) were discussed and agreed with the neighbouring companies. These were **Southern Water, Veolia SE (now Affinity Water), Portsmouth Water, Thames Water and Sutton and East Surrey Water.** The connection node points and the deployable outputs (average and peak flows) were agreed with the companies prior to any design and costing exercises being carried out. The pipeline routes were also shared with the other companies for clarity and openness.

Costing

223. The costing for all the option categories was carried out on a consistent basis using the same Unit Cost Database (UCDB) rates. However, for specific items such as embankments for reservoirs the rates were built up from current construction and published rates for the costing exercise. Similarly, due to the limitation of data, the unit rate derived in the PR09 study was used to cost RO plant with an appropriate cost increase index. The PR09 rates were validated by comparing with the cost estimate carried out as part of the drought relief plan.

224. Mitigation and enhancement measures and land purchase costs have been included in the costings for all options where applicable, including Arlington and Broad Oak reservoirs. These were extrapolated from a range of examples of detailed reservoir costings and include specific provision for mitigation and enhancement including compensatory habitat creation.

Scheme Durations / Periods

225. The feasibility and promotion period and construction period for each option category was established based on expert knowledge as follows:

Table 40: Scheme duration assumptions

Option Category	Feasibility/ Promotion (years)	Construction (years)
Groundwater	1 to 4	1 to 2
Surface Water	6	4
Water Reuse	5	3
Desalination	5	3
Bulk Transfer	3 to 8 years	1 to 5
Conjunctive Use	3	3
Water Treatment Works	1	1 to 2

Rates and Cost Functions

226. The UCDB, which was prepared primarily based on framework contracts, quotations from suppliers and other similar sources, was used to establish rates and cost functions for the cost estimates. The UCDB was initially developed for capital maintenance purposes. It was further expanded to take account of capital delivery projects in July/August 2012. The base rates for the latest UCDB are dated 2012/13.

Project Add-ons

227. The add-ons assumed in this study are summarised in table 41 below:

Table 41: Project Add-ons

Item	Reservoir	Borehole Dev	Pipeline	WTW	Service Reservoir	Pumping Station
Unmeasured Items	10%	10%	10%	10%	10%	**10%**
Contractor Overhead	25%	**Included in UCDB rates/cost function**				
Company Overhead	24%	17%	18%	17%	17%	**19%**
Contingency	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**

Fixed Opex

228. The following assumptions were made to establish the fixed opex for each option:

- Routine maintenance: the number of staff and hours required to maintain the proposed scheme was determined based on the cost estimate carried out by Atkins in 2007 as part of PR09 study for Mid-Kent Water;
- Abstraction rate: wherever appropriate allowance was made based on £4667/Ml/d and £5471/Ml/d for options in Western and Eastern Region respectively;
- Allowance of £5,000 (lump sum) was made for SCADA and telecommunication for each option;
- Business rate was calculated for pumping station and WTW as 1.7% of the CAPEX.

Variable Opex

229. Energy costs have been calculated as a function of pump capacity, pumping hours per day and days of operation per year. The unit rate of energy is updated to £0.07/kWh;

230. The cost of chemical consumption for different types of WTW was determined based on rates obtained as part of PR09 study, with an allowance for escalation.

Carbon Footprint

231. The valuation of carbon emissions we have applied is in line with government guidance on the cost of carbon (Carbon Valuation in UK Policy Appraisal: A revised Approach) published by DECC in July 2009. This is also the approach recommended by EA guidance (Water Resources Planning Guideline, EA, June 2012, p. 113). The requirement for an adjustment in the price of carbon is not inherent in either of these methodologies. Appendix 7D contains the summary of the methodology and key assumptions for the carbon costing.

Environmental and Social Costing Environmental and Social (E&S) Cost

232. The methodology for environmental and social costs was based on Environment Agency guidance (Benefits Assessment Guidance (BAG) and associated updates) (EA, 2003; eftec, 2012a and 2012b). General impact categories were examined in line with BAG

recommendations as appropriate, based on input information available at the time of the assessment. General impact categories examined for supply side options include: biodiversity and ecology; landscape amenity; commercial fisheries; angling; informal bank-side recreation; construction impacts (congestion costs) and energy and climate change (carbon footprinting). Appendix 7D contains the summary of the methodology and key assumptions for the E&S costing.

Demand Management Option Costing

233. The demand saving of each household option has been derived using the micro component demand forecast to ensure that estimates are consistent with the baseline forecast so there is no double counting savings that may be assumed within the baseline trends.

234. We have drawn upon our various in-house water efficiency projects as well as data collected nationally under UKWIR and Water Wise programmes to estimate the take up rates and unit savings of the various measures.

235. Unit costs of equipment have been taken from supplier quotations and actual costs of current contracts, where available. Installation costs are based upon PR09 estimates or costs from contractors undertaking similar activities on behalf of the company.

236. The baseline demand forecast includes a significant reduction in Per Capita Consumption (PCC) due to underlying trends of appliance replacement. Therefore the assumption is that items such as cistern displacement devices (CDDs) will be installed as a single campaign during an AMP cycle and will be replaced by new toilets rather than needing to replace the CDDs as part of an on-going water efficiency measure.

Social and Environmental Aspects

237. The dossiers include sections on social and environmental issues covering the following:
    - Baseline conditions
    - Potential impacts for construction and operation
    - Environmental mitigation and enhancement
    - Sustainability
    - Assessment uncertainty
    - HRA constraints

238. The information provided in each section of the dossiers is tailored to the option type. This represents a summary of key information provided in clear and consistent manner to enable comparisons between options to be made. Further information is provided in the accompanying maps.

239. For each option the information summarises baseline relevant to any surface or groundwater abstraction. Designations and sensitive sites are highlighted for potential groundworks including infrastructure and pipelines.

240. Key sources of information for the dossier include:
    - Groundwater - relevant Catchment Abstraction Management Strategies (EA publications)
    - Surface water – Waterbody status information – published EA WFD data
    - Designated statutory sites for landscape, historic and cultural heritage sites, recreation amenity, and ecology- MAGIC website, Natural England
    - Selected locally designated sites (e.g. nature reserves, wildlife sites and Sites of Importance for Nature Conservation) for certain option types
    - Biodiversity Action Plan Priority habitat sites
    - Mapped OS features
    - Local authority landscape, ecology and archaeology information plans (for certain option types).
    - Site visit observations for surface water options

241. The options are further assessed as part of the SEA as set out in the SEA Scoping Report (November 2012) and reported in the SEA Environmental Report (2013) and SEA Post Adoption Statement (2014).

Potential Climate Change Impacts on Feasible Options

242. Appendix 7F comprises the Review of Potential Climate Change Impacts on South East Water's Feasible Options List. This report was prepared by HR Wallingford in September 2012 (Report TN MAR4966-04 R1).

Appendices

Appendix 7A: Water Efficiency and Metering

This appendix describes the baseline (everyday) water efficiency and metering activities that are being implemented and how these are being promoted to other organisations and the process for accounting for the wider benefits of the activities.

We have a statutory duty to promote water efficiency to all their Customers and for the period 2010-2015 also had new Water Efficiency targets set by Ofwat. This was an activity based target for all companies to achieve an assumed saving of 1l/prop/day; for South East Water this equates to 0.84 Ml/d.

We were not given additional funding for water efficiency activities over AMP5 and therefore the baseline water efficiency activities had to be scaled up in order to meet the targets. This involves a mixture of activities, including education, 'hard' measures (such as shower timers, shower regulators etc.) and non-household activity. Since August 2011 we have been implementing our Customer Metering Programme (CMP) which incorporates extensive customer engagement to promote and implement a range of water efficiency activities.

Soft Measures – Education
We provide school talks to all schools across our area, on request, which include a lot of information on water efficiency. The pupils are provided a 'Sally Shower' 4 minute shower timer to take home and beat the challenge. They take the message home and encourage the rest of the family to beat the challenge of showering in under 4 minutes.

Our website provides a number of pages providing information on water efficiency for domestic customers both in the home and the garden. There are also a number of links to other sites where they can purchase discounted water butts, drought tolerant plants, siphons to recycle bath water and a link to a partner site "Save Water Save Money", where a large range of water and energy efficient goods are available.

Also on our website is an online water and energy calculator provided by the Energy Savings Trust. This allows households to calculate their water and energy use around the home and the associated utility costs associated with this. They are then provided with a full report with simple ideas on how to reduce their consumption and therefore their bills.

Customers are given other opportunities to complete simple self-audits to understand their water use and ways to reduce their consumption. They can do this if they apply for a meter under our optant metering programme; at events and talks where they have time to complete the audit form; and as part of the universal metering programme. Members of staff discuss water use with the customer and provide advice on where they can change habits to save water and money.

Where possible we attend local events and county shows with the South East Water trailer which allows customers to find out more about the company and provides them with information on water efficiency and the opportunity to talk to staff members on ways to save water. We also provide goodie bags containing leaflets, hippo bags, shower timers and stickers for children. At some events we also provide water saving crystals for plants and shower and tap inserts for customers to fit in their homes.

We provide community talks across the company area on request to all community groups. These are often tailored on a specific topic related to the local area, but where possible will include water efficiency along with free devices such as hippo bags and shower timers.

Customers are given further information on water efficiency on their bills and the billing magazine, including the top tips to save water in the home, information on water butt offers and where to find further information on our website.

We have supported many large scale national campaigns in the past and we will continue to support them when the opportunity arises. To date we have been involved in the shower power campaign, national smile month, the big tap challenge, drought campaigns; love your river and the Rango movie competition. We see these as good way of spreading the same messages across England, in a consistent approach, on the importance of saving water.

Hard measures

We continue to promote free Cistern Displacement Devices to all our customers via bills, on the website and at events and talks. Also provided are free shower timers at events, school talks and online during times of drought and associated restrictions.

We work with a water butt producer to ensure we can offer the best subsidised rates to our customers and these are available via the website and in the customer billing magazine. We also provide a number of water butts free as online prizes and donations to local groups for allotments, schools and community programmes.

Where possible we work with partners to offer in home assessments and the opportunity to leave or install fee devises such as Hippo bags, shower regulators, tap regulators and shower timers.

Metering

We plan to meter 90% of customers by 2020 as a cost effective way of reducing demand. By switching to consumption based charging, customers have a financial incentive to become more water efficient and therefore, take the opportunity to provide them with information and face to face support to think about their water use and save wherever possible. We provide all newly metered customers (CMP and optants) with a welcome pack including literature on their new meter (leakage, how to read, billing and further water efficiency advice) and a 4 minute shower timer and a hippo bag for their toilets.

We also offer an in home water use assessment with the metered customers where they can discuss their current water use and staff can provide advice on how they can reduce their wastage and help them save money. They also offer them a shower insert where suitable for the property.

Our sites

At a number of staff sites across the company area, such as head office and smaller office sites, we have installed water efficiency equipment to reduce our own water use. This includes low flow taps, dual flush toilets, waterless urinals, hot water heaters, solar heating, low flow showers and push button taps. We will also seek to adopt the latest available water efficient devices when other sites are refurbished.

We encourage staff to take part in small trials and promotions to test products before they offer them to customers. This ensures offering customers the most effective devices while encouraging all of our staff to take the messages home to their families.

Partnership working

We work with many partners and stakeholders to ensure their messages reach the largest audience possible. Water efficiency is integrated with energy savings and other cost savings such as debt advice, explaining the different tariff options available and explaining the different grants and funding available for additional work where possible.

We also work with regulators to ensure water efficiency is included in the standards for new homes and we have current projects monitoring new, water efficient homes. This allows a better understanding of water use in new homes for future planning. Where possible projects have been carried out to retro-fit water efficient appliances in existing properties and we continue to push for further projects with partners; one likely method will be to undertake a large number of retro-fits as part of the Green Deal process.

A South East England partnership has also been set up which will look at providing and delivering water efficiency across the region, including South East Water and a number of other water companies and stakeholders. This will include, communication programmes, working with non-households and partnership working to deliver water efficiency to a larger range of customers.

Non Households

We offer water audits to all our non-household customers and we provided them for free during the drought of 2012. We continue to work closely with all our key accounts to monitor for leakage and provide advice on how they can save water through their processes and operations. Further information is available through a dedicated section on our website and through our commercial customers team. We promote services via billing and through contacting the relevant companies.

For a number of years we have worked with East Malling Research on developing new methods to save water in fruit growing. A number of our high using customers are related to the fruit growing business so we continue to fund trials to develop equipment and methods to reduce water use for irrigation. We then encourage these customers to assist us in spreading this out more widely, as the results are very encouraging. This work was runner up at the 2012 Waterwise and Environment Agency water efficiency awards for farming and horticulture.

We are also working with the Horticultural Trades Association and other organisations on developing an online web based training certificate to ensure their members are using the most water efficient practices and passing knowledge onto their customers.

We have provided funding for a few schools and scout groups to install rain water harvesting on their sites for toilet flushing and to educate children on the importance of water and ways to recycle the resource.

Where possible we will monitor any associated savings from trials and projects to understand the full cost benefit of such water efficiency work. This isn't always feasible due to funding and resourcing, but we hope to see reductions from all the work through the wider customer demand data and on-going monitoring of total water use across the company.

Appendix 7B: Leakage Reduction

This appendix describes how leakage control options are fully considered as part of the options appraisal and the consideration of synergies with other demand management measures.

We continue to maintain leakage at or below the Sustainable Economic Level of Leakage (SELL), through a range of operational, find and fix type activities and capital investments to reduce the break out rate of leaks and their average size. Additionally, the current Customer Metering Programme (CMP) by which we aim to have 90% of domestic households metered by 2020, enables us to more quickly and robustly identify leaks on customers' supply pipes.

We continually seek new ways to work more effectively and efficiently in managing leakage. The water mains are configured in to a network of District Meter Areas (DMAs) which enable us to continually monitor flows. The DMAs meter data is sent automatically back to our technicians, who using our analysis system spot changes in leakage levels so as to prioritise where to deploy resources and respond quickly to bursts.

During AMP5 we have trialled a number of technologies and approaches to enable us to detect and locate leaks more quickly and also control pressures in our network in real time, such that fluctuations and overall pressures are minimized, reducing the break out rate and flow of leaks. For example we have been trialling the i2O Advanced Pressure system for automatically optimising and remotely controlling water pressure in the network as well as GL Water's Burstfinder, an innovative leakage and demand location technique, which identifies likely leakage hotspots in the network, for further investigation. Developments that are found to be cost effective are embedded within our leakage management strategy and the results of our trials have been used to inform the range of options considered within our Water Resources Management Plan (WRMP).

Customers' Preferences Influence on Leakage Proposals
In assessing the leakage options we consider the full range of costs and benefits, including the disturbance to customers in the streets where we may be working as well as other impacts such as traffic disruption.

Leakage Options Considered
The update of our SELL has considered the level of resources that are deployed in Active Leakage Control (ALC) to detect, locate and repair leaks as well as using new technologies and techniques within this process. We have also developed a range of capital investment options to reduce leakage. These cover;

- Reconfiguring our network and installing Pressure Reducing Valves (PRVs);
- Installing real time control equipment on PRVs;
- Replacing mains.

In total six leakage management options (beyond our current activities) have been developed as part of the options appraisal.

Leakage options have been selected in comparison with other options and in consideration of the specific deficits of each zone as part of a least cost solution to maintain the supply demand balance over the 25 year planning horizon.

All six of the identified leakage management options have been developed for each of our eight water resource zones, giving 48 options in total which have been included in our least cost modelling.

Appendix 7C: Details of Fine Screening Using Multi-criteria Analysis

C.1: GROUNDWATER OPTIONS

In order to reduce the groundwater options to a manageable number the fine screening process used MCA against a set of environmental and technical criteria. The following section describes the fine screening approach adopted in scoring and selecting the 'feasible' groundwater options.

MCA Methodology for Groundwater
The performance of the groundwater constrained options was scored against the eight criteria described below.

The proposed pipelines which would take the water to the treatments works and service reservoirs were included in the assessment. However it was recognised that only a preliminary routing had been undertaken and in some cases routes were direct A to B lines. Given the uncertainty over the pipe routes with the potential for routing to avoid environmental constraints combined with, in some cases, uncertainty over borehole location, the sensitivity testing of the MCA included looking at the scoring with, and without, the pipelines.

The workshops held to examine the selection of the feasible groundwater options focused on the MCA results for water availability (CAMS status), quality, aquatic ecology, and yield uncertainty. In addition, a minimum yield threshold was applied. The results were considered using individual criteria in addition to the option ranking. Through the workshops the potential for further information such as option potential and environmental constraints were considered. In some cases it was determined that issues could be mitigated or avoided or the uncertainty over the impact was such that the option would be worth studying further. The comments on these issues and the basis for keeping options in, putting them in a reserve list or removing them altogether were then recorded.

Biodiversity (Terrestrial)
The impact of a groundwater option on terrestrial ecology was assessed based on the length of pipeline intersecting environmental designated sites such as Ramsar sites, Special Areas of Conservation (SAC), Species Action Plan (SAP), Sites of Special Scientific Interest (SSSI), Biodiversity Action Plan (BAP) areas, areas of Ancient Woodland (AW) and National Parks (NP).

Table C1-1: Fine screening scoring for potential impact of groundwater options on terrestrial biodiversity

Length (m) of pipeline within environmental designation (Ramsar, SAC, SPA, SSSI, AW, NP)	Score
0 – 100m	Low
100m – 500m	Low/Medium
500m – 1000m	Medium
1000m – 2000m	Medium/High
>2000m	High

The pipeline route for each option was designed and mapped within the GIS database. Every effort was made to avoid any environmentally designated sites while delineating the pipeline route for each option. However, since a large proportion of our region is constrained by environmental designations, both statutory and non-statutory, it was not possible to avoid intersecting some environmentally designated sites.

The length of pipeline intersecting an environmental designation was generated using the GIS database. This was used to score the level of impact using the matrix shown in the table above.

Biodiversity (Aquatic Ecology)
Under this criteria the potential impact of groundwater options on biodiversity were assessed from the option's proximity to environmentally designated site and its hydraulic connectivity.

The radius of influence of a borehole is unlikely to exceed more than 3km. Therefore the impact of a borehole on aquatic biodiversity which is 3km away is envisaged to be negligible. However, to make a conservative assessment a score of 'low' was used for groundwater sources in unconfined aquifers and within 3km to 10km from a water body, as shown in the scoring matrix below. If the distance between the proposed sources and a water body exceeded 10km the impact was considered to be neutral.

However, confined aquifers are not in hydraulic connection with any surrounding water bodies. Thus the impact of an option targeting a confined aquifer on aquatic biodiversity was considered to be neutral.

Table C1-2: Fine screening scoring for potential impact of groundwater options on aquatic biodiversity

Aquifer type	Distance of an environ-- mental designation from an option (km)	Score - 'Closing the gap'	Score - New licence
Confined	N/A	Neutral	Neutral
Unconfined	10	Neutral	Neutral
	3 to 10	Low	Low
	1.5 to 3.0	Low	Low/medium
	1.0 to 1.5	Low/Medium	Medium
	0.5 to 1.0	Low/Medium	Medium/High
	<0.5	Medium	High

Water Resources
The assessment of the potential impact of an option on water resources was carried out based on the water availability status of the relevant groundwater management unit (GWMU) as detailed in the Catchment Abstraction Management Strategy (CAMS) reports. This was based on whether there was 'Water available' or 'No water available' in the GWMUs or Water Resource Management Units (WRMU) as defined in the relevant CAMS report. This criterion was scored for each option based on the matrix shown in the table below.

Table C1-3: Fine screening scoring for potential impact of groundwater options on water resources

CAMS - Water availability	Option Subcategory			
	Aquifer Storage Recovery (ASR)	'Closing the gap' – Optimisation / within site borehole	'Closing the gap' - satellite boreholes	New/ Beyond the licence
Water Available	Neutral	Neutral	Neutral	Low/Medium
No Water Available	Neutral	Low	Low	Medium/High
Over Licensed	Low	Low	Low/Medium	High
Over Abstracted	Low	Low	Medium	High

Water Quality

The impact of a groundwater sources on the catchment water resources and the water quality are interdependent. If a groundwater source impacts the water resources that is the 'low flows' of a watercourse, the water quality of the watercourse is also expected to deteriorate as its dilution ability decreases. This impact is most likely to be severe if the watercourse is receiving effluent. Therefore, the following considerations were used in scoring this criterion:

- Hydraulic connectivity of the proposed sources with the nearest watercourse;
- Proximity of the proposed sources to a watercourse;
- Number and proximity of discharge points around the proposed source;
- The water availability status of the catchment;
- Whether the option is closing the gap or beyond the licence; and
- Considering the uncertainty on the impact of injected water on the geochemistry of the aquifer and the native water a score of 'medium' was given to Aquifer Storage Recovery (ASR) schemes.

Landscape/Townscape

Under this criterion the visual impact of an option on a landscape/ townscape area was assessed. In most cases boreholes are not considered to have a major visual impact on the appearance of a particular landscape. However, some of the proposed schemes would require more intrusive infrastructure to be built, such as water treatment works. The following considerations were made in assessing the impact of the proposed options on the landscape/ townscape criteria:

- Location of any additional infrastructure required (its proximity to environmentally designated sites); and
- Whether this was a previously developed site or an undeveloped site.

Sustainability and Carbon Footprint

The sustainability and carbon footprint of an option was assessed based on the carbon that would be emitted during its operation. A hydraulic analysis was carried out to determine the annual energy consumption for each option. The annual operational carbon emission was then calculated as

a function of the annual energy consumption. Each option was scored based on the matrix shown in the table below.

Table C1-4: Fine screening scoring for sustainability and carbon footprint

Carbon emissions (Tonnes CO2 e/Ml/d) based on energy consumption	Score
	Neutral
<20	Low-
20-60	Low/Medium-
61-100	Medium-
101-140	Medium/High-
>141	High-

Technical feasibility and cost effectiveness

A preliminary cost estimate was carried out and the capital cost per Ml/d (£CAPEX/Ml/d) was calculated. This was used to score the technical feasibility and cost effectiveness as shown in the matrix below.

Table C1-5: Fine screening scoring for technical feasibility and cost effectiveness

CAPEX Per unit average yield (£k/Ml/d)	Score
0	Neutral
1,000	Low-
1,000-2,000	Low/Medium-
2,000-3,000	Medium-
3,000-5,000	Medium/High-
>5000	High-

Maintain sustainable yield

The yield of a groundwater source depends on a number of factors such as the outcrop area and factors such as aquifer geology and depth which determine the transmissivity and storativity of an aquifer. For simplicity, however, the following scoring matrix was used in the MCA:

Table C1-6: Fine screening scoring for yield uncertainty

Aquifer Geology		Depth		
		<50 m	50 – 100 m	>100 m
Gravels		Low	n/a	n/a
Unconfined Chalk		Low/Medium	Low/Medium	Medium
Confined Chalk		n/a	Medium	Medium/High
Upper Greensand		Low	Low/Medium	Medium
Lower Greensand	Folkestone Beds	Low	Low	Low
	Hythe Formation	Low/Medium	Low/Medium	Low/Medium
Ashdown Beds Hastings Beds		Low/Medium	Low/Medium	Low/Medium

C2: SURFACE WATER OPTIONS

C2.1 SCREENING OF STORAGE RESERVOIR OPTIONS

The storage reservoir options consist of the following sub-options:

- Bunded Reservoirs;
- Impounding and Bankside Reservoirs; and
- Raising Existing Reservoirs.

The storage reservoir options that passed the coarse screening were subject to a further stage of screening prior to fine-screening using Multi-Criteria Analysis (MCA).

The following storage reservoir options were removed from the constrained list prior to MCA analysis:

Table C2-1: Summary of reasons for excluding options

GIS ID	Option Name	Reasons for exclusion
SW-38	Blackmoor (Rother)	**Located within National Park (Same site as SW-37).**
SW-102	Sandhurst raw water reservoir - Moore Green	**Considered with other gravel pit options (see Section C2.2) but subsequently excluded on technical and cost grounds.**
SW-103	Frimley raw water reservoir	
SW-172	Medway_Bund1	**'Conceptual' bunded reservoir options on the Medway for evaluation by the WRSE group to be assessed as regional option to offset sustainability reductions.**
SW-173	Medway_Bund2	
SW-174	Medway_Bund3	
SW-175	Medway_Bund4	
SW-176	Medway_Bund5	
SW-177	Medway_Bund6	
SW-178	Medway Barrage	**As Medway bunded options. Also rejected due to unsuitable geology**
SW-227	Rother_Bund1	**Conceptual bunded reservoir options on the Rother for evaluation by the WRSE group to be assessed as regional option to offset sustainability reductions**
SW-228	Rother_Bund2	
SW-229	Rother_Bund3	
SW-230	Rother_Bund4	
SW-231	Rother_Bund5	
SW-232	**Rother_Bund6**	

Surface Water Fine Screening Objectives
The methodology and approach adopted for carrying out the MCA fine screening for the storage reservoir options involved defining a common set of objectives and criteria which were applied across the sub-option types and were scored against each criterion. The relative scoring allowed the storage reservoir options to be ranked in order of their overall performance relating to environmental and social acceptability, promotability, technical feasibility and cost effectiveness.

MCA Screening of Storage Reservoir Options
The basis of the MCA process was a matrix divided into the main criteria and objectives which were established as relevant to assessing the storage reservoir options.

These criteria used were:

- Biodiversity (Terrestrial);
- Biodiversity (Aquatic Ecology and Fisheries);
- Landscape/Townscape;
- Sustainability and Carbon Footprint;
- Flood Risk;
- Cultural Heritage;
- Public Health and Wellbeing;
- Local Economy and Strategic Infrastructure;
- Land Quality and Geological Diversity; and
- Technical feasibility and Cost Effectiveness.

The following criteria were not assessed against the storage reservoir options as they were not considered relevant at this stage:

- Climate Change Resilience and Adaptability;
- Water Resources; and
- Community and Public Acceptability and Equality, Access.

Although water resources, as a criterion, was not scored separately, the yield analysis carried out for all the sources took into account all the existing abstractions and all the required releases. Therefore this ensured that the existing water resources would not be adversely affected.

Screening Using GIS Datasets
All the environmental and technical constraints used in the MCA process, with the exception of the Water Framework Directive information, were available as Geographic Information System (GIS) datasets. The fine screening was undertaken by mapping the over-lapping areas of the reservoir options with the environmental datasets to identify the potential direct environmental impacts for each reservoir option.

The pipeline routes from the intake to the storage reservoir option had not been designed in any detail and were largely ‘straight line’ routes. Since the pipelines can be re-routed to avoid any environmental constraints by increasing the length of the pipeline, this impact was measured as a penalty cost to the option, affecting the option’s cost-effectiveness.

Surface Water Scoring
The intersections of the various surface water options with the constraints were recorded in a performance matrix format using a visual ‘traffic light’ score. The ‘traffic light’ score was then refined into a numeric score based on the score range set out in Table. For criteria that were not considered relevant to the option the score was recorded as neutral/ zero.

MCA Criteria Applied to Surface Water Options

The following criteria were used to complete the MCA ranking of the storage reservoir options. The details of the scoring applied for each criterion are included below in Tables C2-2 to C2-12.

Biodiversity (Terrestrial)

The following environmental designations were used to assess this criterion:

- Ramsar sites;
- Special Protection Areas (SPA);
- Special Ares of Conservation (SAC);
- Sites of Special Scientific Interest (SSSI);
- National Natural Reserves (NNR);
- Local Nature Reserves (LNR);
- Biodiversity Action Plan (BAP) habitats; and
- Ancient Woodland (AW)

The impact of an option on terrestrial ecology was measured from the direct loss of any part of any of one of the above environmental designations from a reservoir. The impacts were scored using the traffic light and numeric scoring range shown in the table below.

Table C2-2: Fine screening scoring for biodiversity (terrestrial ecology)

Traffic light score		Designations Category (RAMSAR,SPA,SAC,SSSI or NNR) (area m^2)	Ancient Woodland or BAP Habitat (area Hectares)	Numeric Range of Scores
N	Neutral/not relevant	0	0	0
L	Low	n/a	0-0.2	5-20
LM	Low /medium	n/a	0.2-0.5	25-40
M	Medium	n/a	0.5-0.75	45-60
MH	Medium/high	n/a	0.75-1	65-80
H	High	>1	>1	85-100

Biodiversity (Aquatic Ecology)

The length of river impacted by a surface water option was the main assessment criteria for aquatic biodiversity. The impact of an option on a stretch of river was measured either directly, for impounding reservoirs, or, for bunded reservoirs, from the potential reduced flows from the intake due to the water which would be removed from the river to fill the (bunded) reservoir. The length of river downstream of the intake down to the next major confluence or to the tidal limit was taken as the affected river stretch. The status of river as described in the Water Framework Directive (WFD, 2009) and information on fisheries (Cyprinid or Salmonid) and overall biological status, was taken into account in the assessment as well as whether the river included any statutory designations, such as Ramsar, SPA, SAC or SSSI sites.

The following environmental designations were used to assess this criterion:

- Natura 2000 sites (Ramsar, SPA or SAC);
- SSSI;
- Length of the river habitat affected measured in metres (the length of rivers affected varied from over 7,700m down to 29m);
- Sensitivity of the river habitat affected from WFD;
- Fisheries (Cyprinid or Salmonid);
- River lost (impoundment only); and
- River downstream intake (impoundment and bunded).

Table C2-3: Fine screening scoring for biodiversity (aquatic)

Aquatic Biodiversity Criteria	Traffic light score	Numeric Range of Scores
Neutral/not relevant	N	0
Short length of river affected	L	5-20
Fishery potential but poor status	LM	25-40
Long length of river affected	M	45-60
Important fishery and length of river affected	MH	65-80
High protection/sensitive river lost	H	85-100

Landscape

The main landscape assessment criterion was the size of the area of the reservoir within an Area of Outstanding Natural Beauty (AONB). This only applied to a small number of impounding reservoirs as no bunded reservoirs were located within an AONB. An assessment was also made of the visual impact of the reservoir on the landscape based on whether the site was considered to affect either a rural or more developed location.

The footprint and visual impact of the reservoir was the used to rank the options as shown in Table C2-4.

Table C2-4: Fine screening scoring for landscape

Traffic light score		Reservoir Footprint in AONB (Hectares)	Numeric Range of Scores
N	Neutral/not relevant	0	0
L	Low	<1	5-20
LM	Low/ medium	1-3	25-40
M	Medium	3-5	45-60
MH	Medium/high	5-10	65-80
	High	>10	85-100

Sustainability and Carbon Footprint

The main measure of the sustainability and carbon footprint of each option was the calculation of the potential CO_2 emissions which would be made during the operational stage. Operational CO_2 emissions are primarily due to pumping of water from the river to the reservoir, from the reservoir to the WTW and due to treatment of water.

Table C2-5: Fine screening scoring for sustainability and carbon footprint

Traffic light score		Operational CO_2 emissions (tonnes CO_2/yr per Ml/d)	Numeric Range of Scores
N	Neutral/not relevant	0	0
L	Low	<60	5-20
LM	Low /medium	60-90	25-40
M	Medium	90-120	45-60
MH	Medium/high	120-150	65-80
H	High	>150	85-100

Water Quality

The water quality was measured against the aim of promoting the Water Framework Directive objectives. The basis for scoring this criteria was the current WFD status of the river on which the reservoir (impounding) is built or where the water was abstracted from (impounding and bunded); and the impact the reservoir will have on the WFD objectives for the watercourse.

Table C2-6: Fine screening scoring for water quality

Traffic light score		Criteria	Numeric Range of Scores
N	Neutral/not relevant	0	0
L	Low	HMWB and Poor potential	5-20
LM	Low/ medium	HMWB and moderate potential	25-40
M	Medium	Not HMWB and poor potential	45-60
MH	Medium/high	Not HMWB and Moderate potential	65-80
H	High	Not HMWB and good potential	85-100

Note: HMWB = Heavily Modified Water Body

Flood Risk

The assessment of the potential increase in flood risk due to each reservoir option was based on the footprint of the bunded reservoir situated within a national flood zone; in the case of impounded reservoirs this criteria was considered to be neutral.

Existing flood risk was mapped on the basis of a 1-in-100-year return period flood level in the case of rivers (fluvial flooding) and a 1-in-200-year return period flood level on the coast, including the tidal length of rivers (tidal flooding). This is known as Flood Zone 3. The extent of an extreme flood event (up to 1-in-1000-year return period) is known as Flood Zone 2.

Table C2-7: Fine screening scoring for flood-risk

Traffic light score		Percentage (%) of reservoir footprint within a National Flood Zone	Numeric Range of Scores
N	Neutral/ not relevant	0	0
L	Low	<5%	5-20
LM	Low /medium	5-10%	25-40
M	Medium	10-15%	45-60
MH	Medium/high	15-20%	65-80
H	High	>20%	85-100

Cultural Heritage

The following environmental designations were used to assess the impact of the option on cultural heritage assets:

- World Heritage Sites;
- Scheduled Monuments;
- Listed Buildings (Grades I, II* and II);
- Registered Historic Parks and Gardens (Grades I, II* and II); and
- Registered Historic Battlefields

Table C2-8: Fine screening scoring for culture heritage

Traffic light score		Registered Historic Parks and Gardens, Registered Historic Battlefields (m^2)	Scheduled Monuments (m^2) or Listed Buildings (No.)	Numeric Range of Scores
N	Neutral/ not relevant	0	0	0
L	Low	Reservoir affects any Registered Park & Garden/Registered Historic Battlefield less than $50m^2$	N/A	5-20
LM	Low /medium	Reservoir affects $50m^{2any}$ to $100m^2$ of Registered Park & Garden/Registered Historic Battlefield	N/A	25-40
M	Medium	Reservoir affects a $100m^2$-$300m^2$ of Registered Park & Garden/Registered Historic Battlefield	N/A	45-60
MH	Medium/high	Reservoir affects $300m^2$-$500m^2$ of Registered Park & Garden/Registered Historic Battlefield	Reservoir affects up to 10 m^2 of Scheduled Monument OR More than 1 Listed Building	65-80
H	High	Reservoir affects more than $500m^2$ of Registered Park & Garden/ Registered Historic Battlefield	Reservoir affects more than $10m^2$ of Scheduled Monument or more than 2 Listed Buildings	85-100

Public Health and Recreation

Impact of the reservoir on the following environmental designation is used as a measure of the impact of the reservoir on public health and recreation:

- Length of rivers affected;
- National Parks (NP);
- National Trails (NT);
- Country Parks (CP);
- Public Footpaths;
- Countryside Rights of Way Act 2000 Land with Public Access;
- Corine Data Green Urban Areas;
- Corine Data Sport and Leisure Activity sites;
- Woodland Trust sites;
- Forestry Commission sites; and
- Millennium Greens.

Table C2-9: Fine screening scoring for public health and recreation

Traffic light score		Rivers (Length m) (Impounding reservoirs only)	Designations (National Parks, National Trails, Country Parks) (m/m^2)	Corine Data (141 - Green Urban Area, or 142 - Sport and Leisure Activities), CRoW Access, Woodland Trust, Forestry Commission Land (m^2)	CRoW - S15 Land, S16 Dedicated Land, S4 Open Country, S4 Registered Common Land & Millennium Greens (m^2)	Numeric Range of Scores
N	Neutral/ not relevant	0	0	0	0	0
L	Low	<500	National Trails/ Country Parks >0m/m^2	Woodland Trust/ Forestry Commission impact >0m^2	>0m^2	5-20
LM	Low /medium	500-1000	National Trails/ Country Parks >100m/m^2	Woodland Trust/ Forestry Commission impact >10,000m^2	>10m^2	25-40
M	Medium	1000-2000	National Trails/ Country Parks >200m/m^2	Any CRoW Access impact OR Woodland Trust/ Forestry Commission impact >50,000m^2	>100m^2	45-60
MH	Medium/high	2000-3000	National Trails/ Country Parks >500m/m^2	Any Corine 141 - Green Urban Area/Corine 142 - Sport and Leisure Activities impact OR Woodland Trust/ Forestry Commission impact >100,000m^2	>5000m^2	65-80
H	High	>3000	Any National Park impact OR National Trails/ Country Parks >1000m/m^2	Corine 141 - Green Urban Area/Corine 142 - Sport and Leisure Activities >200,000m^2	>10000m^2	85-100

Local Economy and Strategic Infrastructure

Impact of the option on local economy and strategic infrastructure is measured in terms of impacts on:

- Buildings;
- Roads (Motorways, A/B roads, Minor roads, Local Streets Private Roads);
- Railway lines (various); and
- Electrical transmission lines.

Table C2-10: Fine screening scoring for local economy and strategic infrastructure

Traffic light score		Buildings (No.)	Roads (m)	Railway lines and Electrical Transmission Lines (m)	Numeric Range of Scores
N	Neutral/not relevant	0	0	0	0
L	Low	N/A	Locals Streets/Private Roads/Unknown Roads >0m	Railway lines/ Transmission lines >0m	5-20
LM	Low /medium	0-1 buildings	B Roads/Minor Roads > 0m OR Locals Streets/Private Roads/Unknown Roads >1000m	Railway lines > 30m OR Transmission lines >200m	25-40
M	Medium	2-4 buildings	B Roads/Minor Roads > 1000m	Railway lines > 100m OR Transmission lines >5000m	45-60
MH	Medium/high	5-9 buildings	B Roads/Minor Roads > 2000m	Railway lines > 500m OR Transmission lines >1000m	65-80
H	High	>10 buildings	Any Motorways Crossings/A Roads/Primary Roads Crossings OR B Roads/Minor Roads > 4000m	Railway lines > 1000m	85-100

Land Quality

Impact of the reservoir footprint on the following land classifications were taken as a measure of impact on land quality:

- Agricultural Land Classification (ALC) Grade 1;
- ALC Grade 2;
- ALC Grade 3;
- Historic Landfills; and
- Geological SSSI

The assessment was based primarily on Agricultural Land Classification. Agricultural land is classified into five grades with Grade one being the most expensive, best quality and most flexible.

Table C2-11: Fine screening scoring for land quality

Traffic light score		ALC Grade 1 (Hectares)	ALC Grade 2 (Hectares)	ALC Grade 3 (Hectares)	Historic Landfills (m^2)	Geological SSSI	Numeric Range of Scores
N	Neutral/not relevant	n/a	n/a	0	0	0	0
L	Low	n/a	n/a	0-40	>50	n/a	5-20
LM	Low /medium	>0	>0	40-70	50-100	n/a	25-40
M	Medium	5-10	10-20	>70	100-500	n/a	45-60
MH	Medium/high	10-20	20-30	n/a	500-1000	n/a	65-80
H	High	>20	>30	n/a	>1000	>0	85-100

Cost Effectiveness

Cost effectiveness of each option was measured on the basis of the calculation of the cost per unit yield of water produced with different ranges used for bunded and impounded reservoirs. The unit adopted here (£k per Ml/d) is essentially proportional to, but not the same as, the Average Incremental Cost (AIC) which was determined subsequently, as described later in this section.

Table C2-12: Fine screening scoring for cost effectiveness

Traffic light score	Impounding Reservoirs CAPEX Per unit average yield (£k/Ml/d)	Bunded Reservoirs CAPEX Per unit average yield (£k/Ml/d)	Numeric Range of Scores
Neutral/not relevant	0	0	0
Low	<5,000	<10,000	5-20
Low/medium	5,000-7,500	10,000-18,000	25-40
Medium	7,500-10,000	18,000-26,000	45-60
Medium/high	10,000-12,500	26,000-35,000	65-80
High	>12,500	>35,000	85-100

Option Development and Costs

The development and costs for each option were based on:

- the reservoir;
- the raw water abstraction point and pipeline to deliver water to the reservoir;
- pipeline to transfer water from the reservoir to an associated water treatment works; and
- the associated water treatment works, which was assumed to be an expansion of the nearest existing facility.

Raw Water Abstraction Pipelines Costs

The length of raw water pipeline from the river intake to the reservoir represents a major cost of a reservoir option. The length of pipeline from the intake to the reservoir site was calculated using an automated process in GIS. The process also provided data on any environmental designations intersected by pipeline from the river intake to the impounded/bunded reservoir.

For the MCA analysis, due to the large number of options, straight pipelines were assessed between the river intake and reservoir and no routing to avoid important environmental designations or

infrastructure was carried out. To compensate for the absence of a designed pipeline route, where there was a potential impact with an important environmental constraint, a cost adjustment was made to the overall cost of the pipeline to allow for an increased pipeline length to avoid the impact. A cost adjustment was made to each pipeline where there was a potential impact with the following environmental designations:

- Ancient Woodland;
- Ramsar Sites (Convention on Wetlands of International Importance);
- Special Areas of Conservation (SAC);
- Special Protection Areas (SPA);
- Sites of Special Scientific Interest (SSSI);
- World Heritage Sites;
- Registered Historic Battlefields;
- Scheduled Monuments;
- Registered Historic Parks and Gardens;
- National Parks;
- Country Parks;
- Local Nature Reserves;
- National Nature Reserves; and
- Woodland Trust sites.

Delivery Pipeline and Water Treatment Works

All the surface water reservoir options included a water treatment works (WTW) which would be located within the boundary of the nearest existing WTW. The pipeline from the reservoir to WTW was routed to avoid impacting any major environmental designations.

Cost per Unit Output

A model was set up which systematically produced the sizes of the necessary pipelines, pump stations and water treatment works for each option to provide an overall capital cost and operating costs. The reservoir was costed by applying unit rates to global major quantities with percentage additions for ancillary components. The cost per unit output (Ml/day) of options was calculated to help compare and rank all the options.

Selection of Feasible Options within River Basin Catchment Areas

As the final part of the fine screening process the surface water options were grouped into their respective river basin catchment areas based on the intake location as indicated in Table C2-13 and illustrated in the Storage Reservoir Option Layouts which were included in the feasible options layouts, but which are not reproduced in this Report. All the options within each catchment were assessed together so as to select the best option from within that group including those which would be considered most acceptable to the public in terms of being an existing development area or urban fringe.

Table C2-13: Intake Locations Used to Group Surface Water Options

Intake Number	Intake Name
1	Loddon at Amerden
2	Wey at Tilford
3	Adur at Shermanbury
4	Medway (Penshurst)
5	Ouse at Barcombe
6	Cuckmere
7	Medway at Kettle Corner
8	Rother at Crowhurst Bridge
9	Rother at Thornsdale
10	Waller's Haven at Hazard's Green
11	Stour at Plucks Gutter

The scores from each criterion were collated together into a single performance matrix and used to select the most feasible option within each group. Along with the performance matrix the following considerations were made to reduce environmental impact of the reservoir and make a reservoir more selectable:

- Reduce size of the reservoir;
- Relocate reservoir to reduce impacts;
- Change the layout (shape) of bunded reservoir to avoid environmental designation; and
- Undertake engineering interventions like providing protective bunds around environmental designations to avoid impacts.

In certain cases it was clear that an environmental constraint could be avoided thus producing an amended option which would be suitable in terms of the MCA analysis and still produce a viable amount of water. In these cases the option was added to the 'take forward' list and then re-scored on the basis of the amended reservoir footprint. This was achieved by slightly re-locating a reservoir option, re-defining the shape of the reservoir bund or by reducing the size of the reservoir to avoid direct impacts. The other most promising options were retained on a 'reserve list' of options whilst the remaining options were rejected outright. At this stage the reserve list comprised a total of 8 options (2 impounding and 6 bunded) which would pass the subsequent test of average incremental unit cost (AIC) of water produced being less than £5 per cubic metre.

The 'take forward' surface water options were then subject to internal and external review with the responses incorporated into the assessment.

Selecting the Short-list of Feasible Options

Finally the 'take forward' lists from storage reservoir options were amalgamated with the other option types and ranked by Deployable Output. The additional criterion used to produce the final feasible options list involved the application of an average incremental unit cost (AIC) of water produced. Using this criterion those storage reservoir options with a unit cost greater than £5 per cubic metre (£5000 per Ml) were screened out leaving only the more cost-effective options regardless of the option type. Figure C2-1 illustrates this process. One exception, at just over £6/m^3 was Option SW-245, a relatively large bunded reservoir site utilising the considerable potential for winter storage from the Medway which was retained as a possible regional resource.

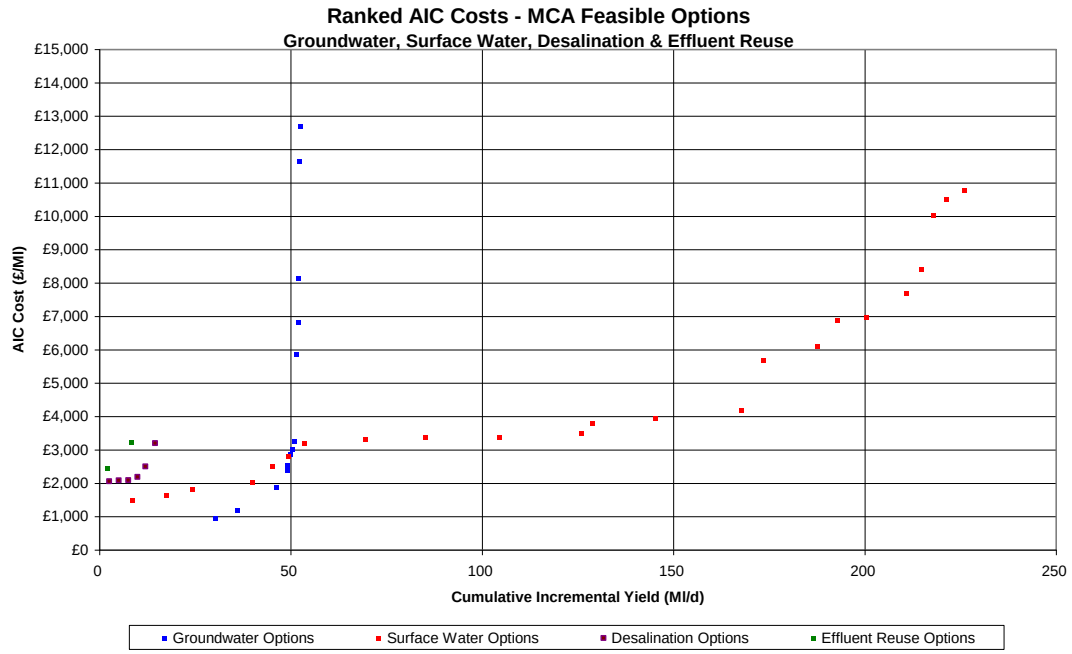


Figure C2-1: Ranked AIC Costs for MCA Feasible Options

Outcome of Site Visits

Site visits were undertaken on 4th and 5th July 2012 when a total of 13 potentially feasible storage reservoir sites were visited, with 5 further sites being considered as well. As a consequence of discussions during these site visits it was concluded that 7 of these options should be relegated to the "reserve list" for the following reasons:

- Impounding reservoirs impact directly on the riverine environment and are generally considered to be less "deliverable" than bunded reservoirs where such alternatives exist. 4 impounding reservoir options were relegated for this reason: SW-42 (Withyham) in the Medway catchment, SW-60 (Hugletts Stream) in the Wallers Haven catchment, SW-218 in the Rother catchment and SW-244 on a tributary of the Stour.
- The reservoir site visits that followed the MCA supported that Clay Hill reservoir (SW-48) be removed from the feasible list. Given the history of the Clay Hill reservoir option, the option was included in the initial feasible options list so that the EFG was given full opportunity to provide comment on its inclusion/exclusion in July 2012.
- Two other impounding reservoir options were taken forward to the feasible options list: SW-33 (Beech Hill) as otherwise there would be no surface water options in our western area (RZ4 and RZ5); and SW-14 (Broad Oak) where we already own the land.
- SW-80 on the Adur was relegated because of the proximity of a monastery. SW-77 is available as an alternative and is more likely to be deliverable.
- SW-191 was relegated as it is closer to the South Downs National Park compared with 3 other alternatives (SW-40, 51 & 89) available from the Ouse.
- SW-99 would not fit well into a relatively unspoiled and remote rural landscape.
- SW-245 had been considered primarily as a potential regional resource. The unit cost of water would be relatively high and, as the site is located outside our supply area, it has not been taken forward to the feasible options list.

Bewl Reservoir Raising
Option SW-4 (Raising of Bewl Reservoir) was not included in the constrained options list (along with other similar options and variants involving the possible raising of Southern Water reservoirs). This option has now been carried forward to the feasible options list to reflect our interest in this option.

C2.2 SCREENING OF GRAVEL PIT OPTIONS

These options involve the direct abstraction of water from flooded gravel pits. Usually the pits store water through a combination of groundwater and more predominantly surface water inflows and these options seek to abstract this water for portable supply relying on the natural storage that these gravel pits provide.

The fine screening of abstraction from gravel pit options consist of those adjacent to a river and those not adjacent to a river.

Abstraction from Gravel Pits Adjacent to a River
Sites were screened out if the Environment Agency's Catchment Abstraction Management Strategy (CAMS) document showed that the river is over-abstracted, over licensed or no water is available. This is because gravel pits would not provide reliable DYAA yield during summer and abstraction would cause unacceptable environmental impact at low flow periods.

Sites were screened out if the site is a conflict with a statutory environmental designation (e.g. SPA, SAC, RAMSAR or SSSI) as such sites may provide valuable ecological and fisheries habitat and reducing water level may adversely affect them.

Sites which do not conflict with environmental designations but are adjacent to over-abstracted rivers would need to be water-proofed and converted into bankside reservoirs so that they are no longer surface water abstraction sites but storage reservoirs. However, gravel pits converted into storage reservoirs need to provide sufficient storage capacity (>1.5MCM) to be viable. Since gravel pits are usually connected with an underlying aquifer, it may be cheaper to abstract and treat water from a nearby borehole. An assessment would be required to establish whether it is cost effective to abstract and treat water from a borehole or as a surface abstraction from the gravel pit/bankside storage. However, some gravel abstraction works may be located too near to watercourses for waterproofing measures to be installed economically after their completion.

Abstraction from Gravel Pits Not Adjacent to a River
Sites were screened out if the Environment Agency's Catchment Abstraction Management Strategy (CAMS) document showed that the underlying aquifer is over-abstracted. This is because such gravel pits would not provide reliable DYAA yield during summer.

Other screening criteria were similar to those for gravel pits adjacent to a river.

Gravel Pits used as Bankside or Bunded Reservoirs
As noted above gravel pits are usually connected with an underlying aquifer and would need to be waterproofed to prevent loss of stored water to the aquifer., With pumping generally of surplus winter inflows only for storage it is necessary to provide sufficient storage capacity (>1.5MCM) to be viable. The four bankside reservoirs included in the constrained options list are all adjacent to the River Blackwater (a tributary of the Loddon) and it is considered unlikely that adequate waterproofing measures can be installed economically.

C2.3 SCREENING OF RIVER ABSTRACTIONS

The constrained options list included 16 River Abstraction Options. One of these Options (SW-2: Forstal Link) was re-classified as a Water Transfer Option with two variants (now numbered TR-56 and TR-56a). Similarly, a previous Water Transfer Option (TR-56: Adur to Ardingly Reservoir) was reclassified as a Surface Water Option (SW-278) and taken forward to the Feasible Option List.

On further investigation the other 15 River Abstraction Options on the constrained options list were not taken forward for the following reasons:

- Winter-only abstraction schemes do not provide reliable DYAA yield during summer (unless part of a reservoir storage or conjunctive use scheme)
- The potential resource from Internal Drainage Board areas which discharge upstream of proposed river intake locations for reservoir storage options is already taken into account in such options. In many cases the proposed abstraction location is at or near to the tidal limit.
- The potential resource from the remainder of the Internal Drainage Board areas is relatively small compared with the upstream catchments. It is unlikely that reliable yield can be obtained without the provision of storage.
- Other new river abstraction schemes cannot provide reliable DYAA yield during summer without the provision of storage.

C2.4 RESULTS

There were a total of 131 surface water options in the constrained options list of which 78 were taken forward for MCA screening. A total of 13 surface water options were carried forward to the feasible options list, with a further 16 options relegated to the reserve list, as summarised in Table C2-14.

Table C2-14: Summary of Surface Water Options

Option Type	Option Sub Type	Constrained Options (March 2012)	Further Exclusions and Additions:		Subject to MCA Screening	Options excluded due to:		Relegated to reserve list	Feasible Options
			Addendum (May 2012)	Task 3 and 4		Poor fine screening result	Excessive unit cost		
ESW	Licence Alteration	1	0	0	n/a	0	0	0	1
NSW	River Abstraction	16	1	1 added but 15 excluded	n/a	0	0	0	1
	Gravel Pit Abstraction	17	4	21 added but all excluded	n/a	0	0	0	0
RES	Bunded Reservoir	74	0	12	62	38	9	10	5
	Bankside Reservoir	4	2	2	0	0	0	0	0
	Impounding Reservoir	17	2	1	14	5	0	6	3
	Licence Alteration	0	0	0	n/a	0	0	0	0
	Reservoir Raising	2	0	1 added *see note	2	0	0	0	3
Total Surface Water		**131**	**9**		**78**	**53**	**9**	**16**	**13**

* Option SW-4 (Raising of Bewl Reservoir) was not included in the constrained options list (along with other similar options involving the possible raising of Southern Water reservoirs). This option has now been carried forward to the feasible options list to reflect our interest in this option.

C3: WATER REUSE OPTIONS

Each option was assessed in relation to the following:

- Potential adverse and beneficial impacts on the environment
    - constraints at WwTW sites;
    - environmental sensitivity along transfer pipeline routes;
    - sensitivity of receiving waters (rivers and/or reservoirs);
    - sensitivity of inland waters where it is proposed to divert effluent away to another water (although most options comprise utilisation of effluent currently discharge to sea);
    - constraints at WTW sites
- Public acceptability;
- Potential water resource yield and level of uncertainty; and
- Cost and technical challenge.

Sources of Data

High level information was collected from readily available sources to inform the MCA. The table below lists the criteria used and associated factors which were taken into consideration in determining the scores for each of the options. Separate scores were assigned for both adverse and beneficial impacts.

Table C3-1: Factors considered in fine screening for scoring water reuse options

Criteria	Factors Considered
Terrestrial Ecology	International (SPA, SAC, Ramsar) and national (SSSI) designations at WwTW, WTW and along pipeline route. BAP habitat along pipeline routes.
Aquatic Ecology	Presence of the following downstream of the effluent discharge, and intervening distance: - International or national nature conservation designations - Fisheries (salmonid/cyprinid designated waters). - Sensitive invertebrate and macrophyte populations Sensitivity of inland waters in relation to the above, where effluent is to be diverted away to another watercourse.
Landscape	Potential impacts of new above ground structures at WwTW and WTW (ability to integrate into existing site or need for new development area). Transfer pipeline distance through National Parks or AONBs (Temporary construction impacts).
Sustainable Energy and Carbon Emissions	Length of transfer pipeline routes. Maximum elevation along pipeline routes. Potential for use of more conventional tertiary treatment technologies as an alternative to energy intensive RO.
Water Quality and Water Framework Directive (WFD) Status	Designation of receiving waters as “natural” or “heavily modified water body (HMWB)” (higher impact with natural waters). Ecological and Chemical status of receiving water (higher potential for impact with Good status waters, but more potential for improvement with Poor quality waters). Potential dilution in receiving water. All the above for donor waters where options are proposed for diverting effluent away from an inland water.

Criteria	Factors Considered
Water Quantity and Management of Resources	Maximum effluent flow potentially available. Proportion of river water lost for options proposing diversion of existing inland discharges.
Flood Risk	Location of existing WwTW and WTW sites and adjacent land in floodplain
Cultural Heritage	Length of transfer pipeline (indication of potential to impact on buried archaeology)
Public Health & Wellbeing	Extent of construction disruption (ability to locate works within existing sites and length of transfer pipelines). Length of receiving river prior to re-abstraction (discharge direct to reservoirs without intervening river travel score poorly). Potential to create an "effluent recycling loop" where the effluent is used to supply areas that contributed the source wastewater. Proportion of industrial content in wastewater.
Public Acceptability	Extent of construction disruption. Presence of health safeguards (river discharge versus direct reservoir discharge). Landscape impacts (primary transfer pipelines through National Parks and AONBs).
Cost and Technical Challenge	Extent of new WwTW and WTW infrastructure required (surrogate for cost and based on previous cost estimates from PR-09 for new WwTW and WTW facilities). Requirement for new land for WwTW and WTW facilities. Transfer pipeline length (as a surrogate for cost) Number of road, rail and river crossings.
Yield Uncertainty	Potential to use more conventional tertiary treatment technologies to RO (which has high losses). Travel time in receiving river and potential for associated losses. Uncertainty in forecast development growth for those options which depend on economic growth.

MCA Scoring

In order to reduce the subjectivity of the scoring, a workshop forum was used comprising technical and environmental specialists to assign the initial scores. A second workshop was then held to challenge the scores that had been assigned. Comments received from the EFG were also considered in the scoring.

The output of the MCA process provided a ranking of the options based on an overall computation of all the beneficial and adverse scores for each of the criteria. This resulted in a final ranking of options with a range from -200 to -655.

Weighting of criteria was not used in the MCA process in order to avoid the difficulties of introducing subjectivity. However sensitivity testing was carried out to determine impacts on the final ranking of the options if scores were changed.

The final selection of the feasible options (initially seven in total) was principally based on selecting those options from the top of the MCA ranking. Thus the seven selected options were in the range -200 to -325, with those below this score being rejected. The total complement of 28 water reuse options assessed was confined to four Water Resource Zones (RZ2, RZ3, RZ6 and RZ8). The 7

selected options include the most favourable for each of these four zones, so that all the rejected options comprise secondary options at best for any given resource zone.

As a final stage in the selection process, it was decided that 2 of the 4 options (EF-5 6, 7 and 8) based on treating effluent from Peacehaven and Newhaven WwTWs should be relegated to the reserve list. The options relegated in this way are those which discharge the effluent directly to Barcombe raw water storage reservoir (EF-6 and EF-8). The alternatives which discharge the effluent directly to the River Ouse further upstream (EF5 and EF-7) have been retained on the feasible options list.

C4: DESALINATION OPTIONS

C4.1 FINE SCREENING APPROACH

As reported in the constrained options a total of 11 desalination options were included on the constrained options list. Following discussions one option (DS-20 - Eastbourne seawater), which had been rejected at coarse screening, was added back in leaving 12 options at the start of the fine screening process.

The desalination options in the MCA process were then assessed against a set of environmental, technical, cost criteria, as described in this appendix. Following the MCA stage, a total of 5 options were dropped, because they either scored badly or they had major disadvantages compared to other desalination options. These were:

- DS-2: Reculver offshore plant;
- DS-6: Dungeness seawater;
- DS-11: Medway estuary seawater;
- DS-18 Medway tidal at Chatham; and
- DS-21: Havant seawater.

All 4 of the brackish water options (DS-1, DS-3, DS-4 and DS-5) were reconsidered at this stage. They had been removed at the coarse screening stage on the grounds that it was understood that the Environment Agency would not contemplate the risk of saline intrusion. That assumption was felt to be unreasonably pessimistic.

A total of 7 options were then merged into 2 other options, on the basis that they could be considered as variants to a single theme. These were:

The following were merged into option DS-1, Reculver RO Desalination:

- DS-3: Reculver Brackish – 1 borehole;
- DS-4: Faversham Brackish;
- DS-5: Seasalter Brackish; and
- DS-22: N Kent coast seawater.

The following were merged into option DS-7, with the only difference between the two being that one would supply Zone RZ2 and the other Zone RZ3:

- DS-7 – Newhaven – supply to Eastbourne (RZ2); and
- DS-8 – Newhaven – supply to Mid-Sussex (RZ3).

After this sorting process a total of 6 feasible options were left.

Subsequently, following a review by the Steering Group on 29th June 2012 and further fine screening, 3 options were relegated to the 'reserve list' because each one had a significant weakness or disadvantage, e.g. carried a high degree of uncertainty. These were:

- DS-17: Medway Tidal at Aylesford/Snodland;
- DS-20: Eastbourne seawater; and
- DS-23: Hythe seawater.

DS-17 suffers from a 14km to 18km long brine disposal pipeline that crosses over a ridge of high ground that would add 100 metres to the pumping head. There is also uncertainty that brine

disposal into the River Thames at Gravesend could be jeopardised by environmental constraints as yet unknown.

DS-20 would compete with the Newhaven option which has been well studied and offers a reasonable degree of confidence in its feasibility. The same cannot be said for DS-20, owing to its geographical location between Eastbourne and Pevensey Bay, where there is considerable amenity value, and prestigious new development around the marina. Planning and Environment difficulties could be anticipated.

DS-23 suffers from its location which is nearly 20km distant from the population centre of Ashford that the water would best supply.

Three desalination options were left after this process of reduction:

- DS-1: Reculver RO desalination of brackish water (with its potential variants);
- DS-7: Desalination of seawater at Newhaven (with options to supply Zones RZ2 and RZ3); and
- DS-10: Desalination of seawater at Bexhill, coupled with use of bio-gas fuel, made more tenable by the option of using a conventional electricity supply.

C4.2 MCA METHODOLOGY

Biodiversity (Terrestrial)

All options were analysed using GIS data to estimate the permanent impact caused from the installation of desalination plants. Maps were created to identify the impact of pipelines routes within protected areas and the rank attributed to each option followed the scoring below:

Table C4-1: Fine screening scoring for biodiversity (Terrestrial)

Traffic light score		Length of Pipeline Intersection (Km)	Evaluation of Impact	Numeric Range of Scores
N	Neutral/ not relevant	0	Neutral	0
L	Low	<10	Low	5-20
LM	Low /medium	<20	Low/Medium	25-40
M	Medium	<30	Medium	45-60
MH	Medium/high	<40	Medium/High	65-80
H	High	>40	High	85-100

Biodiversity (Aquatic Ecology)

The assessment was made based on the proposed location for the water abstraction/discharge site for the desalination plant in relations to aquatic designations. The scoring criteria were based on the location of the abstraction/discharge zone for the proposed plants affecting protected marine areas. These include:

- Marine Protected Areas (MPA);
- Marine SACs;
- Marine SPAs; and
- Marine Conservation Zones (MCZ).

Table C4-2: Fine screening scoring for biodiversity (Aquatic Ecology)

Traffic light score	Water Abstraction / Discharge Location	Numeric Range of Scores
Neutral/ not relevant	Neutral	0
Low	Abstraction / Discharge at sea	5-20
Low /medium	Intake or Discharge within protected marine area	25-40
Medium	Intake or Discharge less than 1km from/to protected marine area	45-60
Medium/high	Intake and Discharge less than 1km from/to protected marine area	65-80
High	Intake and Discharge within protected marine area	85-100

Landscape/Townscape

GIS mapping was used to identify potential impact of plant and transfer pipeline with AONB, National Parks and Country parks. The scores were assigned following the assumptions below.

Table C4-3: Fine screening scoring for landscape

Traffic light score		Length of pipeline Intersection (km)	Numeric Range of Scores
N	Neutral/ not relevant	0	0
L	Low	<5	5-20
LM	Low /medium	<15	25-40
M	Medium	<25	45-60
MH	Medium/high	<35	65-80
H	High	>35	85-100

Sustainability and Carbon Footprint minimisation

The potential carbon emissions for each option were calculated for the desalination plant and proposed pipelines in terms of Total CO_2 emissions per year. The embodied carbon footprint arising from construction and mechanical and electrical installations are typically < 10% of the total carbon footprint in the life of a water treatment works. Therefore, operational carbon is used as the sole parameter for carbon reporting and the scores were assigned to the categories shown in the table below:

Table C4-4: Fine screening scoring for sustainability and carbon footprint

Traffic light score		Total (tCO2/yr) for plant and pipelines	Numeric Range of Scores
N	Neutral/ not relevant	<100	0
L	Low	100-1000	5-20
LM	Low /medium	1000-2500	25-40
M	Medium	2500-3100	45-60
MH	Medium/high	3100-3500	65-80
H	High	>3500	85-100

Water Quality objectives

The impact on the water objectives was assessed based on the proposed location for the water abstraction/discharge site for the desalination plant. The scoring criteria were based on the location of the abstraction/discharge zone for the proposed plants affecting protected marine areas. These include:

- Marine Protected Areas (MPA);
- Marine SACs;
- Marine SPAs; and
- Marine Conservation Zones (MCZ).

Table C4-5: Fine screening scoring for water quality

Traffic light score		Water Abstraction / Discharge Location	Numeric Range of Scores
N	Neutral/ not relevant	Neutral	0
L	Low	Abstraction / Discharge at sea	5-20
LM	Low /medium	Intake or Discharge within protected marine area	25-40
M	Medium	Discharge within protected marine area, Intake at sea	45-60
MH	Medium/high	Intake and Discharge within protected marine area	65-80
H	High	High risk of saline intrusion into groundwater sources	85-100

Cultural Heritage

The following environmental designations were used to assess the impact of the option on cultural heritage assets:

- World Heritage Sites;
- Scheduled Monuments;
- Listed Buildings (Grades I, II* and II);
- Registered Historic Parks and Gardens (Grades I, II* and II); and
- Registered Historic Battlefields

Table C4-6: Fine screening scoring for culture heritage

Traffic light score		Registered Historic Parks and Gardens, Registered Historic Battlefields (m^2)	Scheduled Monuments (No.) or Listed Buildings (No.)	Numeric Range of Scores
N	Neutral/ not relevant	0	0	0
L	Low	Reservoir affects any Registered Park & Garden/Registered Historic Battlefield less than $100m^2$	<1 Scheduled Monuments OR Listed Buildings	5-20
LM	Low /medium	Reservoir affects $100m^{2any}$ to $300m^2$ of Registered Park & Garden/Registered Historic Battlefield	1-4 Scheduled Monuments OR Listed Buildings	25-40
M	Medium	Reservoir affects a $300m^2$-$500m^2$ of Registered Park & Garden/Registered Historic Battlefield	4-7 Scheduled Monuments OR Listed Buildings	45-60
MH	Medium/high	Reservoir affects $500m^2$-$900m^2$ of Registered Park & Garden/Registered Historic Battlefield	7-9 Scheduled Monuments OR More Listed Buildings	65-80
H	High	Reservoir affects more than $900m^2$ of Registered Park & Garden/ Registered Historic Battlefield	Reservoir affects>9 Scheduled Monument OR Listed Buildings	85-100

Technical challenges and costs

The core process of desalination presents a common level of technical challenge across the chosen options. Any technical differentiation between options would arise from the complexity of other components – sub-sea pipelines and their associated headworks, and to a lesser extent the construction difficulty of on-land pipelines, e.g. through protected areas. Such factors are reflected in the cost of each option. Therefore it was deemed that a single score would adequately reflect both the technical and cost challenge.

No option was given a Low or Low/Medium score, given the relatively high cost of desalination in comparison to other option types, e.g. groundwater sources.

Table C4-7: Fine screening scoring for technical challenge and costs summary

Traffic light score		Water Abstraction / Discharge Location	Numeric Range of Scores
N	Neutral/ not relevant	Not applicable	0
L	Low	None	5-20
LM	Low /medium	None	25-40
M	Medium	£50 to £60 million	45-60
MH	Medium/high	£60 to £75 million	65-80
H	High	Over £75 million	85-100

Appendix 7D: Environmental and Social Costing Methodology

Introduction

This note is a summary of the methodology and key assumptions applied in the environmental and social costing August 2012 submission to the WRSE group (Phase 2b).

The methodology for E&S costs was based on the following guidelines and methodologies:

- Benefits Assessment Guidance (BAG) Environment Agency, 2003;
- Water Resource Planning Guideline – The technical methods and instructions. Joint development by Environment Agency, Ofwat, Defra and the Welsh Government, June 2012;
- BAG User Guide, eftec, January 2012 (2012a);
- BAG Worked Example, eftec, February 2012 (2012b).

We have confirmed with the Environment Agency that our approach is in accordance with best practice and has been consistently applied.

A spreadsheet was created to undertake the assessment. This spreadsheet used embedded calculations for which key option information could be filled in to complete the assessment for each category of impact, drawing upon information recommended within the BAG; as well as data from other sources (e.g. the Department for Transport's Transport Appraisal Guidance website (TAG); average property prices in each resource zone from the Land Registry and average population densities per resource zone. More relevant studies were sourced to quantify impacts when that was required (e.g. Value of SSSIs, GHK, 2011). All values used were uplifted to 2012 prices as appropriate.

The aim of the calculations was to capture and value significant residual impacts (i.e. after mitigation) in relation to the categories examined. In addition to the calculations for each category a qualitative assessment and / or notes relevant to calculations were recorded as required.

For this submission, a high level assessment was carried out, depending on the stage of development of the option and the relevant environmental assessment available. Where an MCA was carried out, this was used as a starting point; focus was given to options with an identified High impact at the MCA stage.

General impact categories examined included:

Supply side options:
- Biodiversity and ecology
- Landscape amenity
- Commercial fisheries
- Angling
- Informal bank-side recreation
- Construction impacts (congestion costs)
- Energy and climate change (carbon footprinting)
- Air quality

Demand management options:
- Financial loss to public
- Personal disturbance

- Health impacts
- Additional energy
- Carbon saving
- Waste generated
- Public awareness
- Social inequality

The following section looks at individual impact categories in more detail.

Impact categories – supply side options

Biodiversity and ecology

Impacts on biodiversity and ecology examine potential effects of options on water quality and quantity, aquatic and terrestrial ecology, habitats and species.

Impacts on terrestrial biodiversity resulting from pipe laying are considered temporary in nature; however there are exceptions relating to habitats whose reinstatement rate is slow or where pipe laying could affect the integrity of the site (e.g. pipelines crossing Ancient Woodland or pipeline routes with long lengths within designated areas). Where pipeline routes intersect with environmentally sensitive and designated areas (SSSI, SPA, SAC, Ramsar, National Park, Ancient Woodland) but follow a road going through those areas or the route of an existing pipeline, it is assumed that there will be no significant residual impact.

There were a small number of options where, from a visual, map-based inspection, pipelines appeared to go through Ancient Woodland and/or there was no apparent existing infrastructure followed (i.e. existing pipeline routes or roads). An impact for those options was valued based on a unit Willingness to Pay value for the continued existence of ancient woodlands.

In terms of impacts on aquatic ecology and water quality and quantity, depending on the category of scheme the following approach was adopted:

Transfers: Most of the transfer options relate to transfers between service reservoirs, operating under the assumption that the transfer will only be triggered when there is excess water in the source reservoir. It has therefore been deduced that there would be no aquatic biodiversity impacts related to a fluctuation in the quality or quantity of nearby water bodies for those options.

A number of transfers involved raw rather than treated water transfers. Separate mention is made for their potential to result in impacts to local ecology, however insufficient data are available to quantify this; these options would need to be further reviewed in detail in subsequent stages.

Groundwater: Information on the water availability status; whether the aquifer is confined or unconfined; and the existence of environmentally sensitive areas with possible hydraulic connections to the option site have informed the assessment on aquatic biodiversity.

Water reuse: Impacts examined in terms of aquatic biodiversity related to a fluctuation in the quality or quantity of nearby water bodies as a result of the option.

Desalination: Impacts on aquatic biodiversity would mostly relate to the point where brine is discharged; information on the precise location, and therefore baseline ecology and potential impacts, was not available at the time of assessment.

Surface Water: The assessment has been informed by the water availability status and the existence of environmentally sensitive areas within a close range to the option site. Reservoir locations were visually inspected on GIS.

Landscape Amenity

The quantification of landscape impacts is generally discouraged within the updates to the BAG (BAG User Guide, eftec, January 2012) as the transfer values used in BAG are particularly dated. Effects on landscape were to be considered if it was expected that there would be a significant impact or if an option involves the building of a structure that will significantly alter the character of an area.

This impact was particularly relevant to Surface Water options. Impact quantification for these options was based on capital inputs into the option; the proximity to other structures; and other landscape characteristics of the areas which would be inundated under each option.

Commercial Fisheries

This category involves impacts upon all activities that exploit fish stocks. Desk-based research was conducted on the impact potential of options involving increased water abstraction or reservoir creation. No direct impacts were identified in relation to commercial fisheries for any of the options.

Angling

Desk-based research was conducted on the impact potential of options involving water abstraction or reservoir creation. No direct impacts were identified in relation to angling activity for any of the options.

Informal bank side recreation

This category involves impacts upon a wide range of different activities, such as walking and hiking; picnicking; dog-walking; and nature appreciation related activities such as bird watching. Desk-based research was conducted on the impact potential of options involving water abstraction, reservoir creation or the construction of buildings. Relevant impacts were identified and valued for a small number of options.

Traffic related impacts

Traffic disruption / congestion impacts were considered for two events: (a) laying a pipeline in the verge of a made road and (b) crossing a road. The length of pipe laid in urban/suburban and in rural areas, as well as the number of motorway, A road and B road crossings was provided through GIS data.

Guidance suggests that rural roads are unlikely to become congested, so the length of road considered relevant for disruption was assumed to be equal to the total urban / suburban pipeline length. The type of road used in the quantification calculation was selected as the one with the largest number of road crossings. The number of road crossings was multiplied by an upper estimate for the recommended taper length for road works per type of road and added to the length of urban and suburban pipeline where applicable.

It is assumed that the speed of pipe laying is 30m/day for a built up area and 40m/day for a non-built up area. Congestion costs per passenger kilometre were sourced from Department for Transport appraisal guidance (published in 2007; values uplifted to 2012 prices using the GDP deflator).

Other factors used to determine social costs (e.g. the average vehicles per hour on type of road affected) were included as outlined in BAG.

Energy and Climate Change
This category involves greenhouse gas emissions resulting from energy use or embodied in the production of materials and equipment. This applied to all options. More information on the methodology used can be found in a separate section below (see 'Carbon').

Air quality
This is a new impact category which was introduced in the 2012 BAG User Guide. No information was available at the time of the assessment on the air quality impacts related to each option.

Impact categories – demand management options

Demand management options required a different approach to supply side options. Relevant impacts here included:

Financial Loss to the Public
Potential of the scheme to result in financial losses for members of the public. This was not found to be a concern for any of the options considered.

Personal Disturbance
All of the schemes that involved interaction with customers were voluntary; it was therefore assumed that the cost of people's time would have already been taken into account by them when they chose to participate in the option.

Health/hygiene Impacts
None of the schemes involved potential impacts on health or hygiene.

Additional Energy/Carbon Saving
This category includes energy used in transport, energy used in operation of equipment and energy embodied in production of equipment. For example, the delivery and installation of a water efficiency device to a home would be valued based upon the travel involved and the embodied carbon of the device. Carbon savings are calculated based on water savings related to each option.

Waste
This category examines the potential for generation and disposal of significant amounts of waste.

Public awareness
Any awareness-raising component of the scheme is noted.

Social inequality
Any component of the scheme which promotes or lowers social inequality is noted.

Carbon

The carbon footprint of options was calculated using our Carbon Calculator (SEW CC). This tool was developed in 2010/11 and includes items listed in our UCDB. The carbon factors included in the SEW CC were built up using the latest data on embodied carbon from the University of Bath Inventory of Carbon and Energy (Bath ICE v2.0), supplemented with data provided by Defra and DECC. This tool is in line with the spirit of UKWIR 2008.

The output of the calculator is in tCO2; however the current requirement is that companies report on additional greenhouse gas emissions using carbon dioxide equivalent units (tCO2e). To convert the output to tCO2e in line with current requirements, the following actions were taken:

- Embodied carbon: results were uplifted by 6%, based on Bath ICE v2.0 which notes that "…it was estimated from the fuel use only (i.e. not including any process-related emissions) the full CO2e is approximately 6% higher than the CO2 only value of embodied carbon".
- Operational carbon: the carbon factor for electricity was updated using Defra 2011 figures of tCO2e / kWh; chemical use and sludge disposal factors were sourced from UKWIR 2012.

The following sections provide the main assumptions incorporated in embodied and operational carbon calculations.

Embodied carbon

For embodied carbon, the main materials / items of equipment were accounted for in the carbon footprint of each option, as provided by project engineers.

A number of items listed in the scheme were not included in the 2011 SEW CC, such as service reservoirs; generic water treatment works; reverse osmosis racks, etc. For large items, namely service reservoirs and water treatment works, composite carbon factors were calculated. This was based on schematics in our PR09 Methodology report (Part IV) and on engineering judgement, which established key material components and their specifications for generic high level items of various sizes. Other items not included in the SEW CC could not be included in the carbon footprint due to their complexity or due to a lack of specific information (e.g. BRF back flush filters, etc.). In these cases the item was recorded but left blank in the carbon calculation sheet.

Excluded from the carbon footprints are emissions related to the use of on-site plant during construction or other on-site construction activities. The reason for not including construction activities in all schemes lies in the fact that the calculation method for these uses the cost of construction; and final construction costs were not always available at the time of calculation.

Operational carbon

Fixed and variable operational carbon emissions were estimated for each option.

The variable operational carbon estimate was derived based on the consumption of energy consumption for pumping and treatment and chemicals use relating to each option.

The fixed operational estimate was derived based on the following assumptions:

- Emissions relating to baseline energy consumption (e.g. lighting and heating of buildings/pumping stations etc.) were assumed to be equal to 10% of the variable carbon estimate.
- Emissions relating to site inspections and maintenance visits were based on figures provided by engineers for given trip distances and frequency.
- To approximate emissions relating to the replacement of assets, the proportion of the capital cost of replacements over the total capital expenditure was applied to the total tonnes of embodied carbon estimated. This approach has drawbacks, in that capital costs may not necessarily correlate with carbon costs; however this was the only practical approximation that could be applied within the timeframe available. It is recommended that this is reviewed and amended at later stages in the option development process.

The nature of emissions associated with demand management schemes required a slightly different approach. Embodied / installation carbon was calculated based on travelling requirements and

embodied emissions of any physical items (e.g. meters, water efficiency devices) associated with each option. Operational carbon consisted of the quantification of carbon savings associated with the water saving and the ensuing reduced pumping and heating requirement. Assumptions on domestic water use were applied, sourced from Ofwat 2011.

The result of the carbon footprinting exercise was monetised using the traded and non-traded price for carbon as provided in DECC guidance and associated updates. Based on this guidance, different values are placed on the traded sector (carbon emissions from the activities of sectors involved in the European Union Emissions Trading Scheme) and the non-traded sector (carbon emissions resulting from the activities of sectors not included in the EU ETS). These values change year on year.

Carbon costs will be discounted within the modelling process, using the stream of values provided within current policy appraisal. The valuations presented here are nominal carbon costs based on the prices of carbon in 2020. The traded price is used for operational carbon and the non-traded price for one-off carbon. 2020 was selected as the end of the AMP period and represents the highest possible impact for the PR14 five-year planning cycle.

Differences with PR09

A number of options examined were PR09 options. It is probable that differences may be observed between results from PR09 and those provided for Phase 2b.

In order to maintain consistency between "old" (PR09) and new options, the same set of assumptions and approach to assessment was used for all options.

Differences may be attributed to the following factors:

- one-off ecological impacts may have been assessed differently at PR09, depending on the type of option (e.g. using information such as change in RE class of river, which was not readily available for this costing exercise) and the availability of valuation data (i.e. there is different availability in valuation data compared to before);
- pipeline routes and scheme locations may have been different;
- landscape impacts were only valued for specific locations; valuation of landscape impacts is generally discouraged in this round;
- differences in pipeline lengths and routes may have led to different traffic / congestion impacts generated;
- carbon quantification in PR09 was still in its infancy. Only items where the quantification was straightforward would have been included in the footprints that were calculated. In 2012, more processes and materials, at a higher level of detail, have been included; and
- the method for valuing carbon as well as the actual valuation prices have changed in comparison to PR09.

Examples of Environmental and Social Costing

Details of the environmental and social costing for selected options in the preferred plan are shown overleaf.

	Option Title	Carbon (tCO_2e)			Carbon (£)			Ecology (£)		Landscape (£)		Recreation (£)		Traffic (£)		SubTotal E&S (£)		Grand Total	
		One-off	Annual (variable)	Annual (fixed)	One-off	Annual (variable)	Annual (fixed)	One-off	Annual	One-off	Annual	One-off	Annual	One-off	Annual	One-off	Annual	One-off	Annual
GIS ID	**Water Re-use**																		
EF-7	SR-ER-07 Peacehaven to River Ouse	22,911	16,747	1,677	£1,466,283	£485,653	£48,711		£54,060		£0		£0	£9,467		£9,467	£54,060	**£1,475,750**	**£588,424**
EF-11	WRSE1 Aylesford	6,433	8,635	864	£411,706	£250,423	£25,083		£0		£0		£0	£946		£946	£0	**£412,652**	**£275,506**
GIS ID	**Groundwater**																		
GW-58	Cowbeech groundwater - New biological treatment	316	228	0.0	£20,203	£6,624	£0		£0				£0	£0		£0	£0	**£20,203**	**£6,624**
GW-98	Boxalls Lane LGS	230	177	0.0	£14,749	£5,144	£0		£0				£0	£5,115		£5,115	£0	**£19,864**	**£5,144**
GW-130	Additional borehole at Sharnden (Coggins Mill)	809	261	0.0	£51,776	£7,568	£0		£0		£0		£0	£0		£0	£0	**£51,776**	**£7,568**
GW-141	Forest Row- closing the gap	477	177	0.0	£30,517	£5,122	£0		£0		£0		£0	£0		£0	£0	**£30,517**	**£5,122**
GIS ID	**Reservoir**																		
SW-14	Broad Oak Reservoir - Alternative 1b (5,126 Ml; 36m AOD)	25,352	1,006	102	£1,622,526	£29,169	£2,981		£0		£39,868		£0	£6,528		£6,528	£39,868	**£1,629,054**	**£72,018**
SW-40	Bunded Reservoir immediately adjacent to Arlington Reservoir	39,799	939	94	£2,547,164	£27,236	£2,729		£0		£0		£0	£0		£0	£0	**£2,547,164**	**£29,965**
GIS ID	**Transfer**																		
TR-22	Detling SR (SEW RZ6) to Matt's Hill (SWS KME) 5Ml/d	987	252	0.3	£63,148	£7,304	£18		£0		£0			£0		£0	£0	**£63,148**	**£7,322**
TR-92	Aylesford SR to Blackhurst SR	1,587	497	1.1	£101,583	£14,412	£72		£0		£0			£7,076		£7,076	£0	**£108,659**	**£14,484**
TR-33b	Kippings to Pembury SEW Medway (RZ7 to RZ1)	178	0	0.0	£11,422	£0	£0		£0		£0			£0		£0	£0	**£11,422**	**£0**
TR-22a	Matt's Hill (SWS KME) to Detling SR (SEW RZ6) 5Ml/d	989	438	0.3	£63,318	£12,699	£18		£0		£0			£0		£0	£0	**£63,318**	**£12,717**
TR-92a	Blackhurst SR to Aylesford SR (Reverse of Lft67)	915	0	0.0	£58,592	£0	£0		£0		£0			£9,167		£9,167	£0	**£67,759**	**£0**
TR-79	Whitely Hill to Outwood SR	770	0	0.0	£49,261	£0	£0		£0		£0			£38,604		£38,604	£0	**£87,865**	**£0**
TR-79a	Outwood SR to Whitely Hill	814	206	0.7	£52,064	£5,976	£43		£0		£0			£38,604		£38,604	£0	**£90,668**	**£6,019**
TR-131	Bough Beech to Riverhill (RZ1) 10Ml/d	3,128	513	0.4	£200,184	£14,874	£23		£0		£0			£405		£405	£0	**£200,589**	**£14,897**
TR-132	Best Beech to Blackhurst	3,747	0	0.0	£239,822	£0	£0		£0		£0			£3,295		£3,295	£0	**£243,117**	**£0**
TR-136a	Windsor (SWA RZ) to Surrey Hills (SEW RZ4) 10Ml/d	1,365	0	0.0	£87,380	£0	£0		£0					£0		£0	£0	**£87,380**	**£0**
GIS ID	**Water Treatment Works and Process Loss**																		
WT-14	WTW in RZ2 process recovery	424	68	8	£27,123	£1,961	£279									£0	£0	**£27,123**	**£2,240**
WT-4	WTW in RZ4 extension 29Ml/d	5,616	941	95	£359,401	£27,294	£2,812									£0	£0	**£359,401**	**£30,106**
WT-1	Matham Farm Option 2 4.3Mld	993	135	15	£63,582	£3,922	£475									£0	£0	**£63,582**	**£4,398**

Appendix 7E: WRMP14 Options List

The following appendix provides a comprehensive list of all the unconstrained options and summarises the progression of the screening process through to the revised feasible options list and the modelled list for the preferred plan.

Options shown as passing the coarse screening stage were taken through to the constrained list (table 22).

Options shown as passing the fine screening stage were taken through to the initial feasible options list (table 33).

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
GW-18	EGW	RZ6	Ryarsh Group smart licensing at Peak: Remove licence constraint	No	No	No	Sources located within over abstracted GWMU, risk of contamination from nearby land fill.	No		No
GW-19	NGW	RZ6	Hythe Beds - New peak use borehole near King's Hill / Beech	No	No	No	Option located within over abstracted GWMU and impact on existing sources.	No		No
GW-23	NGW	RZ7	Bewl Bridge Boreholes - New BH off-site & new 4Ml/d WTW	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-24	NGW	RZ7	Bewl Bridge Boreholes - New BH off -site	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-25	ASR	RZ8	ASR scheme at Wye - 2 Ml/d	Yes	Yes	No	Relegated to reserve list. The source of water for this ASR scheme is considered to be Kingston. However, Kingston source is subject to NEP reduction of 3.5Ml/d. It will be hard to promote this scheme. However, the option can be linked with other sources.	No		No
GW-26	ASR	RZ8	ASR scheme at Ford	No	No	No	Technically unfeasible. Hydrological storage/recovery very low	No		No
GW-28	ASR	RZ8	ASR scheme at Wye - 4 Ml/d	Yes	No	No	Option GW-28 assumes 66% recovery and is similar to GW-25 which assumes 33% recovery. As the reasonable recovery of injected water in the area is considered to be only 33%, Option GW-28 has been rejected.	No		No
GW-30	EGW	RZ8	Licence amendment and treatment upgrade at Hoplands Farm	Yes	Yes	No	Relegated to reserve list. The option may have impact on Stodmarsh SAC/SPA and Gibbins Brook SSSI.	No		No
GW-35	EGW	RZ8	Re-commission borehole at Henwood and pass into SEW treatment works at Westwell	No	No	No	Option already recommissioned.	No		No
GW-36	NGW	RZ8	Direct abstraction from Disused Kent Coal Mines	No	No	No	Rejected on water quality grounds and cost.	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
GW-37	NGW	RZ8	Direct abstraction from the Tilmanstone Chalk Block	Yes	No	No	The option is in ' Over abstracted' GWMU. However, the Stour CAMS report highlighted that the water availability classification is 'likely to be over estimation'. However, the scheme has water quality issues. Therefore, the option has been rejected.	No		No
GW-38	EGW	RZ4	RZ4 Groundwater Enhancement from Gravels	No	No	No	The gap on DO and licence has already been closed	No		No
GW-39	EGW	RZ5	Hawkley Closing the Gap	Yes	No	No	Target ADO <1Ml/d. There is little benefit in developing this scheme. In addition there is high uncertainty on yield. Therefore, the option has been rejected.	No		No
GW-40	EGW	RZ4	Lasham Closing the Gap	Yes	No	No	This scheme considers closing the gap on peak. But RZ4 is not peak driven. Therefore, the option has been rejected.	No		No
GW-41	EGW	RZ4	West Ham (WH)/West Ham Park (WHP) - Increase Licence	Yes	Yes	No	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc would be required to demonstrate sustainability.	No		No
GW-42	EGW	RZ4	Woodgarston Closing the Gap	Yes	No	No	The scheme may require developing a new source, which is anticipated to provide more than the existing gap on licence. Hence beyond the licence Option GW-90 has been retained. This option has been rejected.	No		No
GW-43	EGW	RZ5	Greatham beyond the licence (RZ5)	Yes	Yes	No	Relegated to reserve list. The option is in the over licensed GWMU and requires developing a new source. However, the aquifer is not in hydraulic continuity with the river.	No		No
GW-44	EGW	RZ5	Hythe Beds Confined Oakhanger Infrastructure Improvement	No	No	No	GW-44 is an already implemented option leaving no gap in the licence.	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
GW-45	EGW	RZ5	East Meon Closing the gap.	Yes	No	No	A very small scheme in ' Over abstracted' GWMU.(Target ADO<1Ml/d). Option has been rejected.	No		No
GW-46	ASR	RZ4	ASR Chalk Unconfined (Alton)	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No
GW-47	ASR	RZ4	ASR Chalk Confined Aquifer (Beenhams Heath/White Waltham)	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-48	ASR	RZ5	ASR LGS Confined	Yes	No	No	Cost of scheme found to be >£5000/Ml/d. Option has been rejected	No		No
GW-49	NGW	RZ5	Tilford Meads Beyond the Licence	Yes	No	No	EA may object this option as is in 'Over licensed' GWMU. The option has been rejected.	No		No
GW-50	NGW	RZ4	RZ4 Confined Chalk - closing the gap	Yes	No	No	Target ADO<1Ml/d and the preliminary AIC of the scheme is >£5000/Ml. The option has been rejected.	No		No
GW-51	EGW	RZ4	Hurley - Closing the Gap	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-52	EGW	RZ5	Bourne (Farnham)	Yes	No	No	The option is in over licensed catchment and requires developing new borehole. It is unlikely to obtain consent from EA. Option has been rejected.	No		No
GW-53	NGW	RZ5	Bourne (Farnham) - Additional	Yes	Yes	No	Relegated to reserve list. This option as is in 'Over licensed' GWMU. It is unlikely to obtain consent from EA.	No		No
GW-54	NGW	RZ5	Britty Hill Closing the Gap	Yes	Yes	No	Relegated to reserve list. The option is closing the gap in over-licensed area. It requires developing a new sources. It is unlikely to obtain consent from EA.	No		No
GW-55	NGW	RZ4	Boxalls Lane Chalk - Peak	Yes	No	No	Target ADO<1Ml/d. The option has been rejected.	No		No
GW-56	NGW	RZ5	Headley Park Closing Gap on Peak	Yes	No	No	Target ADO<1Ml/d. Option has been rejected.	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
GW-57	NGW	RZ5	Weysprings Restoration with River Augmentation	Yes	No	No	It is technically challenging to sustain the target flow for long period. In addition continuous circulation of water may bring water quality issues. Option Rejected.	No		No
GW-58	EGW	RZ3	Cowbeech groundwater - New biological treatment	Yes	Yes	Yes		Yes		Yes
GW-59	NGW	RZ1	Groundwater development at Brown Woods	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-60	NGW	RZ3	Re-licence Sedlescombe	Yes	No	No	Target ADO<1Ml/d. The option has been rejected.	No		No
GW-61	NGW	RZ1	New Hastings licences: Lilley Farm	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-61	NGW	RZ1	New sources Medway Gravels	Yes	No	No	This is similar to Tonbridge Gravel beyond the licence. Option rejected.	No		No
GW-63	NGW	RZ1	New sources LGS (north)	Yes	No	No	EA may object developing a new sources in over abstracted GWMU. The option has been rejected.	No		No
GW-64	NGW	RZ2	New sources Lower Greensand	Yes	Yes	No	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc would be required to demonstrate sustainability.	No		No
GW-65	ASR	RZ1	ASR in confined Lower Greensand	Yes	No	No	Recovery of injected water in an already' over-abstracted' catchment could be challenging. The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No
GW-66	NGW	RZ3	Hastings groundwater - licences: Kent Street	Yes	No	No	Target ADO<1Ml/d. Poor yield aquifer. Hence option has been rejected.	No		No
GW-67	EGW	RZ2	Enhance sources at Balcombe	Yes	No	No	Target ADO<1Ml/d. Poor yield aquifer. Hence option has been rejected.	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
GW-68	EGW	RZ2	Stream augmentation at Balcombe	Yes	No	No	Target ADO<1Ml/d. In addition most of the water would be lost in the river channel. The option has been rejected.	No		No
GW-69	EGW	RZ1	Pembury Closing the Gap on Peak	Yes	Yes	No	Relegated to reserve list. Option is for closing the gap on peak. Although ADO yield <1Ml/d option retained on reserve list for peak.	No		No
GW-70	EGW	RZ3	Increase DO at Crowhurst Bridge	Yes	Yes	Yes		No	Option committed in AMP5	No
GW-73	EGW	RZ2	New sources in Seaford Chalk	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-74	NGW	RZ3	New sources in Eastbourne Chalk	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-75	NGW	RZ3	Increase actual in Eastbourne Chalk (Wigdens, Waterworks, Birling)	No	No	No	Duplicate of Eastbourne Chalk conjunctive use option CU-01	No		No
GW-76	EGW	RZ1	Increase actual to licence at Tonbridge	Yes	Yes	No	Already included in SEW deployable output (DO) baseline assessment.	No		No
GW-77	EGW	RZ4	Frimley Springs	No	No	No	Rejected on water quality grounds and existing infrastructure now dismantled.	No		No
GW-79	EGW	RZ5	Farringdon Groundwater	No	No	No	There is no gap on licence. No gain in implementing the option.	No		No
GW-80	EGW	RZ5	Weyspring Sources Relocation-A31	No	No	No	Duplicate of Options GW-92 and 93	No		No
GW-81	EGW	RZ5	Weyspring Sources Relocation Woodside	No	No	No	Duplicate of Options GW-92 and 93	No		No
GW-82	EGW	RZ4	Cliddesden Beyond the Licence	Yes	Yes	No	Relegated to reserve list. Cliddesden boreholes have very low yield with yield uncertainty in this area.	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
GW-83	EGW	RZ4	West Ham/West Ham Park - Increase DO to Aggregate Licence	Yes	Yes	No	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc would be required to demonstrate sustainability, particularly in relation to Test catchment	No		No
GW-84	EGW	RZ5	Sheet Closing the Gap	No	No	No	The gap between licence and DO is marginal	No		No
GW-85	EGW	RZ5	Oakshott Closing the Gap	No	No	No	Source abandoned due to unreliability of yield	No		No
GW-86	EGW	RZ5	Woodhanger Closing the Gap	No	No	No	Source abandoned due to unreliability of yield	No		No
GW-87	ASR	RZ4	ASR Chalk Unconfined	No	No	No	Due to uncertainty in ASR, one scheme GW-46 believed to be adequate. Hence option no longer required	No		No
GW-88	ASR	RZ5	ASR LGS Confined (Duplicate)	No	No	No	One ASR scheme in LGS GW-48 is believed to be adequate. Duplicate option no longer required.	No		No
GW-89	EGW	RZ4	Lasham - Beyond the Licence	Yes	Yes	No	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc would be required to demonstrate sustainability.	No		No
GW-90	EGW	RZ4	Woodgarston - Beyond Licence	Yes	Yes	No	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc would be required to demonstrate sustainability, particularly in relation to Test catchment	No		No
GW-91	EGW	RZ5	Hawkley Beyond the Licence	Yes	No	No	Hawkley is a spring source. It has small catchment. It is unlikely to sustain the proposed target yield. The option has been rejected.	No		No
GW-92	EGW	RZ5	Weyspring Source Relocation-Chalk	Yes	No	No	Weyspring sources has been closed in 2003 as part of RSA. The assets from the sources has already been stripped. It is difficult and costly to promote this option. Option Rejected	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
GW-93	EGW	RZ5	Weyspring Source Relocation UGS	Yes	No	No	Weyspring sources has been closed in 2003 as part of RSA. The assets from the sources has already been stripped. It is difficult and costly to promote this option. Option Rejected	No		No
GW-95	EGW	RZ4	College Avenue	Yes	No	No	This option considers closing the gap between DO and Licence at College Avenue. However, the source is in an over-abstracted GWMU and suspected to impact on Maidenhead Ditch. For this reason it is difficult to promote the scheme. Option rejected.	No		No
GW-96	EGW	RZ4	Itchel - Closing the gap	Yes	Yes	No	Sustainability concerns on River Hart from current abstractions	No		No
GW-98	EGW	RZ4	Boxalls Lane LGS - Closing the Gap	Yes	Yes	Yes		Yes		Yes
GW-103	NGW	RZ4	Increased groundwater abstraction at Westham park, by discharging effluent to river Loddon	No	No	No	Rejected due to issues on water quality and public acceptability	No		No
GW-104	EGW	RZ3	Cowbeach groundwater –– treatment at Hazards Green	No	No	No	Reject as is included GW-58	No		No
GW-105	EGW	RZ3	Cowbeach groundwater - new conventional treatment	No	No	No	Reject as is included GW-58	No		No
GW-106	NGW	RZ2	New Hastings licences: Redgate Mill	No	No	No	Rejected due to poor aquifer yield	No		No
GW-107	NGW	RZ3	Limekiln Bottom	No	No	No	SEW carried out a study in 1995 and found this site to be unproductive.	No		No
GW-108	ASR	RZ1	Aquifer Storage and Recovery (ASR) - Chalk	No	No	No	The Chalk aquifer generally unconfined with high permeability. Unsuitable for ASR.	No		No
GW-109	NGW	RZ6	New sources NW Kent (a. Bean Farm & Stonewood)	No	No	No	Outside of SEW area and high yield uncertainty. Option rejected.	No		No

Passed Screening Stage Filter										
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GW-110	EGW	RZ3	Hastings groundwater - licences: Cadborough	Yes	No	No	Target ADO<1Ml/d, poor yield. The option has been rejected.	No		No
GW-111	EGW	RZ1	Pembury Springs licence variation	No	No	No	This option has already been implemented.	No		No
GW-112	EGW	RZ2	Increase actual to DO/LR at Cockhaise/Holywell	Yes	No	No	According to information obtained from Trevor Muten part of the licence of this sources has been returned to EA. Hence the gap between ADO and average licence is less than 1Ml/d. Considering the limited benefit of developing the scheme it has been rejected.	No		No
GW-113	EGW	RZ3	Wallers Haven - water into pipeline	No	No	No	High yield uncertainty. Due to water quality issue requires complex WTW.	No		No
GW-114	EGW	RZ2	Bring borehole 2 at Forest Row back into use	No	No	No	The borehole is now back in operation. Option no longer required	No		No
GW-116	NGW	RZ2	New sources Underhill Chalk	Yes	Yes	No	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc would be required to demonstrate sustainability especially in relation to impact on chalk springs and headwaters of Adur.	No		No
GW-117	EGW	RZ2	Increase actual to DO at Saddlescombe	Yes	No	No	Target ADO<1Ml/d and potential impact on environmental sensitive site such as Poynings. Option Rejected.	No		No
GW-119	EGW	RZ4	White Waltham - third borehole	Yes	No	No	Target ADO<1Ml/d. The option has been rejected.	No		No
GW-120	NGW	RZ4	Camberley Sand - minor aquifer potentially some yield	Yes	Yes	No	Relegated to reserve list. There is little information on the Camberley Sand as the aquifer is minor aquifer and has not been investigated for public water supply purpose in the past. The aquifer is also anticipated to have water quality issues.	No		No
GW-121	NGW	RZ4	Confined Chalk - around Farnborough	Yes	Yes	Yes		No	The option is in EA red list.	No

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GW-122	ASR	RZ4	ASR- Confined Chalk around Farnborough	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. The option has been rejected due to excess cost.	No		No
GW-123	NGW	RZ4	Oakley - new licence within Chalk	Yes	No	No	Target ADO<1Ml/d. There is high yield uncertainty hence option rejected.	No		No
GW-124	NGW	RZ4	North Waltham - new licence within Chalk	Yes	No	No	Target ADO<1Ml/d. Poor yield aquifer. Hence option has been rejected.	No		No
GW-125	NGW	RZ5	Monkwood - New licence within chalk	Yes	Yes	No	Further consideration of environmental sensitivities indicates that excessive study, pump tests etc would be required to demonstrate sustainability.	No		No
GW-126	NGW	RZ5	East Worldham - new licence in Lower Greensand	Yes	No	No	The option is in 'over licensed' GWMU. It is hard to promote this option. The option has been rejected.	No		No
GW-127	NGW	RZ2	Hempstead Closing the gap	No	No	No	This option has already been implemented with water pumped into Barcombe reservoir.	No		No
GW-128	NGW	RZ2	Tapping scarp slope springs from Chalk	Yes	Yes	No	Relegated to reserve list. This option considers the same group of sources as GW-116 and is hence a potential duplicate.	No		No
GW-129	NGW	RZ3	Crowhurst bridge beyond the licence	Yes	Yes	No	Relegated to reserve list. Three options (GW-131: Powder Mill Beyond licence, GW-192: Hastings Beds-Brede River and GW-129: Crowhurst bridge beyond the licence) have been identified on account of the water availability in Hastings Beds GWMU. Considering the unpredictability and low reliability of yield of the Ashdown aquifer it may not be feasible to develop the three options in the next AMP. Therefore only Powder Mill Beyond licence has been progressed as a feasible option.	No		No
GW-130	EGW	RZ2	Additional borehole at Sharnden (Coggins Mill)	Yes	Yes	Yes		Yes		Yes

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GW-131	EGW	RZ3	Powder Mill - Beyond licence	Yes	Yes	No	Close to other sources eg SWS. A lot more investigation needed. Complex area and likely surface water /ecological effect	No		No
GW-132	NGW	RZ3	Beachy Head under sea springs	No	No	No	Technically difficult to implement and environmentally sensitive (saline intrusion)	No		No
GW-133	NGW	RZ3	Redistribution of Eastbourne chalk: Abstract water from the historical adit	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-134	NGW	RZ3	Redistribution of Eastbourne chalk: developing new abstraction point	Yes	No	No	Option included in GW-133 - Redistribution of Eastbourne chalk: Abstract water from the historical adit	No		No
GW-135	NGW	RZ1	Tonbridge Gravels - Beyond the Licence	Yes	Yes	No	Uncertainty over yield linked to current EA "hands-off flow" constraint at Teston of 980Ml/d for new licences.	No		No
GW-136	NGW	RZ1	Kemsing - Increase pumping capacity and sources optimisation	Yes	No	No	The scheme is in over abstracted GWMU. It requires developing new source. EA may object the scheme. The option has been rejected.	No		No
GW-139	NGW	RZ1	Pembury and Matfield Boreholes- Closing the gap, new borehole in Ashdown Beds	Yes	Yes	Yes		No	Option committed in AMP5	No
GW-140	NGW	RZ1	Hartlake Wells; Resize and optimisation of pumps to close licence	Yes	No	No	Target ADO<1Ml/d and the preliminary AIC of the scheme is >£5000/Ml. The option has been rejected as is very expensive scheme.	No		No
GW-141	NGW	RZ2	Forest Row - closing the gap	Yes	Yes	Yes		Yes		Yes
GW-142	NGW	RZ4	River Thames Gravels - RZ4 New Groundwater	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-143	NGW	RZ4	Tongham bridging the licence gap	Yes	No	No	Target ADO<1Ml/d hence little benefit on average. RZ4 is not peak driven hence option has been rejected.	No		No

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GW-144	NGW	RZ1	Tonbridge - New Wharf Rd PS – bridging the licence gap	Yes	No	No	Target ADO <1Ml/d. There is little benefit in developing this scheme. Therefore, the option has been rejected.	No		No
GW-145	NGW	RZ2	Holywell bridging the licence gap.	No	No	No	This option is a duplicate of GW-112. Option rejected.	No		No
GW-146	NGW	RZ3	Birling Farm treatment capacity to bridge the licence gap	Yes	No	No	Target ADO <1Ml/d. There is little benefit in developing this scheme. Therefore, the option has been rejected.	No		No
GW-147	NGW	RZ3	Holywell bridging the gap	No	No	No	Option included in GW-148. Option Rejected.	No		No
GW-148	NGW	RZ3	Cornish bridging the licence gap	No	No	No	The source is part of the Eastbourne Chalk. Hence it has already been included under GW-133/134. Option was rejected as a duplicate.	No		No
GW-149	NGW	RZ6	New Source development in the Eastern Lower Greensand. Potential for Licence Trading.	Yes	No	No	EA may object developing a new sources in 'Over Licensed' GWMU. The sources is close to R Len. The option has been rejected.	No		No
GW-151	NGW	RZ6	Cossington Borehole Optimisation	No	No	No	Included in Option GW-08 - Cossington GS BH No.3 - Option no longer required	No		No
GW-152	NGW	RZ6	Increase take from Burham	No	No	No	Option rejected as SEW has no control on the operation of this SWS source.	No		No
GW-153	NGW	RZ6	Halling redistribution of licence with other sources with WRMU and RZ6	No	No	No	There is no gap on licence. No gain in implementing the option	No		No
GW-154	NGW	RZ6	Halling - New Licence / redistribution of licence wrt Halling Lake	Yes	No	No	The scheme is in over licensed catchment. It requires developing new source. EA may object the scheme. The option has been rejected.	No		No
GW-156	NGW	RZ6	Harrietsham, Hockers Lane and Thurnham – increase in licence through Licence Trading	No	No	No	This option is a duplicate of options GW-11,GW-12 and GW-13. Hence it has been excluded from the constrained option list.	No		No

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GW-157	NGW	RZ6	Hartley pumping station enhancements – bridging the licence gap	Yes	Yes	No	Relegated to reserve list. The scheme is in over licensed catchment. It requires developing new source. EA may object to the scheme.	No		No
GW-158	EGW	RZ6	Hartley, Ridley and Stansted Chalk – Hydrogeological aquifer optimisation - bridging the licence gap	No	No	No	Source no longer operational due to unreliability of yield	No		No
GW-159	NGW	RZ7	Bewl Borehole 1 and 2 – upside raw water main – bridging the licence gap	Yes	No	No	Target ADO<1Ml/d. The option has been rejected.	No		No
GW-161	EGW	RZ7	Bewl Bridge Groundwater – increase the licence	No	No	No	The option is duplicate of option GW-23/24	No		No
GW-162	NGW	RZ7	Goudhurst Pumping Station - bridging the licence gap	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-163	NGW	RZ7	Lamberhurst Pumping Station - bridging the licence gap	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-164	NGW	RZ7	Redistribution of the Licence from Maytham Farm - replacement of Maytham	Yes	No	No	This is feasible option. However, the focus is mainly in replacing the existing WTW. Hence it has been included in the WTW options list as WT-1. Option removed from the GW options list.	No		No
GW-165	NGW	RZ8	New source development in the Faversham LLT GWMU	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-166	NGW	RZ8	New source development in the Selling LLT GWMU	Yes	Yes	Yes		No	The option is in EA red list.	No
GW-167	NGW	RZ8	Boughton, Copton & Ospringe – increase licence through Licence Trading	Yes	No	No	EA may object increase in licence in this area as the licensing strategy is 'presumption against' increase in abstraction in major aquifers such as the chalk. The option has been rejected.	No		No

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GW-168	EGW	RZ8	Charing Pumping Station – redistribute licence between existing abstraction boreholes to close the gap	Yes	No	No	Target ADO <1Ml/d. The option has been rejected.	No		No
GW-169	NGW	RZ8	Charing Pumping Station – new abstraction point – bridging the licence gap	Yes	No	No	Target ADO <1Ml/d. The option has been rejected.	No		No
GW-170	EGW	RZ8	Chilham and Chartham – increase licence	Yes	No	No	The groundwater only water availability of Horton GWMU is ' Water Available'. However, on account of the downstream GWMU (Vauxhall) the integrated GW-SW status is set at 'Over Licensed'. This option is within the same GWMU as GW-171 and GW-172. The option has been rejected.	No		No
GW-171	NGW	RZ8	New groundwater source – new licence in the Horton GWMU between Crundale and Bodsham	Yes	No	No	The groundwater only water availability of Horton GWMU is ' Water Available'. However, on account of the downstream GWMU (Vauxhall) the integrated GW-SW status is set at 'Over Licensed'. This option is within the same GWMU as GW-170 and GW-172. The option has been rejected.	No		No
GW-172	EGW	RZ8	Godmersham Pumping Station – increase in licence	Yes	No	No	The groundwater only water availability of Horton GWMU is ' Water Available'. However, on account of the downstream GWMU (Vauxhall) the integrated GW-SW status is set at 'Over Licensed'. This option is within the same GWMU as GW-170 and GW-171 . The option has been rejected.	No		No
GW-173	NGW	RZ8	New groundwater source – new licence in the Wye GWMU in the Broughton / Broughton Lees area	Yes	No	No	In general the groundwater only water availability status of Wye GWMU is 'Water Available'. However, integrated GW-SW availability is 'Over-licensed' on account of the potential impact on downstream low flows. There is 'presumption against' increase in abstraction in this GWMU. The option has been rejected.	No		No

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GW-175	NGW	RZ8	Kingston Pumping Station – reduce the licence gap	Yes	No	No	This requires a new source development. The GWMU is over-abstracted it is unlikely to obtain consent from EA on licence alteration. The option has been rejected.	No		No
GW-179	EGW	RZ8	New abstraction point and licence redistribution at Westwell PS to enable increase in licence yield	Yes	No	No	The groundwater only water availability status of Wye GWMU is 'Water Available'. However, integrated GW-SW availability is 'Over-licensed' in account of the potential impact on downstream low flows. There is 'presumption against' increase in abstraction in this GWMU. Considering the sensitivity of Stour Catchment this option has been rejected.	No		No
GW-180	NGW	RZ8	Westwell – bridging the licence gap	Yes	No	No	Option within licence, however target ADO<1Ml/d. Hence little benefit in developing the scheme. The option has been rejected.	No		No
GW-181	EGW	RZ8	Wichling, Newnham & WCS – bridging the licence gap	Yes	No	No	Target ADO <1Ml/d. The option has been rejected.	No		No
GW-182	NGW	RZ8	Wichling, Newnham & WCS – increase in the licence through Licence Trading	Yes	No	No	This options looks at increasing the licence in 'Over licensed' GWMU. EA may object any increase in the licence as CAMS states that there is a' presumption against' further increase in licence in major aquifers such as Chalk. The option has been rejected.	No		No
GW-183	NGW	RZ4	Oakley – wastewater discharge to ground – dilution – downstream groundwater abstraction	No	No	No	Discharge of wastewater from the Oakley WWTW is insufficient.	No		No
GW-184	NGW	RZ5	West Marden – wastewater discharge to ground – dilution – downstream groundwater abstraction	Yes	No	No	The site is outside of SEW boundary. There may be competition with other water company to develop this sources. The option is also in 'over licensed' GWMU. Option Rejected	No		No

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GW-185	NGW	RZ4	North Waltham – wastewater discharge to ground – dilution – downstream groundwater abstraction	No	No	No	Discharge of wastewater from the North Waltham WWTW is insufficient.	No		No
GW-186	NGW	RZ4	Overton – wastewater discharge to ground – dilution – downstream groundwater abstraction	No	No	No	Discharge of wastewater from the Overton WWTW is insufficient.	No		No
GW-187	NGW	RZ5	New Alresford – wastewater discharge to ground – dilution – downstream groundwater abstraction	Yes	No	No	New Alresford – wastewater discharge to ground – dilution – downstream groundwater abstraction. However, this option is outside of the SEW boundary. Other water companies may want to develop it. Option rejected as is in competition with other water companies.	No		No
GW-188	NGW	RZ5	Liss – wastewater discharge to ground – dilution – downstream groundwater abstraction	Yes	No	No	Option considers developing a borehole to abstract effluent water discharged to the ground. However, this water may have been accounted in the CAMS water balance analysis. Therefore, EA may object increase in licence. The Upper Rother LGS GWMU licensing strategy states that there is a 'presumption against new groundwater licence because of the knock on effect on river low flows'. Therefore option has been rejected.	No		No
GW-189	NGW	RZ2	Pyecombe – wastewater discharge to ground – dilution – downstream groundwater abstraction	Yes	No	No	Target ADO<1Ml/d. In addition the option has water quality issues hence it has been rejected.	No		No
GW-190	EGW	RZ8	Abstractions at Sittingbourne	Yes	No	No	EA may object to increase in licence in this area as the licensing strategy is' presumption against' increase in abstraction in major aquifers such as the chalk. The option has been rejected on account of potential impact on the environment.	No		No
GW-191	EGW	RZ8	Abstractions at Faversham	Yes	Yes	No	Potential impact on North Kent Marshes	No		No

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GW-192	NGW	RZ3	Hasting Beds - Brede River	Yes	Yes	No	Relegated to reserve list. Three options (GW-131: Powder Mill Beyond licence, GW-192: Hastings Beds-Brede River and GW-129: Crowhurst bridge beyond the licence) have been identified on account of the water availability in Hastings Beds GWMU. Considering the unpredictability and low reliability of yield of the Ashdown aquifer it may not be feasible to develop the three options in the next AMP. Therefore only Powder Mill Beyond licence has been progressed as a feasible option.	No		No
GW-193	EGW	RZ4	Individual Groundwater Enhancements RZ5	No	No	No	A number of options have been considered in RZ5. Hence this option has been rejected.	No		No
GW-194	NGW	RZ5	Development of Oakhanger-Oaklands-Southlands wellfield	No	No	No	The option is duplicate of GW-44 which is an already implemented option leaving no gap in the licence.	No		No
GW-195	NGW	RZ3	Eastbourne/Seaford Chalk Block gw development	No	No	No	This option is duplicate of GW-73 (Seaford Chalk) and GW-74 (Eastbourne Chalk). Therefore rejected.	No		No
SW-1	NSW	RZ6	Develop new surface water abstraction from Halling Lake	Yes	No	No	Halling lake (also known locally as Grey Lake) is a groundwater fed flooded gravel pit. This option is effectively an additional abstraction from the Medway Chalk which is already over-licenced (Medway CAMS 2005).	No		No
SW-4	RES	RZ7	Raise Bewl Water and abstract additional yield at Bewl Bridge WTW	Yes	Yes	Yes		No	Feasible option but requires agreement with Southern Water	No
SW-10	ESW	RZ6	Licence alteration at Springfield (reduce MRF) and take additional yield as bulk supply from Burham WTW	Yes	Yes	No	Currently being implemented by Southern Water	No		No
SW-11	NSW	RZ7	New small winter-only abstraction from the Royal Military Canal or Lower Rother	Yes	No	No	Winter abstraction without storage is not viable. Other options cover abstraction from Rother with storage.	No		No

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SW-12	NSW	RZ7	Winter only abstraction from Lower Rother and new WTW at Maytham Farm	Yes	No	No	Winter abstraction without storage is not viable. Other options cover abstraction from Rother with storage.	No		No
SW-13	RES	RZ8	Broad Oak Reservoir - Alternative 1a (12,300 Ml; 41.5m AOD)	No	No	No	Loss of > 2ha of SSSI - No scope to avoid.	No		No
SW-14	RES	RZ8	Broad Oak Reservoir - Alternative 1b (2,815 Ml; 32.5m AOD) - Reduced size	Yes	Yes	Yes		Yes		Yes
SW-15	RES	RZ8	Broad Oak Reservoir - Alternative 1c (15,000 Ml; 43m AOD)	No	No	No	Loss of > 2ha of SSSI - No scope to avoid.	No		No
SW-16	RES	RZ8	Broad Oak Reservoir - Alternative 1d (24,057 Ml; 47m AOD)	No	No	No	Loss of > 2ha of SSSI - No scope to avoid.	No		No
SW-17	RES	RZ8	Phased development of Option 30 [(b) - (c) phased]	No	No	No	Reservoir size not suitable for phased development.	No		No
SW-18	RES	RZ8	Modelling of 40% share only of options 30a - 30d to SEW	No	No	No	Reservoir size not sufficient for shared development.	No		No
SW-19	RES	RZ8	Modelling of 60% share only of options 30a - 30d to SEW	No	No	No	Reservoir size not sufficient for shared development.	No		No
SW-20	RES	RZ8	Modelling of 80% share only of options 30a - 30d to SEW	No	No	No	Reservoir size not sufficient for shared development.	No		No
SW-21	RES	RZ8	Broad Oak Reservoir - Alternative 2 - indirect effluent discharge to increase yield	No	No	No	Duplicate of Effluent Reuse option EF-41	No		No
SW-22	RES	RZ8	Broad Oak Reservoir - Alternative 3 - conjunctive use in combination with other alternatives	No	No	No	Duplicate of Effluent Reuse option EF-42	No		No
SW-24	RES	RZ6	New winter storage reservoir (RZ 6)	No	No	No	Duplicate of other more specific reservoir sites in the WRZ 6	No		No

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SW-25	RES	RZ7	New winter storage reservoir (RZ 7)	No	No	No	Duplicate of other more specific reservoir sites in the WRZ 7	No		No
SW-26	RES	RZ8	New winter storage reservoir (RZ 8)	No	No	No	Duplicate of other more specific reservoir sites in the WRZ 7	No		No
SW-27	NSW	RZ8	New surface water abstraction from the River Stour downstream of Ashford	Yes	No	No	River abstraction without storage is not viable. Other options (eg Broad Oak: SW-14) cover abstraction from Stour with storage.	No		No
SW-28	NSW	RZ8	Direct abstraction from gravel pits along Great Stour	Yes	No	No	Generic option superseded by options SW-64 to SW-67	No		No
SW-29	RES	RZ8	Use Chislet Marshes ditches as storage reservoir	No	No	No	Reservoir site not suitable	No		No
SW-30	NSW	RZ8	Winter surface water abstraction from Stour	Yes	No	No	Winter abstraction without storage is not viable. Other options cover abstraction at Pluck Gutter with storage.	No		No
SW-31	RES	RZ4	Beech Hill - Blackwater	Yes	No	No	Duplicate of SW-33 (SW-31 filled from Blackwater only)	No		No
SW-32	RES	RZ4	Beech Hill - Loddon	Yes	No	No	Duplicate of SW-33 (SW-32 filled from Loddon only)	No		No
SW-33	RES	RZ4	Beech Hill - Loddon & Blackwater	Yes	Yes	No	Rejected as per environmental focus group (EFG) comment.	No		No
SW-34	RES	RZ4	Wildmoor Farm	No	No	No	Reservoir site not suitable	No		No
SW-35	RES	RZ4	Hawthorn Hill	Yes	No	No	Excessive unit cost	No		No
SW-36	RES	RZ5	Malt House Kingley Reservoir	Yes	No	No	Excessive unit cost	No		No
SW-37	RES	RZ5	Blackmoor (Wey)	No	No	No	Located within National Park	No		No
SW-38	RES	RZ5	Blackmoor (Rother)	No	No	No	Located within National Park	No		No
SW-40	RES	RZ3	New Arlington Reservoir	Yes	Yes	Yes		Yes		Yes

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SW-41	RES	RZ3	Raise Arlington Reservoir, R. Cuckmere	Yes	Yes	Yes		Yes		No
SW-42	RES	RZ2	Withyham Reservoir, Medway catchment	Yes	Yes	No	Relegated to reserve list. AONB consultation suggests that no impounding reservoir will be accepted in AONB.	No		No
SW-43	RES	RZ2	Holtye Reservoir, Medway catchment	No	No	No	Impact on scheduled monument and 40ha of registered park or garden.	No		No
SW-44	RES	RZ1	Postern Park on R. Medway	No	No	No	Loss of 4 listed buildings, ALC Grade 2 agricultural land, BAP Habitat Group and National Flood Zone.	No		No
SW-45	RES	RZ2	Bevern Stream Reservoir, Lower Ouse	No	No	No	Building borders the reservoir outline, sensitive area between rivers, - No scope to avoid.	No		No
SW-46	RES	RZ2	Furner's Green Reservoir, Ouse catchment	Yes	No	No	The option impacts ancient woodland, lake and buildings.There is a road running through reservoir.	No		No
SW-47	RES	RZ2	Foxhole Reservoir, Ouse catchment	No	No	No	Loss of scheduled monument. No scope to avoid.	No		No
SW-48	RES	RZ2	Clay Hill Reservoir, Lower Ouse - Option 1	Yes	Yes	No	Rejected as per environmental focus group (EFG) comment.	No		No
SW-49	RES	RZ2	Clay Hill Reservoir, Lower Ouse - Option 2	No	No	No	Variant of Clayhill option SW-48	No		No
SW-50	RES	RZ2	Clay Hill Reservoir, Lower Ouse - Option 2 with reduced bulk supply from SWS	No	No	No	Variant of Clayhill option SW-48	No		No
SW-51	RES	RZ2	Broyle Place Reservoir	Yes	Yes	Yes		No	Bunded reservoir in greenfield site with no existing water supply infrastructure and with perceived greater promotability risk.	No

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SW-52	RES	RZ3	Bunded Reservior 10Ml/d	Yes	Yes	No	Relegated to reserve list. Potential impact on listed buildings. On reserve list due to low unit cost.	No		No
SW-53	RES	RZ3	Laughton Reservoir	Yes	No	No	Proximity of airfield; existing lake within reservoir and some ancient woodland.	No		No
SW-54	RES	RZ3	Bunded Reservior 5Ml/d	Yes	Yes	No	Relegated to reserve list. Potential impact on listed buildings. On reserve list due to low unit cost.	No		No
SW-55	RES	RZ3	Willard's Hill Reservoir, Rother catchment	Yes	No	No	Ancient woodland; WFD natural river good status	No		No
SW-56	RES	RZ2	Batt's Wood Reservoir, Rother catchment	Yes	No	No	Ancient woodland; listed buildings difficult to avoid; WFD natural river good status	No		No
SW-57	RES	RZ3	Kent Ditch Reservoir, Rother catchment	No	No	No	Loss of five listed buildings, ancient woodland (45 ha), B road and local road. No scope to avoid.	No		No
SW-58	RES	RZ3	Reservoir on Tillingham, Tillingham catchment	No	No	No	Loss of listed buildings and Ancient Woodland.	No		No
SW-59	RES	RZ3	Nunningham Stream Reservoir, Wallers Haven	Yes	Yes	No	Relegated to reserve list. Potential impact on ancient woodland and listed buildings. On reserve list due to low unit cost.	No		No
SW-60	RES	RZ3	Hugletts Stream Reservoir, Wallers Haven	Yes	Yes	No	Relegated to reserve list. AONB consultation suggests that no impounding reservoir will be accepted in AONB.	No		No
SW-61	RES	RZ8	New abstraction, WTW and bankside storage res. at Plucks Gutter (SWS option)	No	No	No	Option owned by Southern Water Services	No		No
SW-62	RES	RZ7	Revised licence arrangements at Darwell (removal of environmental flow release) to raise DO	No	No	No	Option owned by Southern Water Services	No		No

GIS ID	Option Type	SEW WRZ	WRMP Option Name	Passed Screening Stage Filter: Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
SW-63	NSW	RZ6	Abstraction to Burham WTW	Yes	No	No	Option is dependent on an existing SWS abstraction and operational protocol so better progressed by SWS. Therefore, the option has not been progressed.	No		No
SW-64	NSW	RZ8	Conningbrook Gravel Pits	Yes	No	No	CAMS WRMU over abstracted hence no scope for water abstraction. If site converted to a surface water storage, the capacity is too small to provide useful yield. Site is SSSI.	No		No
SW-65	NSW	RZ8	Horton Gravel Pits	Yes	No	No	CAMS WRMU over abstracted hence no scope for water abstraction. If site converted to a surface water storage, the capacity is too small to provide useful yield.	No		No
SW-66	NSW	RZ8	Stodmarsh Gravel Pits	Yes	No	No	CAMS WRMU over abstracted hence no scope for water abstraction. If site converted to a surface water storage, the capacity is small to provide useful yield. Site is SSSI.	No		No
SW-67	NSW	RZ8	Wickhambreux Gravel Pits	Yes	No	No	CAMS WRMU over abstracted hence no scope for water abstraction. If site converted to a surface water storage, the capacity is too small to provide useful yield.	No		No
SW-70	RES	RZ2	Adur Burgesshill	Yes	No	No	Potential impact on ancient woodland	No		No
SW-71	RES	RZ2	Adur N1 Bunded Reservoir	No	No	No	Impacts on BAP Habitat Group and Land Management Group and National Flood Zone	No		No
SW-77	RES	RZ2	Goose Green Reservoir	Yes	Yes	Yes		No	Bunded reservoir in greenfield site with no existing water supply infrastructure and with perceived greater promotability risk.	No
SW-78	RES	RZ2	Shipley Reservoir	Yes	No	No	Potential impact on ancient woodland	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
SW-79	RES	RZ2	Ashurst Reservoir	Yes	Yes	No	Relegated to reserve list. Potential impact on listed buildings. On reserve list due to low unit cost.	No		No
SW-80	RES	RZ2	Cowfold Reservoir	Yes	Yes	No	Relegated to reserve list due to its proximity to Carthusian monastery.	No		No
SW-81	RES	RZ2	Shermanbury Reservoir	Yes	No	No	Too many buildings which cannot be avoided	No		No
SW-82	RES	RZ2	Twineham Green Reservoir	Yes	No	No	Potential impact on ancient woodland	No		No
SW-83	RES	RZ2	Wivelsfield Reservoir	Yes	Yes	No	Relegated to reserve list. Non preferred MCA option. Potential impact on building. On reserve list due to low unit cost.	No		No
SW-84	RES	RZ2	Bunded Reservoir - AH8	No	No	No	Impacts on BAP Habitat Group and Landscape Designation GIS Layers	No		No
SW-85	RES	RZ2	Cooksbridge Reservoir	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-86	RES	RZ2	Bunded Reservoir - AH10	No	No	No	Impacts on BAP Habitat Group and Landscape Designation and railway.	No		No
SW-87	RES	RZ2	Palehouse Common Reservoir	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-88	RES	RZ2	Bunded Reservoir - AH12	No	No	No	Loss of BAP Habitat Group area and listed building.	No		No
SW-89	RES	RZ2	Halland Reservoir (near Laughton)	Yes	Yes	Yes		No	Bunded reservoir in greenfield site with no existing water supply infrastructure and with perceived greater promotability risk.	No
SW-90	RES	RZ3	Bunded Reservoir - AH14	No	No	No	Impacts on several properties and a listed building.	No		No

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GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
SW-91	RES	RZ3	Brede - 02	No	No	No	Loss of a listed building, Countryside Stewardship Agreement, agricultural land and Ancient Woodland	No		No
SW-92	RES	RZ3	Brede - 01	No	No	No	Loss of listed buildings and >25ha of ancient woodland. Also impacts rail line at four locations.	No		No
SW-94	RES	RZ8	Beult Bethersden Val	Yes	No	No	Potential impact on ancient woodland	No		No
SW-95	RES	RZ6	Beult Cross	No	No	No	Rejected due to loss of 2 listed buildings, 3 other buildings and requires realignment of 1000m of a road.	No		No
SW-96	RES	RZ7	Beult Frittenden	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-97	RES	RZ8	Beult Shadoxhurst	Yes	No	No	Potential impact on ancient woodland	No		No
SW-98	RES	RZ7	Beult Sherway Val	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No
SW-99	RES	RZ7	Beult Smarden Val (potential bank side storage)	Yes	Yes	No	Relegated to reserve list. Bunded reservoir would not fit into relatively unspoiled and remote rural landscape.	No		No
SW-100	RES	RZ7	Beult Southernden	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-101	RES	RZ4	Sandhurst raw water reservoir - Fleet Copse / Eversley Cross	Yes	No	No	Active/Operational gravel pits are not viable option	No		No
SW-102	RES	RZ4	Sandhurst raw water reservoir - Moore Green	Yes	No	No	Site can be used as surface water abstraction option. However, ground water option GW-120, GW-121 and GW-122 in vicinity to utilize available water. Abstracting and treating ground water is more cost effective than abstracting and treating from a surface water source.	No		No
SW-103	RES	RZ4	Frimley raw water reservoir	Yes	No	No	Option rejected due to unsuitable geology (Camberley Sand - 50m)	No		No

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SW-104	RES	RZ4	Eversley to Eversley Cross	Yes	No	No	Active/Operational gravel pits are not viable option	No		No
SW-105	RES	RZ3	Hale Green Reservoir	No	No	No	Loss of stream, impact on Ancient Woodland and Listed Building. No scope to avoid.	No		No
SW-106	RES	RZ3	Cuckmere - 02	No	No	No	Impact on AONB and Listed buildings. Loss of stream. No scope to avoid	No		No
SW-107	RES	RZ3	Cuckmere - 03	No	No	No	Loss of listed buildings, residential property, public roads and ancient woodland. No scope to avoid.	No		No
SW-108	RES	RZ3	Cuckmere Caneheath	No	No	No	Loss of BAP habitat, CRow Act 2000 S16 Dedicated Land, agricultural land and ancient woodland. No scope to avoid.	No		No
SW-109	RES	RZ3	Broad Farm Reservoir	Yes	Yes	Yes		No	Bunded reservoir in greenfield site with no existing water supply infrastructure and with perceived greater promotability risk.	No
SW-110	RES	RZ3	Cuckmere Impounding Reservoir supplemented with pumping	No	No	No	Loss of scheduled monument, listed buildings, SSSI, Parks or Gardens and ancient woodland. No scope to avoid.	No		No
SW-111	RES	RZ3	Wartling Reservoir	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-112	RES	RZ3	Cuckmere Bankside Storage Reservoir	No	No	No	Loss of ancient woodland.	No		No
SW-113	RES	RZ1	Eden Cooperscorner Val	No	No	No	Loss of ancient woodland (>9 ha). No scope to avoid.	No		No
SW-114	RES	RZ1	Eden Edenbridge	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No

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SW-115	RES	RZ2	Eden Edenbridge Val	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-116	RES	RZ2	Eden Newchapel	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No
SW-117	RES	RZ8	Gstour Broadoak	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-118	RES	RZ8	Gstour Minster	No	No	No	Loss of Agricultural Land (grades 1 and 2). No scope to avoid	No		No
SW-119	RES	RZ8	Gstour Sholden	No	No	No	Impacts on Reserves and Parks Group and National Flood Zone	No		No
SW-120	RES	RZ8	Gstour Stourmouth	Yes	No	No	Impact on Grade 1 agricultural land	No		No
SW-121	RES	RZ8	Gstour Thorndenwood	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No
SW-122	RES	RZ8	Gstour Westbleanwood	No	No	No	Impacts on BAP Habitat Group and Reserves and Parks Group	No		No
SW-123	RES	RZ8	Gstour Westmarsh	Yes	No	No	Impact on Grade 1 agricultural land	No		No
SW-124	RES	RZ3	Coombe Haven - 01	No	No	No	Impacts on registered battlefield (6 ha), Registered Park/Garden (18ha), listed building and ancient woodland.	No		No
SW-125	RES	RZ3	Coombe Haven - 02	No	No	No	Impacts on listed building, public road and ancient woodland.	No		No
SW-126	RES	RZ3	Coombe Haven - 03	No	No	No	Less than 1.5 MCM capacity. Loss of >6ha of ancient woodland. No scope to avoid.	No		No
SW-130	RES	RZ4	Chineham Reservoir	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-133	RES	RZ4	Loddon N5 Bankside Storage Reservoir	No	No	No	Loss of Special Protection Area. No scope to avoid.	No		No

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SW-134	RES	RZ4	Loddon N6 Bankside Storage Reservoir	No	No	No	Loss of scheduled monument, six listed buildings and > 5ha of ancient woodland.	No		No
SW-136	RES	RZ2	Medway - 02	No	No	No	Impact on listed buildings and ancient woodland.	No		No
SW-137	RES	RZ2	Medway - 03	No	No	No	Loss of Registered Park or Garden, listed buildings, large area ancient woodland. No scope to avoid.	No		No
SW-139	RES	RZ1	Medway - 05	No	No	No	Loss of Ancient Woodland and Listed Buildings. No scope to avoid.	No		No
SW-141	RES	RZ2	Medway - 07	No	No	No	Loss of 89ha of Registered Parks and Gardens, 32ha ancient woodland, Scheduled Monument and 5 listed buildings.	No		No
SW-143	RES	RZ2	Medway - 10	No	No	No	Loss of Ancient Woodland, impact on stream and fisheries. No scope to avoid	No		No
SW-145	RES	RZ2	Medway - 13	No	No	No	Loss of >30 listed buildings and ancient woodland (18 ha). No scope to avoid.	No		No
SW-146	RES	RZ1	Medway - 14	No	No	No	Loss of one listed building, five other buildings and local road network. No scope to avoid.	No		No
SW-148	RES	RZ7	Reservoir on Alder Stream	No	No	No	Very small reservoir with loss of 2.2 ha ancient woodland and listed building.	No		No
SW-149	RES	RZ7	Reservoir on Tudeley Brook	No	No	No	Very small reservoir, no scope to expand due to loss of ancient woodland.	No		No
SW-150	RES	RZ7	Reservoir on Tudeley Brook	No	No	No	Very small reservoir, no scope to expand due to loss of ancient woodland.	No		No
SW-151	RES	RZ1	On Medway - North Bank storage at Postern Park	No	No	No	Loss of three listed buildings and residential property. Also located within a flood zone	No		No
SW-152	RES	RZ1	Enlarged storage at Pembury	No	No	No	Limited scope for additional capacity.	No		No

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SW-153	RES	RZ1	Medway Charcott	No	No	No	Loss of ancient woodland (>4 ha). No scope to avoid.	No		No
SW-154	RES	RZ6	Medway Cliffe Woods	No	No	No	Loss of a residential area, 600m of road realignment and agricultural land (ALC Grade 2&3).	No		No
SW-155	RES	RZ1	Medway Coldharbour Val	Yes	No	No	Small capacity hence not prfeferred to other sites	No		No
SW-156	RES	RZ6	Medway Eccles	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-157	RES	RZ1	Medway Hadlow1	Yes	No	No	Small reservoir and Grade 2 agricultural land	No		No
SW-158	RES	RZ1	Medway Hadlow2	Yes	No	No	Impact on listed buildings	No		No
SW-159	RES	RZ6	Medway Hadlow3 Val	No	No	No	Impacts on BAP Habitat Group, Landscape Designation and Reserves and Parks Group. National flood zone.	No		No
SW-160	RES	RZ8	Medway Kingsnorth	Yes	No	No	Impact on Grade 1 agricultural land	No		No
SW-161	RES	RZ6	Medway Nettlestead	No	No	No	Impact on BAP Habitat Group, listed buildings and road.	No		No
SW-162	RES	RZ6	Medway St Mary Hoo1	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No
SW-163	RES	RZ6	Medway St Mary Hoo2	No	No	No	Loss of buildings and road capacity. No scope to avoid	No		No
SW-164	RES	RZ2	Impounding	No	No	No	Impacts on residential area, 600m of a road realignment and high quality agricultural land (ALC Grade 2&3).	No		No
SW-166	RES	RZ7	Impounding/ supplemented with pumping	No	No	No	Loss of scheduled monument, Park or Garden, listed buildings, large amount ancient woodland. No scope to avoid.	No		No

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SW-167	RES	RZ7	Impounding/ supplemented with pumping	No	No	No	Loss of scheduled monument, ancient woodland (>10 ha) and nine listed buildings. No scope to avoid.	No		No
SW-168	RES	RZ7	Bunded Reservoir (in locality)	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No
SW-172	RES	RZ6	Medway bunded storage (10 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Medway catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-173	RES	RZ6	Medway bunded storage (25 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Medway catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-174	RES	RZ6	Medway bunded storage (50 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Medway catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-175	RES	RZ6	Medway bunded storage (100 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Medway catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-176	RES	RZ6	Medway bunded storage (150 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Medway catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-177	RES	RZ6	Medway bunded storage (200 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Medway catchment as potential regional option indicated unlikely to be taken forward	No		No

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SW-178	RES	RZ6	Medway Barrage at Rochester (10 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Medway catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-181	RES	RZ2	Raise Ardingly Reservoir	Yes	Yes	Yes		Yes		No
SW-183	RES	RZ2	Reservoir on the Ouse - 07	No	No	No	No scope to avoid loss of a listed building and impact on 5ha ancient woodland.	No		No
SW-184	RES	RZ2	Reservoir on the Ouse - 09	No	No	No	Loss of scheduled monument, four listed buildings and >10 ha of ancient woodland. No scope to avoid.	No		No
SW-186	RES	RZ2	Reservoir on the Ouse - 12	No	No	No	Loss of scheduled monument and SSSI (4 ha). No scope to avoid without maintaining sufficient capacity.	No		No
SW-188	RES	RZ2	Reservoir on the Ouse - 14	No	No	No	Loss of >10 Listed buildings. No scope to avoid.	No		No
SW-189	RES	RZ2	Ouse Ashtongreen	Yes	Yes	No	Relegated to reserve list. Potential impact on farm building. On reserve list due to low unit cost.	No		No
SW-190	RES	RZ2	Ouse Chailey_val	No	No	No	Impacts on BAP Habitat Group	No		No
SW-191	RES	RZ3	Ouse Chalvington	Yes	Yes	No	Relegated to reserve list. Closer to South Downs AONB than other feasible alternatives and thus less likely to be deliverable.	No		No
SW-192	RES	RZ2	Ouse Framfield Val	Yes	No	No	Small capacity with significant impact on ancient woodland	No		No
SW-193	RES	RZ2	Ouse Glyndebourne	No	No	No	Impacts on BAP Habitat Group and Land Management Group	No		No
SW-194	RES	RZ3	Ouse Laughton	No	No	No	Impacts on BAP Habitat Group and Land Management Group	No		No

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SW-195	RES	RZ3	Ouse Laughton2	Yes	Yes	No	Relegated to reserve list. Potential impact on listed buildings. On reserve list due to low unit cost.	No		No
SW-196	RES	RZ3	Ouse Markcross	Yes	No	No	Flood risk and impact on transmission line	No		No
SW-197	RES	RZ2	Ouse Markcross2	No	No	No	Loss of ancient woodland (>2 Hectares). No scope to avoid.	No		No
SW-198	RES	RZ2	Ouse Norlngton Val	No	No	No	Rejected due to loss of scheduled monument. No scope to avoid.	No		No
SW-199	RES	RZ2	Ouse Plumpton Val	Yes	No	No	Impact on ancient woodland.	No		No
SW-200	RES	RZ2	Ouse Scufflings	No	No	No	Loss of BAP habitat, Countryside Stewardship Agreement, agricultural land and ancient woodland. No scope to avoid.	No		No
SW-201	RES	RZ2	Ouse Shortgate	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-204	RES	RZ2	Ouse N3 - Impounding Reservoir	No	No	No	Loss of scheduled monuments, listed buildings, parks or gardens, woodland trust and SSSI. No scope to avoid.	No		No
SW-205	RES	RZ2	Bunded Reservoir (in locality)	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-206	RES	RZ2	Bunded Reservoir (in locality) Check Q flows for the right limit	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-207	RES	RZ3	Pevensey Hooe Val	Yes	No	No	The preliminary AIC of the scheme is >£5000/Ml. Option is expensive hence it has been rejected.	No		No
SW-208	NSW	RZ8	River Abstraction at Plucks Gutter	Yes	No	No	River abstraction without storage is not viable. Other options (eg Broad Oak: SW-14) cover abstraction at Plucks Gutter with storage.	No		No

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SW-210	RES	RZ3	Rother - 03	No	No	No	Impact on AONB, loss of ancient woodland and impact on stream. No scope to avoid.	No		No
SW-211	RES	RZ3	Rother - 04	No	No	No	Loss of SSSI (>1 ha) and ancient woodland (15 ha). No scope to avoid.	No		No
SW-212	RES	RZ2	Rother - 05	No	No	No	Impact on several streams, loss of Ancient Woodland and Listed Buildings. No scope to avoid	No		No
SW-214	RES	RZ3	Rother - 07	No	No	No	Loss of Scheduled Monument, five listed buildings and ancient woodland (27 ha). No scope to avoid.	No		No
SW-215	RES	RZ3	Rother - 08	No	No	No	Loss of five listed buildings, ancient woodland (45 ha), B road and local road. No scope to avoid.	No		No
SW-216	RES	RZ7	Rother Tenterden	No	No	No	Loss of three listed buildings and ancient woodland (66 ha). No scope to avoid.	No		No
SW-217	RES	RZ2	Rother N1 - Impounding Reservoir	Yes	No	No	Ancient woodland; listed buildings difficult to avoid; WFD natural river good status	No		No
SW-218	RES	RZ3	Rother N2 - Impounding Reservoir	Yes	Yes	No	Relegated to reserve list. AONB consultation suggests that no impounding reservoir will be accepted in AONB.	No		No
SW-220	RES	RZ7	Rother N4 - Bankside storage reservoir	No	No	No	Impact on Listed Buildings, Ancient Woodland and stream. No scope to avoid.	No		No
SW-221	RES	RZ7	Rother Bankside Storage Reservoir, location optional within the locality	No	No	No	Limited capacity, within designated flood zone	No		No
SW-222	RES	RZ7	Bankside storage reservoir	No	No	No	Loss of scheduled monument, agricultural land (ALC grade 2&3), National Flood Zone and within an AONB. No scope to avoid.	No		No

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SW-223	RES	RZ7	Bankside storage reservoir	No	No	No	Loss of scheduled monument, BAP habitat (wet woodland), National Flood Zone and within an AONB. No scope to avoid.	No		No
SW-224	RES	RZ8	Fully bunded, location optional within the locality	Yes	No	No	Too close to Royal Military Canal	No		No
SW-225	RES	RZ8	Fully bunded, location optional within the locality	No	No	No	Loss of high quality agricultural land (ALC grade 2). Full extents with a National Flood Zone and an AONB. No scope to avoid.	No		No
SW-226	RES	RZ3	Impounding	No	No	No	Loss of National Flood Zone and within an Area of Outstanding Natural Beauty. No scope to avoid.	No		No
SW-227	RES	RZ3	Rother bunded storage (10 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Rother catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-228	RES	RZ3	Rother bunded storage (25 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Rother catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-229	RES	RZ3	Rother bunded storage (50 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Rother catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-230	RES	RZ3	Rother bunded storage (100 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Rother catchment as potential regional option indicated unlikely to be taken forward	No		No

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GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
SW-231	RES	RZ3	Rother bunded storage (150 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Rother catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-232	RES	RZ3	Rother bunded storage (200 Mm3)	Yes	No	No	Initial feedback from WRSE group from assessment of conceptual bunded option in the Rother catchment as potential regional option indicated unlikely to be taken forward	No		No
SW-233	RES	RZ5	Petersfield Bankside Storage Reservoir - Option a	No	No	No	Loss of National Park land. No scope to avoid	No		No
SW-234	RES	RZ5	Petersfield - Option b	No	No	No	All reservoir within National Park.	No		No
SW-235	RES	RZ2	Batt's Wood Reservoir, Rother catchment	No	No	No	Already included as variant of SW-56	No		No
SW-236	RES	RZ2	Batt's Wood Reservoir, Rother catchment	No	No	No	Already included as variant of SW-56	No		No
SW-237	RES	RZ3	Maplestone Reservoir, Tillingham catchment	No	No	No	Impact on stream and Ancient Woodland with no viable mitigation. No scope to avoid.	No		No
SW-238	RES	RZ3	Hugletts Stream Reservoir, Wallers Haven (a)	No	No	No	Already included as variant of SW-60	No		No
SW-239	RES	RZ3	Hugletts Stream Reservoir, Wallers Haven (b)	No	No	No	Already included as variant of SW-60	No		No
SW-240	RES	RZ8	Stubbs Cross Reservoir	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-241	RES	RZ8	Westwell Reservoir	Yes	No	No	Golf course, business park, and across stream	No		No
SW-243	RES	RZ8	Monkton Reservoir	Yes	No	No	Grade 1 agricultural land	No		No
SW-244	RES	RZ8	Hoath Reservoir	Yes	Yes	No	Relegated to reserve list. Flooding of braided river channel is likely to be unacceptable.	No		No

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SW-245	RES	RZ8	Swale Harty	Yes	Yes	No	Relegated to reserve list. Preferred MCA option. However, the preliminary AIC of the scheme is >£5000/Ml.	No		No
SW-246	RES	RZ8	Swale Iwade	Yes	No	No	Grade 1 agricultural land	No		No
SW-247	RES	RZ6	Teise Hunton	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-248	RES	RZ7	Teise Paddock	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-249	RES	RZ7	Teise Staplehurst Val	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-250	RES	RZ4	Ruscombe Lake	No	No	No	Rejected because of the National Flood Zone.	No		No
SW-251	RES	RZ4	Littlewick Green Reservoir	Yes	No	No	Scored badly at fine screening (MCA). Excessive unit cost.	No		No
SW-252	RES	RZ3	Hugletts Stream Reservoir, Wallers Haven (variant of Option SR-W-02-10-70)	No	No	No	Already included as variant of SW-60	No		No
SW-253	RES	RZ3	Wallers Haven - 03	No	No	No	Loss of scheduled monuments, listed buildings, registered Parks or Gardens and ancient woodland. No scope to avoid.	No		No
SW-254	RES	RZ3	Kitchenham Reservoir (Wallers Haven)	No	No	No	Impact on stream and fisheries. Loss of Ancient Woodland. No scope to avoid.	No		No
SW-255	RES	RZ3	Moorhall Reservoir	Yes	Yes	No	Relegated to reserve list. Potential impact on ancient woodland. On reserve list due to low unit cost.	No		No
SW-256	RES	RZ5	Frithend Ho embankment	No	No	No	Loss of scheduled monument and National Park. No scope to avoid.	No		No
SW-258	RES	RZ5	Bunded	No	No	No	Rejected due to its impact on BAP Habitat Group, Reserves and Parks Group and Landscape Designation Group	No		No

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SW-261	RES	RZ6	Longham Wood Reservoir, Thurnham (impounding)	Yes	No	No	Very small capacity; cannot avoid ancient woodland; cost/unit yield twice most of the others	No		No
SW-262	NSW	RZ1	Abstraction from existing Gravel Pits - RZ1	Yes	No	No	CAMS WRMU status as no water available. If site is to be converted to a surface water storage site, the capacity is too small to provide useful yield.	No		No
SW-263	NSW	RZ2	Abstraction from existing Gravel Pits - RZ2	Yes	No	No	Site on minor or non aquifer hence site not a surface water abstraction. If converted to surface water storage site the capacity is too small to provide useful yield.	No		No
SW-264	NSW	RZ3	Abstraction from existing Gravel Pits - RZ3	Yes	No	No	CAMS WRMU status as no water available. If site is to be converted to a surface water storage site, the capacity is too small to provide useful yield.	No		No
SW-265	NSW	RZ4	Abstraction from existing Gravel Pits - RZ4	Yes	No	No	CAMS WRMU status as no water available. If site is to be converted to a surface water storage site, the capacity is too small to provide useful yield.	No		No
SW-266	NSW	RZ5	Abstraction from existing Gravel Pits - RZ5	Yes	No	No	CAMS WRMU status as no water available. If site is to be converted to a surface water storage site, the capacity is too small to provide useful yield.	No		No
SW-267	NSW	RZ6	Abstraction from existing Gravel Pits - RZ6	Yes	No	No	CAMS WRMU over abstracted hence no scope for water abstraction. If site converted to a surface water storage, the capacity is small to provide useful yield	No		No
SW-268	NSW	RZ7	Abstraction from existing Gravel Pits - RZ7	Yes	No	No	No Gravel pit option in the resource zone	No		No
SW-269	NSW	RZ8	Abstraction from existing Gravel Pits - RZ8	Yes	No	No	Site on minor or non aquifer hence site not a surface water abstraction. If converted to surface water storage site the capacity too small to provide useful yield.	No		No

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SW-270	NSW	RZ1	Drainage Water from Internal drainage boards to water supply - RZ1	Yes	No	No	Potential resource discharged upstream of proposed river intake location for reservoir is already taken into account. Potential resource from the remaining area is relatively small compared with upstream catchment and unlikely to provide reliable yield.	No		No
SW-271	NSW	RZ2	Drainage Water from Internal drainage boards to water supply - RZ2	Yes	No	No	Potential resource discharged upstream of proposed river intake location for reservoir is already taken into account. Potential resource from the remaining area is relatively small compared with upstream catchment and unlikely to provide reliable yield.	No		No
SW-272	NSW	RZ3	Drainage Water from Internal drainage boards to water supply - RZ3	Yes	No	No	Potential resource discharged upstream of proposed river intake location for reservoir is already taken into account. Potential resource from the remaining area is relatively small compared with upstream catchment and unlikely to provide reliable yield.	No		No
SW-273	NSW	RZ4	Drainage Water from Internal drainage boards to water supply - RZ4	No	No	No	No existing drainage schemes in this zone	No		No
SW-274	NSW	RZ5	Drainage Water from Internal drainage boards to water supply - RZ5	No	No	No	No existing drainage schemes in this zone	No		No
SW-275	NSW	RZ6	Drainage Water from Internal drainage boards to water supply - RZ6	Yes	No	No	Potential resource discharged upstream of proposed river intake location for reservoir is already taken into account. Potential resource from the remaining area is relatively small compared with upstream catchment and unlikely to provide reliable yield.	No		No

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SW-276	NSW	RZ7	Drainage Water from Internal drainage boards to water supply - RZ7	Yes	No	No	Potential resource discharged upstream of proposed river intake location for reservoir is already taken into account. Potential resource from the remaining area is relatively small compared with upstream catchment and unlikely to provide reliable yield.	No		No
SW-277	NSW	RZ8	Drainage Water from Internal drainage boards to water supply - RZ8	Yes	No	No	Potential resource discharged upstream of proposed river intake location for reservoir is already taken into account. Potential resource from the remaining area is relatively small compared with upstream catchment and unlikely to provide reliable yield.	No		No
SW-278	NSW	RZ2	Transfer Adur to Ardingly Reservoir	Yes	Yes	Yes		Yes		No
LT-1	LIC	RZ6	Aylesford Newsprint/SCA – Industrial user who has under-utilised GW abstraction.	Yes	Yes	No	No positive response from Licensee	No		No
LT-2	LIC	RZ6	Aylesford Newsprint/SCA – Industrial user who has private GW abstraction.	Yes	Yes	No	No positive response from Licensee	No		No
LT-6	LIC	RZ6	EA licence No: 9/40/01/0032/GR	Yes	Yes	No	No positive response from Licensee	No		No
LT-7	LIC	RZ8	EA licence No: 9/40/04/0039/SR	Yes	Yes	No	No positive response from Licensee	No		No
LT-8	LIC	RZ6	EA licence No: 9/40/01/0050/GR	Yes	Yes	No	No positive response from Licensee	No		No
LT-9	LIC	RZ8	EA licence No: 9/40/02/0115/A/GR	Yes	Yes	No	No positive response from Licensee	No		No
LT-10	LIC	RZ8	EA licence No: 9/40/05/0036/GR	Yes	Yes	No	No positive response from Licensee	No		No
LT-11	LIC	RZ6	EA licence No: 9/40/02/0064/B/GR	Yes	Yes	No	No positive response from Licensee	No		No

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LT-12	LIC	RZ6	EA licence No: 9/40/02/0227/G	Yes	Yes	No	No positive response from Licensee	No		No
LT-13	LIC	RZ6	EA licence No: 9/40/01/0086/GR	Yes	Yes	No	No positive response from Licensee	No		No
LT-14	LIC	RZ6	EA licence No: 9/40/01/0195	Yes	Yes	No	No positive response from Licensee	No		No
LT-15	LIC	RZ6	EA licence No: 9/40/01/0069/B/GR	Yes	Yes	No	No positive response from Licensee	No		No
LT-16	LIC	RZ4	EA licence No: 28/39/27/0131	Yes	Yes	No	No positive response from Licensee	No		No
LT-17	LIC	RZ4	EA licence No: 28/39/22/0498	Yes	Yes	No	No positive response from Licensee	No		No
LT-18	LIC	RZ4	EA licence No: 28/39/23/0018	Yes	Yes	No	No positive response from Licensee	No		No
LT-19	LIC	RZ4	EA licence No: 28/39/23/0183	Yes	Yes	No	No positive response from Licensee	No		No
LT-20	LIC	RZ4	EA licence No: 28/39/23/0011	Yes	Yes	No	No positive response from Licensee	No		No
LT-21	LIC	RZ4	EA licence No: 28/39/22/0117	Yes	Yes	No	No positive response from Licensee	No		No
LT-22	LIC	RZ8	EA licence No: 01/115	Yes	Yes	No	No positive response from Licensee	No		No
LT-23	LIC	RZ4	EA licence No: 28/39/23/0124	Yes	Yes	No	No positive response from Licensee	No		No
LT-24	LIC	RZ4	EA licence No: 28/39/25/0072	Yes	Yes	No	No positive response from Licensee	No		No
LT-25	LIC	RZ2	EA licence No: 10/41/261002	Yes	Yes	No	No positive response from Licensee	No		No
LT-26	LIC	RZ8	EA licence No: 9/40/02/0024/GR	Yes	Yes	No	No positive response from Licensee	No		No
LT-27	LIC	RZ8	EA licence No: 9/40/06/0193/G	Yes	Yes	No	No positive response from Licensee	No		No
LT-28	LIC	RZ4	EA licence No: 28/39/26/0122	Yes	Yes	No	No positive response from Licensee	No		No
LT-29	LIC	RZ8	EA licence No: 9/40/04/0022/GR	Yes	Yes	No	No positive response from Licensee	No		No

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LT-30	LIC	RZ6	EA licence No: 9/40/03/0163/SR	Yes	Yes	No	No positive response from Licensee	No		No
LT-31	LIC	RZ8	EA licence No: 08/103	Yes	Yes	No	No positive response from Licensee	No		No
LT-32	LIC	RZ4	EA licence No: 11/42/22.3/150	Yes	Yes	No	No positive response from Licensee	No		No
LT-33	LIC	RZ5	EA licence No: 32/070	Yes	Yes	No	No positive response from Licensee	No		No
LT-34	LIC	RZ2	EA licence No: 21/126	Yes	Yes	No	No positive response from Licensee	No		No
LT-35	LIC	RZ6	EA licence No: 9/40/02/0110/GR	Yes	Yes	No	No positive response from Licensee	No		No
LT-36	LIC	RZ1	EA licence No: 9/40/03/0203/A/GR	Yes	Yes	No	No positive response from Licensee	No		No
EF-1	EFF	RZ3	Effluent reuse to Cuckmere River : source - Newhaven	Yes	No	No	River Ouse/Barcombe provide better options for Newhaven	No		No
EF-2	EFF	RZ3	Effluent reuse to Arlington Reservoir : source - Newhaven	Yes	No	No	River Ouse/Barcombe provide better options for Newhaven	No		No
EF-3	EFF	RZ3	Effluent reuse to Cuckmere River : source - Eastbourne	No	No	No	Eastbourne WwTW inaccessible (underground in town centre)	No		No
EF-4	EFF	RZ3	Effluent reuse to Arlington Reservoir : source - Eastbourne	No	No	No	Eastbourne WwTW inaccessible (underground in town centre)	No		No
EF-5	EFF	RZ2	Effluent reuse to River Ouse: source - Newhaven	Yes	Yes	Yes		Yes		No
EF-6	EFF	RZ2	Effluent reuse to RZ2 WTW: Source - Newhaven	Yes	Yes	No	Relegated to reserve list. (combined with EF-5)	No		No
EF-7	EFF	RZ2	Effluent reuse to River Ouse: source – Peacehaven	Yes	Yes	Yes		Yes		Yes
EF-8	EFF	RZ2	Effluent reuse to RZ2 WTW: Source - Peacehaven	Yes	Yes	No	Relegated to reserve list. (combined with EF-7)	No		No
EF-9	EFF	RZ3	Effluent reuse to Wallers Haven: source - Bexhill	Yes	Yes	Yes		Yes		No

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EF-10	EFF	RZ2	Effluent reuse direct to supply	No	No	No	Effluent reuse direct to supply not currently acceptable by consumers	No		No
EF-11	EFF	RZ6	Aylesford effluent re-use at Aylesford	Yes	Yes	Yes		Yes		Yes
EF-12	EFF	RZ8	Aylesford effluent re-use at Blean	No	No	No	Option EF-11 provides more effective use of Aylesford effluent	No		No
EF-13	EFF	RZ6	Indirect use of effluent from Ashford By brook WwTW - into River Beult	Yes	No	No	River Beult SSSI is likely to be a showstopper with natural England and the EA	No		No
EF-14a	EFF	RZ8	Indirect use of effluent from Ashford Bybrook WwTW - into Great Stour at Wye	Yes	No	No	Ashford development growth highly uncertain and Southern Water will need to deal with effluent discharge anyway.	No		No
EF-14b	EFF	RZ8	Indirect use of effluent from Ashford Bybrook WwTW - into Great Stour at Chilham	Yes	No	No	Ashford development growth highly uncertain and Southern Water will need to deal with effluent discharge anyway.	No		No
EF-15	EFF	RZ8	Indirect Use of effluent from Weatherlees WwTW - into Great Stour	Yes	Yes	Yes		Yes		No
EF-22	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Ham Hill WwTW	Yes	No	No	Aylesford is a preferable option for augmentation of the Medway at Springfield	No		No
EF-23	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Stoke WwTW	No	No	No	Works located on wrong side of Medway Estuary	No		No
EF-24	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Motney Hill WwTW	Yes	No	No	Presence of Natura 2000 site at WwTW site (and first section of pipeline route) could be a potential showstopper	No		No
EF-25	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Queenborough WwTW	No	No	No	Located on Isle of Sheppey with no viable options locally	No		No
EF-26	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Hoo Island	No	No	No	Saline effluent	No		No

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EF-27	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Holborough Cement	No	No	No	Works now disused	No		No
EF-28	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Grain Power Station	No	No	No	Saline effluent	No		No
EF-29	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Natural Gas Installation	No	No	No	Saline effluent	No		No
EF-30	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Kingsnorth Works	No	No	No	Works located on wrong side of Medway Estuary	No		No
EF-31	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Wellmarsh	No	No	No	Works located on wrong side of Medway Estuary	No		No
EF-32	EFF	RZ6	Industrial Effluent Reuse in Lower Medway - Rushenden Marshes	No	No	No	Saline effluent	No		No
EF-33	EFF	RZ8	Effluent Reuse, EA Stour regional study - Faversham WwTW	No	No	No	Insufficient effluent flow	No		No
EF-34	EFF	RZ8	Effluent Reuse, EA Stour regional study - Herne Bay WwTW	No	No	No	Insufficient effluent flow	No		No
EF-35	EFF	RZ8	Effluent Reuse, EA Stour regional study - Ramsgate/Sandwich/Richborough	No	No	No	This is part of Weatherlees WwTW. Hence included in EF-15.	No		No
EF-36	EFF	RZ8	Effluent Reuse, EA Stour regional study - transfer of Bybrook WwTW (Ashford) to Great Stour	No	No	No	Duplicate of EF-14a/14b	No		No

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EF-37	EFF	RZ8	Effluent Reuse, EA Stour regional study - Aylesford WwTW to support Aylesford Newsprint	No	No	No	Southern Water progressing Aylesford options	No		No
EF-38	EFF	RZ8	Effluent Reuse, EA Stour regional study - Ford WwTW	No	No	No	No WwTW (error in original identification)	No		No
EF-39	EFF	RZ8	Effluent Reuse, EA Stour regional study - Ashford Growth - increased abstraction downstream	No	No	No	Duplicate of EF-14a/14b	No		No
EF-40	EFF	RZ8	Effluent Reuse, EA Stour regional study - as EA7 (g) with reduced abstraction at Chilham and Godmersham	No	No	No	Duplicate of EF-14a/14b	No		No
EF-41	EFF	RZ8	Effluent Reuse, EA Stour regional study - as EA7 (g) with refill pipeline direct to Broad Oak	No	No	No	Reuse scheme does not benefit from flow regulation by Broadoak.	No		No
EF-42	EFF	RZ8	Effluent Reuse, EA Stour regional study - as EA7 (g) with abstraction at Plucks Gutter to Broadoak	No	No	No	Reuse scheme does not benefit from flow regulation by Broadoak	No		No
EF-43	EFF	RZ3	Effluent reuse to River Cuckmere: source – Peacehaven	Yes	No	No	River Ouse/Barcombe provide better options for Peacehaven	No		No
EF-44	EFF	RZ3	Effluent reuse to Arlington Reservoir : source - Peacehaven	Yes	No	No	River Ouse/Barcombe provide better options for Peacehaven	No		No
EF-45	EFF	RZ3	Effluent reuse to Darwell Reservoir: source - Bexhill	Yes	No	No	Southern Water very unlikely to accept effluent into Darwell Reservoir. Wallers Haven provides a better option for Bexhill	No		No
EF-46	EFF	RZ3	Effluent reuse to River Rother: source - Bexhill	Yes	No	No	Wallers Haven provides a better option for Bexhill	No		No

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EF-47	EFF	RZ2	Effluent Reuse Burgess Hill (Goddards Green WwTW) to RZ2 - River Ouse	Yes	No	No	EA highly likely to object to diversion of effluent as constitutes major part of River Adur flows	No		No
EF-48	EFF	RZ2	Effluent Reuse Burgess Hill (Goddards Green WwTW) to RZ2 - WTW	Yes	No	No	EA highly likely to object to diversion of effluent as constitutes major part of River Adur flows	No		No
EF-49	EFF	RZ2	Effluent Reuse Burgess Hill (Goddards Green WwTW) - new abstraction from Adur d/s of Goddards Green	Yes	No	No	EA highly likely to object to new abstraction	No		No
EF-50	EFF	RZ3	Effluent Reuse Hailsham to Cuckmere River	Yes	No	No	Objections to effluent diversion away from Pevensey Levels (Natura 2000 site) likely to be a showstopper	No		No
EF-51	EFF	RZ3	Effluent Reuse Hailsham to Arlington Reservoir	Yes	No	No	Objections to effluent diversion away from Pevensey Levels (Natura 2000 site) likely to be a showstopper	No		No
EF-52	EFF	RZ6	Effluent Reuse Whitewall Creek (estuary discharge) into Medway	No	No	No	Not a viable option	No		No
EF-53	EFF	RZ6	Effluent Reuse Sittingbourne (estuary discharge - Swale) into Medway	Yes	No	No	Expensive option for Medway compared to Aylesford or Ham Hill	No		No
EF-54	EFF	RZ8	Effluent Reuse Swalecliffe to tributary of Great Stour	No	No	No	Not a viable option	No		No
EF-55	EFF	RZ8	Effluent Reuse Broomfield Banks to East Stour	Yes	No	No	Expensive option with potentially significant environmental impacts	No		No
EF-56	EFF	RZ8	Effluent Reuse Hythe to East Stour	Yes	No	No	Potential significant impacts on East Stour and expensive option for relatively small resource	No		No
EF-57	EFF	RZ2	Effluent Reuse Crawley to River Ouse u/s of Ardingly	Yes	No	No	Diversion of effluent away from the River Mole likely to raise significant objections, and potential requirement for long brine pipeline if RO tertiary treatment needed	No		No

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EF-58	EFF	RZ6	Indirect Use of effluent from SW Ashford proposed WwTW - into River Beult	Yes	No	No	SW already have AMP5 scheme to sewer Chilmington Green in South-west Ashford and transfer flows to Bybrook	No		No
EF-59	EFF	RZ6	Re-use Gravesend to Medway	No	No	No	Not a viable option - transfer pipeline too long	No		No
DS-1	DES	RZ8	Reculver RO Desalination of brackish groundwater	Yes	Yes	Yes		Yes		No
DS-2	DES	RZ8	Offshore desalination plant at Reculver	Yes	No	No	Dropped due to poor MCA score or had other major disadvantages compared to other options.	No		No
DS-3	DES	RZ8	Reculver RO desalination of brackish groundwater. 1 BH. RO plant at Reculver	Yes	No	No	Concern over the legal implications from potential saline intrusion which is likely to result from coastal groundwater abstraction for desalination. However, it is worth investigation. Therefore option merged with DS-1	No		No
DS-4	DES	RZ8	Faversham RO Desalination of brackish groundwater	Yes	No	No	Concern over the legal implications from potential saline intrusion which is likely to result from coastal groundwater abstraction for desalination. However, it is worth investigation. Therefore option merged with DS-1	No		No
DS-5	DES	RZ8	Seasalter RO Desalination of brackish groundwater	Yes	No	No	Concern over the legal implications from potential saline intrusion which is likely to result from coastal groundwater abstraction for desalination. However, it is worth investigation. Therefore option merged with DS-1	No		No
DS-6	DES	RZ8	Desalination plant at Dungeness	Yes	No	No	Dropped due to poor MCA score or had other major disadvantages compared to other options.	No		No
DS-7	DES	RZ2	Desalination at Newhaven 10 Ml/d output (RZ2) - Mid Sussex	Yes	Yes	Yes		Yes		No
DS-8	DES	RZ3	Desalination at Newhaven 10 Ml/d output (RZ3) - Eastbourne	No	No	No	EA concern is a show-stopper	No		No

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DS-9	DES	RZ2	Desalination facility based on ship	No	No	No	Uncertainty on viability of the option	No		No
DS-10	DES	RZ3	Desalination coupled to biomass-fuelled power plant	Yes	Yes	Yes		Yes		No
DS-11	DES	RZ6	Medway estuary desalination plant	Yes	No	No	Dropped due to poor MCA score or had other major disadvantages compared to other options.	No		No
DS-14	DES	RZ2	Desalination of River Adur estuary water, at Shoreham, W Sussex. (Outside SEW supply area)	No	No	No	Not a viable option	No		No
DS-15	DES	RZ3	Desalination of River Cuckmere estuary water, at site between the sea and Arlington, East Sussex.	No	No	No	Not a viable option	No		No
DS-16	DES	RZ8	Desalination of River Great Stour estuary water, at Sandwich, Kent. (Outside SEW supply area).	No	No	No	Not a viable option	No		No
DS-17	DES	RZ6	Desalination of River Medway tidal water at Aylesford/Snodland.	Yes	Yes	No	Relegated to reserve list due to the need for long brine disposal pipeline.	No		No
DS-18	DES	RZ6	Desalination of River Medway tidal water at Chatham.	Yes	No	No	Dropped due to poor MCA score or had other major disadvantages compared to other options.	No		No
DS-19	DES	RZ3	Desalination of River Rother estuary water, at Rye, Kent.	No	No	No	Not a viable option	No		No
DS-20	DES	RZ3	Desalination of seawater at Eastbourne	Yes	Yes	No	Relegated to reserve list. Anticipated planning difficulties and competes with Newhaven option.	No		No
DS-21	DES	RZ5	Desalination of seawater at Havant, Hampshire. (Outside SEW supply area)	Yes	No	No	Dropped due to poor MCA score or had other major disadvantages compared to other options.	No		No

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DS-22	DES	RZ8	Desalination of seawater at Herne Bay to Whitstable area along North Kent coast.	Yes	No	No	Merged into option DS-1	No		No
DS-23	DES	RZ8	Desalination of seawater at Hythe, or nearby, East Kent coast.	Yes	Yes	No	Relegated to reserve list. Unsuitable location (20km from demand centre)	No		No
TR-3	RTR	RZ6	Transfer 10 Ml/d from SWS Burham WTW to Aylesford	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-4	RTR	RZ8	Transfer 10 Ml/d from SWS Medway Burham WTW to RZ8	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-7	RTR	RZ7	SWS Medway (Burham) to RZ7 - no increase to Bewl WTW	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-7a	RTR	RZ7	Transfer 14.6 Ml/d from SWS Bewl Reservoir to SEW Bewl Bridge WTW	Yes	Yes	Yes		Yes		No
TR-18	INT	RZ8	Tankering water from Sweden	No	No	No	High CO2 emission and storage/transport difficulties	No		No
TR-22	RTR	RZ6	Transfer to Southern Water from Detling SR (SEW RZ6) to Matt's Hill (SWS KME)	Yes	Yes	Yes		Yes		Yes
TR-22a	RTR	RZ6	Transfer from Matt's Hill (SWS KME) to Detling SR (SEW RZ6)	Yes	Yes	Yes		Yes		Yes
TR-25	NTR	RZ6	Large scale transfer from other parts of the UK (National Grid)	No	No	No	Currently being investigated as TWU Option	No		No
TR-26	NTR	RZ8	Tankering from Kielder Reservoir	No	No	No	Rejected on sustainability grounds	No		No

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TR-27	INT	RZ8	Towing icebergs from the Arctic	No	No	No	High CO2 emission and storage/transport difficulties. Global warming issues.	No		No
TR-31a	CTR	RZ7	SEW Transfer, Best Beech to Bewl: RZ2 to RZ7	Yes	Yes	Yes		Yes		No
TR-32	CTR	RZ2	SEW Transfer, Bewl to Best Beech: RZ7 to RZ2	Yes	Yes	Yes		Yes		No
TR-32a	CTR	RZ2	SEW Transfer, Bewl to Best Beech: RZ7 to RZ2	Yes	Yes	Yes		Yes		No
TR-32b	CTR	RZ2	SEW Transfer, Bewl to Best Beech: RZ7 to RZ2	Yes	Yes	Yes		Yes		No
TR-33a	CTR	RZ7	SEW Transfer, Blackhurst to Bewl: RZ1 to RZ7	Yes	Yes	Yes		Yes		No
TR-33b	CTR	RZ1	Kippings to Pembury SEW Medway (RZ7 to RZ1)	Yes	Yes	Yes		Yes		Yes
TR-35	CTR	RZ8	Transfer RZ6 to RZ8 (Maidstone to Canterbury) 10 Ml/d	Yes	Yes	Yes		Yes		No
TR-35b	CTR	RZ8	Transfer RZ6 to RZ8 (Maidstone to Canterbury) 15 Ml/d	Yes	Yes	Yes		Yes		No
TR-35c	CTR	RZ8	Transfer RZ6 to RZ8 (Maidstone to Canterbury) 30 Ml/d	Yes	Yes	Yes		Yes		No
TR-36	CTR	RZ6	Transfer RZ8 to RZ6 (Canterbury to Maidstone) 10 Ml/d	Yes	Yes	Yes		Yes		No
TR-37	CTR	RZ6	Transfer RZ8 to RZ6 (Canterbury to Maidstone) 15 Ml/d	Yes	Yes	Yes		Yes		No

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TR-38	CTR	RZ6	Transfer RZ8 to RZ6 (Canterbury to Maidstone) 30Ml/d	Yes	Yes	Yes		Yes		No
TR-39	CTR	RZ8	Transfer RZ7 to RZ8 (Bewl to Kingsnorth) - duplicate of existing main	Yes	Yes	Yes		Yes		No
TR-40	CTR	RZ8	Transfer RZ7 to RZ8 (Bewl to Aldington)	Yes	Yes	Yes		Yes		No
TR-41	CTR	RZ7	Transfer RZ8 to RZ7 (Kingsnorth to Bewl)	Yes	Yes	Yes		Yes		No
TR-41a	CTR	RZ7	Transfer RZ8 to RZ7 (Aldington to Bewl)	Yes	Yes	Yes		Yes		No
TR-42	RTR	RZ2	SWS Stopham SR to SEW Whitely Hill SR - 5 Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-42a	RTR	RZ2	SEW Whitely Hill SR to SWS Stopham SR - 5Ml/d	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No
TR-42b	RTR	RZ2	SEW Whitely Hill SR to SWS Stopham SR - 5Ml/d [duplicate of TR42a]	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No
TR-42c	RTR	RZ2	SWS Stopham SR to SEW Whitely Hill SR - 5 Ml/d (duplicate of TR 42)	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-44	CTR	RZ1	Transfer SEW RZ2 to SEW RZ1 (Whitely Hill SR to Blackhurst SR via Horsted Keynes SR)	Yes	Yes	Yes		Yes		No

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TR-44a	CTR	RZ1	Whitely Hill SR to Blackhurst SR via Horsted Keynes SR (Duplicate of TR 44)	Yes	Yes	Yes		Yes		No
TR-48	NTR	RZ1	Tankering / Medusa Bags	No	No	No	Rejected on sustainability grounds	No		No
TR-49	INT	RZ2	Towing icebergs from the Arctic	No	No	No	Duplication of existing option TR-27 and both rejected due to high CO2 emission and storage/transport difficulties. Global warming issues.	No		No
TR-50	NTR	RZ1	Canal transfers	No	No	No	Currently being investigated as TWU Option	No		No
TR-51	NTR	RZ1	National Water Grid	No	No	No	Already included in other regional transfer options	No		No
TR-52	INT	RZ2	Transfer through Channel Tunnel	No	No	No	Option being considered by Veolia	No		No
TR-53	RTR	RZ8	Extension of existing transfer (Lex09) to Veolia SE (Barham) from SEW RZ8 (Kingston) - 2 Ml/d increase	Yes	Yes	Yes		Yes		No
TR-53a	RTR	RZ8	Further extension of transfer to Veolia SE (Barham) from SEW RZ8 (Kingston) - 4 Ml/d increase	Yes	Yes	Yes		Yes		No
TR-53b	RTR	RZ8	Veolia SE (Barham) transfer (Lex09) to SEW RZ8 (Kingston) - 2 Ml/d	Yes	Yes	Yes		Yes		No
TR-53c	RTR	RZ8	Veolia SE (Barham) transfer to SEW RZ8 (Kingston) - 2 Ml/d	Yes	Yes	Yes		Yes		No
TR-54	RTR	RZ5	Portsmouth Water (Clanfield) to SEW RZ5 (Tilmore Reservoir) Transfer	Yes	Yes	Yes		Yes		Yes
TR-54a	RTR	RZ5	SEW RZ5 (Tilmore Reservoir) to Portsmouth Water (Clanfield)	Yes	Yes	Yes		Yes		Yes

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TR-55	CTR	RZ4	Southern Region (RZ2) to Northern Region Transfer (RZ4) (Whitely Hill SR to Surrey Hill SR)	Yes	Yes	Yes		Yes		No
TR-56	RTR	RZ6	River Medway abstraction at Forstal (5Mld release from Bough Beech)	Yes	Yes	Yes		Yes		No
TR-56a	RTR	RZ6	River Medway abstraction at Forstal (10Mld release from Bough Beech)	Yes	Yes	Yes		Yes		No
TR-57	CTR	RZ2	Transfer from SEW W Region (RZ4)(Surrey Hills) to Whitely Hill Reservoir (RZ2) (15 Ml/d)	Yes	Yes	Yes		Yes		No
TR-59	RTR	RZ3	Darwell to Eastbourne (Folkington Service Reservoir) Transfer	Yes	Yes	Yes		Yes		No
TR-62	RTR	RZ2	Bulk supply from SWS Sussex Coast WRZ to SEW	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-62a	RTR	RZ2	SEW RZ2 to SWS Swan SR (Sussex Brighton)	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No
TR-64	CTR	RZ5	RZ4 Surrey Hills to RZ5 via Ewshot	Yes	Yes	Yes		Yes		No
TR-64a	CTR	RZ5	Surrey Hill SR to Ewshot SR	Yes	Yes	Yes		Yes		No
TR-66	RTR	RZ4	SEW RZ4 to SWS Otterbourne via Whitedown	Yes	Yes	Yes		Yes		No
TR-72	RTR	RZ1	SESW Bough Beech to SEW Blackhurst	Yes	Yes	Yes		Yes		No
TR-72a	RTR	RZ1	SESW Bough Beech to SEW Blackhurst	Yes	Yes	Yes		Yes		No

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TR-72b	RTR	RZ1	SESW Bough Beech to SEW Blackhurst	Yes	Yes	Yes		Yes		No
TR-77b	CTR	RZ8	Transfer from Broad Oak (Option 30b) to Blean SR	Yes	Yes	Yes		Yes		No
TR-78	CTR	RZ2	SEW RZ3 (Arlington) to RZ2 WTW	Yes	Yes	Yes		Yes		No
TR-78a	CTR	RZ3	RZ2 WTW to RZ3 Arlington Reservoir	Yes	Yes	Yes		Yes		No
TR-79	RTR	RZ2	SEW Whitely Hill to SESW Outwood	Yes	Yes	Yes		Yes		Yes
TR-79a	RTR	RZ2	SESW Outwood to SEW Whitely Hill	Yes	Yes	Yes		Yes		Yes
TR-79b	RTR	RZ2	SEW Whitely Hill to SESW Outwood	Yes	Yes	Yes		Yes		No
TR-79c	RTR	RZ2	SESW Outwood to SEW Whitely Hill	Yes	Yes	Yes		Yes		No
TR-83	RTR	RZ8	SEW Blean SR to SWS Dunkirk BPT	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No
TR-83a	RTR	RZ8	SWS Dunkirk BPT to SEW Blean SR	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-85	CTR	RZ2	Transfer from SEW RZ4 (Surrey Hills SR) to SEW RZ2 (Whitely Hill SR) (10 Ml/d)	Yes	Yes	Yes		Yes		No
TR-86	RTR	RZ5	SEW Tilmore to SWS Rogate WTW	Yes	Yes	Yes		Yes		No
TR-86a	RTR	RZ5	SEW Tilmore to SWS Rogate WTW	Yes	Yes	Yes		Yes		No

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TR-92	CTR	RZ1	SEW RZ6 (Aylesford) to SEW Medway RZ1 (Blackhurst) via East Peckham	Yes	Yes	Yes		Yes		Yes
TR-92a	CTR	RZ6	RZ1 (Blackhurst) to RZ6 (Aylesford) via East Peckham	Yes	Yes	Yes		Yes		Yes
TR-97	RTR	RZ5	PRT Farlington WTW to SEW Tilmore Reservoir - 10 Ml/d	Yes	Yes	No	10 Ml/d transfer variant of this option is less cost effective than alternate (mutually exclusive) option TR-54 - Clanfield SR (Portsmouth Water) to Tilmore SR (SEW) 10Ml/d, so this option is now dropped.	No		No
TR-97a	RTR	RZ5	PRT Farlington WTW to SEW Tilmore Reservoir - 20 Ml/d	Yes	Yes	Yes		Yes		No
TR-98	RTR	RZ3	Darwell Reservoir to Arlington SR	Yes	Yes	Yes		Yes		No
TR-99	RTR	RZ4	Increased transfer from Affinity WRZ6 to Surrey Hills SR 10Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-99a	RTR	RZ4	Increased transfer from Affinity WRZ6 to Surrey Hills SR 20Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-99b	RTR	RZ4	Bulk transfer from Surrey Hills SR to Affinity WRZ6 10Ml/d	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No
TR-99c	RTR	RZ4	Bulk transfer from Surrey Hills SR to Affinity WRZ6 20Ml/d	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No

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TR-106	RTR	RZ3	Wallers Haven (river abstraction) to Darwell Reservoir via Hazards Green	Yes	Yes	No	Without Darwell raising (and/or change to Bewl-Darwell transfers) which is a Southern Water asset, this option is not feasible for SEW. Additional environmental concerns raised regarding inter-basin raw water transfers as well as potential impact of the abstraction on downstream flows in Wallers Haven and on to Pevensey Levels.	No		No
TR-124	RTR	RZ5	TWU Guildford to RZ5	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-124a	RTR	RZ4	RZ4 to TWU Guildford1	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No
TR-125	RTR	RZ5	TWU Guildford to RZ5 (Haslemere to Hindhead)	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-131	RTR	RZ1	SESW Bough Beech to SEW Riverhill	Yes	Yes	Yes		Yes		Yes
TR-132	CTR	RZ1	SEW Best Beech (RZ2) to Blackhurst (RZ1)	Yes	Yes	Yes		Yes		Yes
TR-132a	CTR	RZ2	SEW Blackhurst (RZ1) to Best Beech (RZ2)	Yes	Yes	Yes		Yes		Yes
TR-134	RTR	RZ4	Transfers from Thames Water's GUI zone to SEW RZ4	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-134a	RTR	RZ4	Transfers from Thames Water's GUI zone to SEW RZ4 - 20Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No

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TR-134b	RTR	RZ4	Transfers from SEW RZ4 to Thames Water's GUI zone - 10Ml/d	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No
TR-134c	RTR	RZ4	Transfers from SEW RZ4 to Thames Water's GUI zone - 15Ml/d	Yes	Yes	Yes		No	Water unlikely to be available for transfer to neighbouring water company	No
TR-135	RTR	RZ4	Henley transfers to SEW RZ4	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-135a	RTR	RZ4	TWU Henley transfers to SEW RZ4 - 10Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-136	RTR	RZ4	TWU Windsor to Surrey Hills - 5Ml/d	Yes	Yes	Yes		Yes		No
TR-136a	RTR	RZ4	TWU Windsor to Surrey Hills - 10Ml/d	Yes	Yes	Yes		Yes		Yes
TR-137	RTR	RZ4	TWU Kennet transfers to SEW RZ4 - 5 Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-138	RTR	RZ4	TWU Kennet transfers to SEW RZ4 - 10 Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-139	RTR	RZ2	Transfer from SEW RZ2 to Thames Water's GUI zone - 15Ml/d	Yes	Yes	Yes		Yes		No
TR-139a	RTR	RZ2	Transfer from Thames Water's GUI zone to SEW RZ2 - 10Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No

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TR-139b	RTR	RZ2	Transfer from Thames Water's GUI zone to SEW RZ2 - 20Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-139c	RTR	RZ2	Transfer from Thames Water's GUI zone to SEW RZ2 - 25Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-139d	RTR	RZ2	Transfer from Thames Water's GUI zone to SEW RZ2 - 15Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
TR-139e	RTR	RZ2	Transfer from Thames Water's GUI zone to SEW RZ2 - 20Ml/d	Yes	Yes	Yes		No	Water no longer available for transfer from the neighbouring water company.	No
CU-1	CON	RZ3	Conjunctive Use Schemes - Eastbourne Chalk Block	Yes	Yes	Yes		Yes		No
CU-2	CON	RZ4	Conjunctive Use of Surface Water & Groundwater - Upper Loddon	Yes	No	No	Period of operation during critical dry winter is too short.	No		No
CU-3	CON	RZ4	Conjunctive Use of Surface Water & Groundwater - Whitewater	Yes	No	No	Period of operation during critical dry winter is too short.	No		No
CU-4	CON	RZ5	Conjunctive Use of Surface Water & Groundwater - Arun (Rother)	Yes	No	No	Period of operation during critical dry winter is too short.	No		No
CU-5	CON	RZ1	Conjunctive Use of Surface Water & Groundwater - Upper Medway	Yes	No	No	Period of operation during critical dry winter is too short.	No		No
CU-6	CON	RZ6	Conjunctive Use of Surface Water & Groundwater - Lower Medway	Yes	No	No	Period of operation during critical dry winter is too short.	No		No

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CU-7	CON	RZ2	Conjunctive Use of Surface Water & Groundwater - River Adur	Yes	No	No	Period of operation during critical dry winter is too short.	No		No
CU-8	CON	RZ2	Conjunctive Use of Surface Water & Groundwater - River Ouse	Yes	Yes	No	Conflicts with existing river abstraction at Barcombe.	No		No
CU-9	CON	RZ3	Conjunctive Use of Surface Water & Groundwater - Wallers Haven	Yes	No	No	Insufficient capacity of associated groundwater sources.	No		No
CU-10	CON	RZ3	Conjunctive Use of Surface Water & Groundwater - Upper Rother	Yes	No	No	Period of operation during critical dry winter is too short.	No		No
CU-11	CON	RZ7	Conjunctive Use of Surface Water & Groundwater - Lower Rother	Yes	No	No	Period of operation during critical dry winter is too short.	No		No
CU-12	CON	RZ8	Conjunctive Use of Surface Water & Groundwater - Great Stour	Yes	Yes	Yes		Yes		No
CU-13	CON	RZ5	Conjunctive Use of Surface Water & Groundwater - River Wey	Yes	No	No	Period of operation during critical dry winter is too short.	No		No
WT-1	WTW	RZ7	Maytham Farm Option 2 Increase ADO and PDO: Refurbish treatment works	Yes	Yes	Yes		Yes		Yes
WT-2	WTW	RZ7	Maytham Farm Option 1 Increase ADO: Refurbish treatment works	Yes	Yes	No	Relegated to reserve list due to excessive cost compared to conventional treatment option	No		No
WT-3	WTW	RZ8	Release surplus hydrological yield at Ford WTW through treatment works upgrade	Yes	Yes	No	Relegated to reserve list. Treatment for fluoride estimated to be too costly and hence continue with current dilution process.	No		No
WT-4	WTW	RZ4	RZ4 WTW extension	Yes	Yes	Yes		Yes		Yes

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WT-5	WTW	RZ6	Recovery of process losses	Yes	No	No	PR09 Generic option. No WTW in zone with potential > 0.25 Ml/d	No		No
WT-6	WTW	RZ7	Recovery of process losses	Yes	No	No	PR09 Generic option. No WTW in zone with potential > 0.25 Ml/d	No		No
WT-7	WTW	RZ8	Recovery of process losses	Yes	No	No	PR09 Generic option. Only 1 WTW in zone with potential > 0.25 Ml/d now identified as WT-12	No		No
WT-8	WTW	RZ7	Bewl Bridge WTW Expansion - 14.6 Ml/d	Yes	Yes	Yes		Yes		No
WT-9	WTW	RZ7	Bewl Bridge WTW Expansion - 10 Ml/d	Yes	Yes	Yes		Yes		No
WT-10	WTW	RZ7	Bewl Bridge WTW Expansion - 5 Ml/d	Yes	Yes	Yes		Yes		No
WT-11	WTW	RZ3	Crowhurst WTW recovery of process losses	Yes	Yes	No	Relegated to reserve list. Predicted water recovery less than 1 Ml/d.	No		No
WT-12	WTW	RZ4	RZ4 WTW recovery of process losses	Yes	Yes	No	No CAPEX is required to implement this option so it is being progressed outside WRMP14.	No		No
WT-13	WTW	RZ8	Wichling/ WCS / Newnham WTW recovery of process losses	Yes	Yes	No	Relegated to reserve list. Predicted water recovery less than 1 Ml/d.	No		No
WT-14	WTW	RZ2	RZ2 WTW - Recovery of Process losses	Yes	Yes	Yes		Yes		Yes
WT-15	WTW	RZ4	Beenhams Heath, Hurley and White Waltham Group	Yes	Yes	No	On further examination process losses are below economic level for recovery.	No		No
WT-16	WTW	RZ4	RZ4 Thames Gravels WTW recovery of process losses	Yes	Yes	No	Relegated to reserve list. Predicted water recovery less than 1 Ml/d.	No		No
WT-17	WTW	RZ4	West Ham Group recovery of Process losses	Yes	Yes	No	On further examination process losses are below economic level for recovery.	No		No

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DM-111	WEF	RZ1	Fixed standing charge - Fixed charge for all customers	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-112	WEF	RZ2	Fixed standing charge - Fixed charge for all customers	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-113	WEF	RZ3	Fixed standing charge - Fixed charge for all customers	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-114	WEF	RZ4	Fixed standing charge - Fixed charge for all customers	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-115	WEF	RZ5	Fixed standing charge - Fixed charge for all customers	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-116	WEF	RZ6	Fixed standing charge - Fixed charge for all customers	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-117	WEF	RZ7	Fixed standing charge - Fixed charge for all customers	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-118	WEF	RZ8	Fixed standing charge - Fixed charge for all customers	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-127	WEF	RZ1	Seasonal tariffs - Higher charge over summer periods	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-128	WEF	RZ2	Seasonal tariffs - Higher charge over summer periods	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-129	WEF	RZ3	Seasonal tariffs - Higher charge over summer periods	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-130	WEF	RZ4	Seasonal tariffs - Higher charge over summer periods	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-131	WEF	RZ5	Seasonal tariffs - Higher charge over summer periods	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-132	WEF	RZ6	Seasonal tariffs - Higher charge over summer periods	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-133	WEF	RZ7	Seasonal tariffs - Higher charge over summer periods	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-134	WEF	RZ8	Seasonal tariffs - Higher charge over summer periods	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-135	WEF	RZ1	Subscribed demand tariffs - Customers estimate maximum daily demand for pricing rates	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-136	WEF	RZ2	Subscribed demand tariffs - Customers estimate maximum daily demand for pricing rates	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-137	WEF	RZ3	Subscribed demand tariffs - Customers estimate maximum daily demand for pricing rates	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-138	WEF	RZ4	Subscribed demand tariffs - Customers estimate maximum daily demand for pricing rates	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-139	WEF	RZ5	Subscribed demand tariffs - Customers estimate maximum daily demand for pricing rates	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-140	WEF	RZ6	Subscribed demand tariffs - Customers estimate maximum daily demand for pricing rates	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-141	WEF	RZ7	Subscribed demand tariffs - Customers estimate maximum daily demand for pricing rates	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-142	WEF	RZ8	Subscribed demand tariffs - Customers estimate maximum daily demand for pricing rates	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-143	WEF	RZ1	Interruptible tariffs - Lower tariff but at risk of interruptible supply	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-144	WEF	RZ2	Interruptible tariffs - Lower tariff but at risk of interruptible supply	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-145	WEF	RZ3	Interruptible tariffs - Lower tariff but at risk of interruptible supply	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-146	WEF	RZ4	Interruptible tariffs - Lower tariff but at risk of interruptible supply	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-147	WEF	RZ5	Interruptible tariffs - Lower tariff but at risk of interruptible supply	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-148	WEF	RZ6	Interruptible tariffs - Lower tariff but at risk of interruptible supply	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-149	WEF	RZ7	Interruptible tariffs - Lower tariff but at risk of interruptible supply	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-150	WEF	RZ8	Interruptible tariffs - Lower tariff but at risk of interruptible supply	Yes	Yes	No	Option screened out as does not encourage water efficiency and therefore no benefit	No		No
DM-151	WEF	RZ1	Rising block tariffs - Increasing unit charges for consumption above an essential use volume	Yes	Yes	No	Combine with seasonal tariff as a single option - seasonal rising block.	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-152	WEF	RZ2	Rising block tariffs - Increasing unit charges for consumption above an essential use volume	Yes	Yes	No	Combine with seasonal tariff as a single option - seasonal rising block.	No		No
DM-153	WEF	RZ3	Rising block tariffs - Increasing unit charges for consumption above an essential use volume	Yes	Yes	No	Combine with seasonal tariff as a single option - seasonal rising block.	No		No
DM-154	WEF	RZ4	Rising block tariffs - Increasing unit charges for consumption above an essential use volume	Yes	Yes	No	Combine with seasonal tariff as a single option - seasonal rising block.	No		No
DM-155	WEF	RZ5	Rising block tariffs - Increasing unit charges for consumption above an essential use volume	Yes	Yes	No	Combine with seasonal tariff as a single option - seasonal rising block.	No		No
DM-156	WEF	RZ6	Rising block tariffs - Increasing unit charges for consumption above an essential use volume	Yes	Yes	No	Combine with seasonal tariff as a single option - seasonal rising block.	No		No
DM-157	WEF	RZ7	Rising block tariffs - Increasing unit charges for consumption above an essential use volume	Yes	Yes	No	Combine with seasonal tariff as a single option - seasonal rising block.	No		No
DM-158	WEF	RZ8	Rising block tariffs - Increasing unit charges for consumption above an essential use volume	Yes	Yes	No	Combine with seasonal tariff as a single option - seasonal rising block.	No		No
DM-159	LEA	RZ1	Leakage repairs - Supply pipe repairs	No	No	No	Superseded by more specific leakage management options	No		No
DM-160	LEA	RZ2	Leakage repairs - Supply pipe repairs	No	No	No	Superseded by more specific leakage management options	No		No
DM-161	LEA	RZ3	Leakage repairs - Supply pipe repairs	No	No	No	Superseded by more specific leakage management options	No		No
DM-162	LEA	RZ4	Leakage repairs - Supply pipe repairs	No	No	No	Superseded by more specific leakage management options	No		No
DM-163	LEA	RZ5	Leakage repairs - Supply pipe repairs	No	No	No	Superseded by more specific leakage management options	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-164	LEA	RZ6	Leakage repairs - Supply pipe repairs	No	No	No	Superseded by more specific leakage management options	No		No
DM-165	LEA	RZ7	Leakage repairs - Supply pipe repairs	No	No	No	Superseded by more specific leakage management options	No		No
DM-166	LEA	RZ8	Leakage repairs - Supply pipe repairs	No	No	No	Superseded by more specific leakage management options	No		No
DM-167	LEA	RZ1	Additional pressure management - Install more Pressure Reduction Valves (PRV's)	Yes	Yes	Yes		Yes		Yes
DM-168	LEA	RZ2	Additional pressure management - Install more Pressure Reduction Valves (PRV's)	Yes	Yes	Yes		Yes		Yes
DM-169	LEA	RZ3	Additional pressure management - Install more Pressure Reduction Valves (PRV's)	Yes	Yes	Yes		Yes		Yes
DM-170	LEA	RZ4	Additional pressure management - Install more Pressure Reduction Valves (PRV's)	Yes	Yes	Yes		Yes		Yes
DM-171	LEA	RZ5	Additional pressure management - Install more Pressure Reduction Valves (PRV's)	Yes	Yes	Yes		Yes		Yes
DM-172	LEA	RZ6	Additional pressure management - Install more Pressure Reduction Valves (PRV's)	Yes	Yes	Yes		Yes		Yes
DM-173	LEA	RZ7	Additional pressure management - Install more Pressure Reduction Valves (PRV's)	Yes	Yes	Yes		Yes		Yes

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-174	LEA	RZ8	Additional pressure management - Install more Pressure Reduction Valves (PRV's)	Yes	Yes	Yes		Yes		Yes
DM-175	LEA	RZ1	Enhance pressure logging to optimise PRV settings	Yes	Yes	Yes		Yes		Yes
DM-176	LEA	RZ2	Enhance pressure logging to optimise PRV settings	Yes	Yes	Yes		Yes		Yes
DM-177	LEA	RZ3	Enhance pressure logging to optimise PRV settings	Yes	Yes	Yes		Yes		Yes
DM-178	LEA	RZ4	Enhance pressure logging to optimise PRV settings	Yes	Yes	Yes		Yes		Yes
DM-179	LEA	RZ5	Enhance pressure logging to optimise PRV settings	Yes	Yes	Yes		Yes		Yes
DM-180	LEA	RZ6	Enhance pressure logging to optimise PRV settings	Yes	Yes	Yes		Yes		Yes
DM-181	LEA	RZ7	Enhance pressure logging to optimise PRV settings	Yes	Yes	Yes		Yes		Yes
DM-182	LEA	RZ8	Enhance pressure logging to optimise PRV settings	Yes	Yes	Yes		Yes		Yes
DM-183	LEA	RZ1	Leakage detection - More rapid detection methods	No	No	No	Superseded by more specific leakage management options	No		No
DM-184	LEA	RZ2	Leakage detection - More rapid detection methods	No	No	No	Superseded by more specific leakage management options	No		No
DM-185	LEA	RZ3	Leakage detection - More rapid detection methods	No	No	No	Superseded by more specific leakage management options	No		No
DM-186	LEA	RZ4	Leakage detection - More rapid detection methods	No	No	No	Superseded by more specific leakage management options	No		No
DM-187	LEA	RZ5	Leakage detection - More rapid detection methods	No	No	No	Superseded by more specific leakage management options	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-188	LEA	RZ6	Leakage detection - More rapid detection methods	No	No	No	Superseded by more specific leakage management options	No		No
DM-189	LEA	RZ7	Leakage detection - More rapid detection methods	No	No	No	Superseded by more specific leakage management options	No		No
DM-190	LEA	RZ8	Leakage detection - More rapid detection methods	No	No	No	Superseded by more specific leakage management options	No		No
DM-191	LEA	RZ1	Pressure Management - Reducing pressure but maintaining service	No	No	No	Superseded by more specific leakage management options	No		No
DM-192	LEA	RZ2	Pressure Management - Reducing pressure but maintaining service	No	No	No	Superseded by more specific leakage management options	No		No
DM-193	LEA	RZ3	Pressure Management - Reducing pressure but maintaining service	No	No	No	Superseded by more specific leakage management options	No		No
DM-194	LEA	RZ4	Pressure Management - Reducing pressure but maintaining service	No	No	No	Superseded by more specific leakage management options	No		No
DM-195	LEA	RZ5	Pressure Management - Reducing pressure but maintaining service	No	No	No	Superseded by more specific leakage management options	No		No
DM-196	LEA	RZ6	Pressure Management - Reducing pressure but maintaining service	No	No	No	Superseded by more specific leakage management options	No		No
DM-197	LEA	RZ7	Pressure Management - Reducing pressure but maintaining service	No	No	No	Superseded by more specific leakage management options	No		No
DM-198	LEA	RZ8	Pressure Management - Reducing pressure but maintaining service	No	No	No	Superseded by more specific leakage management options	No		No
DM-207	WEF	RZ1	Changing behaviour - Water efficiency education programmes	Yes	Yes	No	Screened out as is in base	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-208	WEF	RZ2	Changing behaviour - Water efficiency education programmes	Yes	Yes	No	Screened out as is in base	No		No
DM-209	WEF	RZ3	Changing behaviour - Water efficiency education programmes	Yes	Yes	No	Screened out as is in base	No		No
DM-210	WEF	RZ4	Changing behaviour - Water efficiency education programmes	Yes	Yes	No	Screened out as is in base	No		No
DM-211	WEF	RZ5	Changing behaviour - Water efficiency education programmes	Yes	Yes	No	Screened out as is in base	No		No
DM-212	WEF	RZ6	Changing behaviour - Water efficiency education programmes	Yes	Yes	No	Screened out as is in base	No		No
DM-213	WEF	RZ7	Changing behaviour - Water efficiency education programmes	Yes	Yes	No	Screened out as is in base	No		No
DM-214	WEF	RZ8	Changing behaviour - Water efficiency education programmes	Yes	Yes	No	Screened out as is in base	No		No
DM-223	WEF	RZ1	Retrofit dual or variable flush (domestic) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-224	WEF	RZ2	Retrofit dual or variable flush (domestic) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-225	WEF	RZ3	Retrofit dual or variable flush (domestic) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-226	WEF	RZ4	Retrofit dual or variable flush (domestic) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-227	WEF	RZ5	Retrofit dual or variable flush (domestic) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-228	WEF	RZ6	Retrofit dual or variable flush (domestic) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-229	WEF	RZ7	Retrofit dual or variable flush (domestic) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-230	WEF	RZ8	Retrofit dual or variable flush (domestic) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-231	WEF	RZ1	Cistern displacement devices - Reduce volume of a flush	Yes	Yes	No	Merged in DM-495	No		No
DM-232	WEF	RZ2	Cistern displacement devices - Reduce volume of a flush	Yes	Yes	No	Merged in DM-496	No		No
DM-233	WEF	RZ3	Cistern displacement devices - Reduce volume of a flush	Yes	Yes	No	Merged in DM-497	No		No
DM-234	WEF	RZ4	Cistern displacement devices - Reduce volume of a flush	Yes	Yes	No	Merged in DM-498	No		No
DM-235	WEF	RZ5	Cistern displacement devices - Reduce volume of a flush	Yes	Yes	No	Merged in DM-499	No		No
DM-236	WEF	RZ6	Cistern displacement devices - Reduce volume of a flush	Yes	Yes	No	Merged in DM-500	No		No
DM-237	WEF	RZ7	Cistern displacement devices - Reduce volume of a flush	Yes	Yes	No	Merged in DM-501	No		No
DM-238	WEF	RZ8	Cistern displacement devices - Reduce volume of a flush	Yes	Yes	No	Merged in DM-502	No		No
DM-239	WEF	RZ1	Water saver shower heads - reduce the flow rate of normal showers	Yes	Yes	No	Merged in DM-495	No		No
DM-240	WEF	RZ2	Water saver shower heads - reduce the flow rate of normal showers	Yes	Yes	No	Merged in DM-496	No		No
DM-241	WEF	RZ3	Water saver shower heads - reduce the flow rate of normal showers	Yes	Yes	No	Merged in DM-497	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-242	WEF	RZ4	Water saver shower heads - reduce the flow rate of normal showers	Yes	Yes	No	Merged in DM-498	No		No
DM-243	WEF	RZ5	Water saver shower heads - reduce the flow rate of normal showers	Yes	Yes	No	Merged in DM-499	No		No
DM-244	WEF	RZ6	Water saver shower heads - reduce the flow rate of normal showers	Yes	Yes	No	Merged in DM-500	No		No
DM-245	WEF	RZ7	Water saver shower heads - reduce the flow rate of normal showers	Yes	Yes	No	Merged in DM-501	No		No
DM-246	WEF	RZ8	Water saver shower heads - reduce the flow rate of normal showers	Yes	Yes	No	Merged in DM-502	No		No
DM-247	WEF	RZ1	Tap aerators and flow restrictors - reduce the flow rate of taps	Yes	Yes	No	Merged in DM-495	No		No
DM-248	WEF	RZ2	Tap aerators and flow restrictors - reduce the flow rate of taps	Yes	Yes	No	Merged in DM-496	No		No
DM-249	WEF	RZ3	Tap aerators and flow restrictors - reduce the flow rate of taps	Yes	Yes	No	Merged in DM-497	No		No
DM-250	WEF	RZ4	Tap aerators and flow restrictors - reduce the flow rate of taps	Yes	Yes	No	Merged in DM-498	No		No
DM-251	WEF	RZ5	Tap aerators and flow restrictors - reduce the flow rate of taps	Yes	Yes	No	Merged in DM-499	No		No
DM-252	WEF	RZ6	Tap aerators and flow restrictors - reduce the flow rate of taps	Yes	Yes	No	Merged in DM-500	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-253	WEF	RZ7	Tap aerators and flow restrictors - reduce the flow rate of taps	Yes	Yes	No	Merged in DM-501	No		No
DM-254	WEF	RZ8	Tap aerators and flow restrictors - reduce the flow rate of taps	Yes	Yes	No	Merged in DM-502	No		No
DM-255	WEF	RZ1	Rainwater harvesting and water butts - Storage of rainwater for garden use	Yes	Yes	No	Option screened out as water butts are in base and rainwater harvesting is covered in option 15	No		No
DM-256	WEF	RZ2	Rainwater harvesting and water butts - Storage of rainwater for garden use	Yes	Yes	No	Option screened out as water butts are in base and rainwater harvesting is covered in option 15	No		No
DM-257	WEF	RZ3	Rainwater harvesting and water butts - Storage of rainwater for garden use	Yes	Yes	No	Option screened out as water butts are in base and rainwater harvesting is covered in option 15	No		No
DM-258	WEF	RZ4	Rainwater harvesting and water butts - Storage of rainwater for garden use	Yes	Yes	No	Option screened out as water butts are in base and rainwater harvesting is covered in option 15	No		No
DM-259	WEF	RZ5	Rainwater harvesting and water butts - Storage of rainwater for garden use	Yes	Yes	No	Option screened out as water butts are in base and rainwater harvesting is covered in option 15	No		No
DM-260	WEF	RZ6	Rainwater harvesting and water butts - Storage of rainwater for garden use	Yes	Yes	No	Option screened out as water butts are in base and rainwater harvesting is covered in option 15	No		No
DM-261	WEF	RZ7	Rainwater harvesting and water butts - Storage of rainwater for garden use	Yes	Yes	No	Option screened out as water butts are in base and rainwater harvesting is covered in option 15	No		No
DM-262	WEF	RZ8	Rainwater harvesting and water butts - Storage of rainwater for garden use	Yes	Yes	No	Option screened out as water butts are in base and rainwater harvesting is covered in option 15	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-263	WEF	RZ1	Greywater re-use - Wastewater collected and re-used	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-264	WEF	RZ2	Greywater re-use - Wastewater collected and re-used	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-265	WEF	RZ3	Greywater re-use - Wastewater collected and re-used	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-266	WEF	RZ4	Greywater re-use - Wastewater collected and re-used	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-267	WEF	RZ5	Greywater re-use - Wastewater collected and re-used	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-268	WEF	RZ6	Greywater re-use - Wastewater collected and re-used	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-269	WEF	RZ7	Greywater re-use - Wastewater collected and re-used	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-270	WEF	RZ8	Greywater re-use - Wastewater collected and re-used	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-271	WEF	RZ1	Rainwater harvesting - internal and external daily use	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-272	WEF	RZ2	Rainwater harvesting - internal and external daily use	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-273	WEF	RZ3	Rainwater harvesting - internal and external daily use	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-274	WEF	RZ4	Rainwater harvesting - internal and external daily use	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-275	WEF	RZ5	Rainwater harvesting - internal and external daily use	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-276	WEF	RZ6	Rainwater harvesting - internal and external daily use	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-277	WEF	RZ7	Rainwater harvesting - internal and external daily use	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-278	WEF	RZ8	Rainwater harvesting - internal and external daily use	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-279	WEF	RZ1	Installation of water saving appliances - free installation of efficient white goods	Yes	Yes	No	Screened out on grounds of excessive cost. This option is targeting the same savings as the white goods voucher scheme but is far more expensive with little marginal benefit.	No		No
DM-280	WEF	RZ2	Installation of water saving appliances - free installation of efficient white goods	Yes	Yes	No	Screened out on grounds of excessive cost. This option is targeting the same savings as the white goods voucher scheme but is far more expensive with little marginal benefit.	No		No
DM-281	WEF	RZ3	Installation of water saving appliances - free installation of efficient white goods	Yes	Yes	No	Screened out on grounds of excessive cost. This option is targeting the same savings as the white goods voucher scheme but is far more expensive with little marginal benefit.	No		No
DM-282	WEF	RZ4	Installation of water saving appliances - free installation of efficient white goods	Yes	Yes	No	Screened out on grounds of excessive cost. This option is targeting the same savings as the white goods voucher scheme but is far more expensive with little marginal benefit.	No		No
DM-283	WEF	RZ5	Installation of water saving appliances - free installation of efficient white goods	Yes	Yes	No	Screened out on grounds of excessive cost. This option is targeting the same savings as the white goods voucher scheme but is far more expensive with little marginal benefit.	No		No
DM-284	WEF	RZ6	Installation of water saving appliances - free installation of efficient white goods	Yes	Yes	No	Screened out on grounds of excessive cost. This option is targeting the same savings as the white goods voucher scheme but is far more expensive with little marginal benefit.	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-285	WEF	RZ7	Installation of water saving appliances - free installation of efficient white goods	Yes	Yes	No	Screened out on grounds of excessive cost. This option is targeting the same savings as the white goods voucher scheme but is far more expensive with little marginal benefit.	No		No
DM-286	WEF	RZ8	Installation of water saving appliances - free installation of efficient white goods	Yes	Yes	No	Screened out on grounds of excessive cost. This option is targeting the same savings as the white goods voucher scheme but is far more expensive with little marginal benefit.	No		No
DM-287	WEF	RZ1	Household water audits - To assess water use and offer provision or installation of water saving devices	Yes	Yes	Yes		Yes		No
DM-288	WEF	RZ2	Household water audits - To assess water use and offer provision or installation of water saving devices	Yes	Yes	Yes		Yes		No
DM-289	WEF	RZ3	Household water audits - To assess water use and offer provision or installation of water saving devices	Yes	Yes	Yes		Yes		No
DM-290	WEF	RZ4	Household water audits - To assess water use and offer provision or installation of water saving devices	Yes	Yes	Yes		Yes		No
DM-291	WEF	RZ5	Household water audits - To assess water use and offer provision or installation of water saving devices	Yes	Yes	Yes		Yes		No
DM-292	WEF	RZ6	Household water audits - To assess water use and offer provision or installation of water saving devices	Yes	Yes	Yes		Yes		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-293	WEF	RZ7	Household water audits - To assess water use and offer provision or installation of water saving devices	Yes	Yes	Yes		Yes		No
DM-294	WEF	RZ8	Household water audits - To assess water use and offer provision or installation of water saving devices	Yes	Yes	Yes		Yes		No
DM-295	WEF	RZ1	Promotion of water efficient white-goods and sanitary ware in new build houses	Yes	Yes	No	Screened out as in base activity and covered by the code for sustainable homes	No		No
DM-296	WEF	RZ2	Promotion of water efficient white-goods and sanitary ware in new build houses	Yes	Yes	No	Screened out as in base activity and covered by the code for sustainable homes	No		No
DM-297	WEF	RZ3	Promotion of water efficient white-goods and sanitary ware in new build houses	Yes	Yes	No	Screened out as in base activity and covered by the code for sustainable homes	No		No
DM-298	WEF	RZ4	Promotion of water efficient white-goods and sanitary ware in new build houses	Yes	Yes	No	Screened out as in base activity and covered by the code for sustainable homes	No		No
DM-299	WEF	RZ5	Promotion of water efficient white-goods and sanitary ware in new build houses	Yes	Yes	No	Screened out as in base activity and covered by the code for sustainable homes	No		No
DM-300	WEF	RZ6	Promotion of water efficient white-goods and sanitary ware in new build houses	Yes	Yes	No	Screened out as in base activity and covered by the code for sustainable homes	No		No
DM-301	WEF	RZ7	Promotion of water efficient white-goods and sanitary ware in new build houses	Yes	Yes	No	Screened out as in base activity and covered by the code for sustainable homes	No		No
DM-302	WEF	RZ8	Promotion of water efficient white-goods and sanitary ware in new build houses	Yes	Yes	No	Screened out as in base activity and covered by the code for sustainable homes	No		No
DM-303	WEF	RZ1	Other - Limit peak demands	Yes	Yes	No	Screened out as covered by other options and base activities	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-304	WEF	RZ2	Other - Limit peak demands	Yes	Yes	No	Screened out as covered by other options and base activities	No		No
DM-305	WEF	RZ3	Other - Limit peak demands	Yes	Yes	No	Screened out as covered by other options and base activities	No		No
DM-306	WEF	RZ4	Other - Limit peak demands	Yes	Yes	No	Screened out as covered by other options and base activities	No		No
DM-307	WEF	RZ5	Other - Limit peak demands	Yes	Yes	No	Screened out as covered by other options and base activities	No		No
DM-308	WEF	RZ6	Other - Limit peak demands	Yes	Yes	No	Screened out as covered by other options and base activities	No		No
DM-309	WEF	RZ7	Other - Limit peak demands	Yes	Yes	No	Screened out as covered by other options and base activities	No		No
DM-310	WEF	RZ8	Other - Limit peak demands	Yes	Yes	No	Screened out as covered by other options and base activities	No		No
DM-311	WEF	RZ1	"green deal" funding arrangement for white goods replacement	Yes	Yes	No	Screened out as limited data on costs and savings. Savings considered to be very low	No		No
DM-312	WEF	RZ2	"green deal" funding arrangement for white goods replacement	Yes	Yes	No	Screened out as limited data on costs and savings. Savings considered to be very low	No		No
DM-313	WEF	RZ3	"green deal" funding arrangement for white goods replacement	Yes	Yes	No	Screened out as limited data on costs and savings. Savings considered to be very low	No		No
DM-314	WEF	RZ4	"green deal" funding arrangement for white goods replacement	Yes	Yes	No	Screened out as limited data on costs and savings. Savings considered to be very low	No		No
DM-315	WEF	RZ5	"green deal" funding arrangement for white goods replacement	Yes	Yes	No	Screened out as limited data on costs and savings. Savings considered to be very low	No		No
DM-316	WEF	RZ6	"green deal" funding arrangement for white goods replacement	Yes	Yes	No	Screened out as limited data on costs and savings. Savings considered to be very low	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-317	WEF	RZ7	"green deal" funding arrangement for white goods replacement	Yes	Yes	No	Screened out as limited data on costs and savings. Savings considered to be very low	No		No
DM-318	WEF	RZ8	"green deal" funding arrangement for white goods replacement	Yes	Yes	No	Screened out as limited data on costs and savings. Savings considered to be very low	No		No
DM-319	WEF	RZ1	Water efficient products pay back calculator on company website	Yes	Yes	Yes		Yes		Yes
DM-320	WEF	RZ2	Water efficient products pay back calculator on company website	Yes	Yes	Yes		Yes		Yes
DM-321	WEF	RZ3	Water efficient products pay back calculator on company website	Yes	Yes	Yes		Yes		Yes
DM-322	WEF	RZ4	Water efficient products pay back calculator on company website	Yes	Yes	Yes		Yes		Yes
DM-323	WEF	RZ5	Water efficient products pay back calculator on company website	Yes	Yes	Yes		Yes		Yes
DM-324	WEF	RZ6	Water efficient products pay back calculator on company website	Yes	Yes	Yes		Yes		No
DM-325	WEF	RZ7	Water efficient products pay back calculator on company website	Yes	Yes	Yes		Yes		No
DM-326	WEF	RZ8	Water efficient products pay back calculator on company website	Yes	Yes	Yes		Yes		No
DM-327	WEF	RZ1	Water efficient white goods discount vouchers - offered with bills or online for use in retail stores	Yes	Yes	Yes		Yes		Yes

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-328	WEF	RZ2	Water efficient white goods discount vouchers - offered with bills or online for use in retail stores	Yes	Yes	Yes		Yes		Yes
DM-329	WEF	RZ3	Water efficient white goods discount vouchers - offered with bills or online for use in retail stores	Yes	Yes	Yes		Yes		Yes
DM-330	WEF	RZ4	Water efficient white goods discount vouchers - offered with bills or online for use in retail stores	Yes	Yes	Yes		Yes		Yes
DM-331	WEF	RZ5	Water efficient white goods discount vouchers - offered with bills or online for use in retail stores	Yes	Yes	Yes		Yes		Yes
DM-332	WEF	RZ6	Water efficient white goods discount vouchers - offered with bills or online for use in retail stores	Yes	Yes	Yes		Yes		No
DM-333	WEF	RZ7	Water efficient white goods discount vouchers - offered with bills or online for use in retail stores	Yes	Yes	Yes		Yes		No
DM-334	WEF	RZ8	Water efficient white goods discount vouchers - offered with bills or online for use in retail stores	Yes	Yes	Yes		Yes		No
DM-335	MET	RZ1	Smart meter USPL detection	Yes	Yes	No	Current smart meters have uspl capability. Therefore considered in in base and screened out.	No		No
DM-336	MET	RZ2	Smart meter USPL detection	Yes	Yes	No	Current smart meters have uspl capability. Therefore considered in in base and screened out.	No		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-337	MET	RZ3	Smart meter USPL detection	Yes	Yes	No	Current smart meters have uspl capability. Therefore considered in in base and screened out.	No		No
DM-338	MET	RZ4	Smart meter USPL detection	Yes	Yes	No	Current smart meters have uspl capability. Therefore considered in in base and screened out.	No		No
DM-339	MET	RZ5	Smart meter USPL detection	Yes	Yes	No	Current smart meters have uspl capability. Therefore considered in in base and screened out.	No		No
DM-340	MET	RZ6	Smart meter USPL detection	Yes	Yes	No	Current smart meters have uspl capability. Therefore considered in in base and screened out.	No		No
DM-341	MET	RZ7	Smart meter USPL detection	Yes	Yes	No	Current smart meters have uspl capability. Therefore considered in in base and screened out.	No		No
DM-342	MET	RZ8	Smart meter USPL detection	Yes	Yes	No	Current smart meters have uspl capability. Therefore considered in in base and screened out.	No		No
DM-343	MET	RZ1	Smart Metering Consumption Information on Bills with benchmark data and cost saving ideas	Yes	Yes	No	Bill redesign is in base and therefore screened out.	No		No
DM-344	MET	RZ2	Smart Metering Consumption Information on Bills with benchmark data and cost saving ideas	Yes	Yes	No	Bill redesign is in base and therefore screened out.	No		No
DM-345	MET	RZ3	Smart Metering Consumption Information on Bills with benchmark data and cost saving ideas	Yes	Yes	No	Bill redesign is in base and therefore screened out.	No		No
DM-346	MET	RZ4	Smart Metering Consumption Information on Bills with benchmark data and cost saving ideas	Yes	Yes	No	Bill redesign is in base and therefore screened out.	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-347	MET	RZ5	Smart Metering Consumption Information on Bills with benchmark data and cost saving ideas	Yes	Yes	No	Bill redesign is in base and therefore screened out.	No		No
DM-348	MET	RZ6	Smart Metering Consumption Information on Bills with benchmark data and cost saving ideas	Yes	Yes	No	Bill redesign is in base and therefore screened out.	No		No
DM-349	MET	RZ7	Smart Metering Consumption Information on Bills with benchmark data and cost saving ideas	Yes	Yes	No	Bill redesign is in base and therefore screened out.	No		No
DM-350	MET	RZ8	Smart Metering Consumption Information on Bills with benchmark data and cost saving ideas	Yes	Yes	No	Bill redesign is in base and therefore screened out.	No		No
DM-351	LEA	RZ1	DMA data analysis improvements - enhance ALC resource prioritisation	Yes	Yes	Yes		Yes		Yes
DM-352	LEA	RZ2	DMA data analysis improvements - enhance ALC resource prioritisation	Yes	Yes	Yes		Yes		Yes
DM-353	LEA	RZ3	DMA data analysis improvements - enhance ALC resource prioritisation	Yes	Yes	Yes		Yes		Yes
DM-354	LEA	RZ4	DMA data analysis improvements - enhance ALC resource prioritisation	Yes	Yes	Yes		Yes		Yes
DM-355	LEA	RZ5	DMA data analysis improvements - enhance ALC resource prioritisation	Yes	Yes	Yes		Yes		Yes
DM-356	LEA	RZ6	DMA data analysis improvements - enhance ALC resource prioritisation	Yes	Yes	Yes		Yes		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-357	LEA	RZ7	DMA data analysis improvements - enhance ALC resource prioritisation	Yes	Yes	Yes		Yes		No
DM-358	LEA	RZ8	DMA data analysis improvements - enhance ALC resource prioritisation	Yes	Yes	Yes		Yes		No
DM-359	LEA	RZ1	DMA Reconfiguration - Modify DMA boundaries to improve leak detection and location times	Yes	Yes	Yes		Yes		Yes
DM-360	LEA	RZ2	DMA Reconfiguration - Modify DMA boundaries to improve leak detection and location times	Yes	Yes	Yes		Yes		Yes
DM-361	LEA	RZ3	DMA Reconfiguration - Modify DMA boundaries to improve leak detection and location times	Yes	Yes	Yes		Yes		Yes
DM-362	LEA	RZ4	DMA Reconfiguration - Modify DMA boundaries to improve leak detection and location times	Yes	Yes	Yes		Yes		Yes
DM-363	LEA	RZ5	DMA Reconfiguration - Modify DMA boundaries to improve leak detection and location times	Yes	Yes	Yes		Yes		Yes
DM-364	LEA	RZ6	DMA Reconfiguration - Modify DMA boundaries to improve leak detection and location times	Yes	Yes	Yes		Yes		Yes
DM-365	LEA	RZ7	DMA Reconfiguration - Modify DMA boundaries to improve leak detection and location times	Yes	Yes	Yes		Yes		Yes

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GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-366	LEA	RZ8	DMA Reconfiguration - Modify DMA boundaries to improve leak detection and location times	Yes	Yes	Yes		Yes		Yes
DM-367	LEA	RZ1	Innovative Leak location techniques - Pressure logging and hydraulic modelling to identify hotspots	Yes	Yes	Yes		Yes		Yes
DM-368	LEA	RZ2	Innovative Leak location techniques - Pressure logging and hydraulic modelling to identify hotspots	Yes	Yes	Yes		Yes		Yes
DM-369	LEA	RZ3	Innovative Leak location techniques - Pressure logging and hydraulic modelling to identify hotspots	Yes	Yes	Yes		Yes		Yes
DM-370	LEA	RZ4	Innovative Leak location techniques - Pressure logging and hydraulic modelling to identify hotspots	Yes	Yes	Yes		Yes		Yes
DM-371	LEA	RZ5	Innovative Leak location techniques - Pressure logging and hydraulic modelling to identify hotspots	Yes	Yes	Yes		Yes		Yes
DM-372	LEA	RZ6	Innovative Leak location techniques - Pressure logging and hydraulic modelling to identify hotspots	Yes	Yes	Yes		Yes		Yes
DM-373	LEA	RZ7	Innovative Leak location techniques - Pressure logging and hydraulic modelling to identify hotspots	Yes	Yes	Yes		Yes		Yes
DM-374	LEA	RZ8	Innovative Leak location techniques - Pressure logging and hydraulic modelling to identify hotspots	Yes	Yes	Yes		Yes		Yes

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-375	LEA	RZ1	Leakage driven mains replacement	Yes	Yes	Yes		Yes		Yes
DM-376	LEA	RZ2	Leakage driven mains replacement	Yes	Yes	Yes		Yes		Yes
DM-377	LEA	RZ3	Leakage driven mains replacement	Yes	Yes	Yes		Yes		Yes
DM-378	LEA	RZ4	Leakage driven mains replacement	Yes	Yes	Yes		Yes		No
DM-379	LEA	RZ5	Leakage driven mains replacement	Yes	Yes	Yes		Yes		No
DM-380	LEA	RZ6	Leakage driven mains replacement	Yes	Yes	Yes		Yes		Yes
DM-381	LEA	RZ7	Leakage driven mains replacement	Yes	Yes	Yes		Yes		Yes
DM-382	LEA	RZ8	Leakage driven mains replacement	Yes	Yes	Yes		Yes		No
DM-383	WEF	RZ1	Schools water audit and retrofit	Yes	Yes	Yes		Yes		Yes
DM-384	WEF	RZ2	Schools water audit and retrofit	Yes	Yes	Yes		Yes		Yes
DM-385	WEF	RZ3	Schools water audit and retrofit	Yes	Yes	Yes		Yes		Yes
DM-386	WEF	RZ4	Schools water audit and retrofit	Yes	Yes	Yes		Yes		Yes
DM-387	WEF	RZ5	Schools water audit and retrofit	Yes	Yes	Yes		Yes		Yes
DM-388	WEF	RZ6	Schools water audit and retrofit	Yes	Yes	Yes		Yes		No
DM-389	WEF	RZ7	Schools water audit and retrofit	Yes	Yes	Yes		Yes		No
DM-390	WEF	RZ8	Schools water audit and retrofit	Yes	Yes	Yes		Yes		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-391	WEF	RZ1	Bath volume reducers - for bathing small children and babies	Yes	Yes	No	Merged in DM-495	No		No
DM-392	WEF	RZ2	Bath volume reducers - for bathing small children and babies	Yes	Yes	No	Merged in DM-496	No		No
DM-393	WEF	RZ3	Bath volume reducers - for bathing small children and babies	Yes	Yes	No	Merged in DM-497	No		No
DM-394	WEF	RZ4	Bath volume reducers - for bathing small children and babies	Yes	Yes	No	Merged in DM-498	No		No
DM-395	WEF	RZ5	Bath volume reducers - for bathing small children and babies	Yes	Yes	No	Merged in DM-499	No		No
DM-396	WEF	RZ6	Bath volume reducers - for bathing small children and babies	Yes	Yes	No	Merged in DM-500	No		No
DM-397	WEF	RZ7	Bath volume reducers - for bathing small children and babies	Yes	Yes	No	Merged in DM-501	No		No
DM-398	WEF	RZ8	Bath volume reducers - for bathing small children and babies	Yes	Yes	No	Merged in DM-502	No		No
DM-399	WEF	RZ1	Free water saving devices - offered on bills and online (shower heads, hose triggers, tap inserts, shower timer etc)	Yes	Yes	No	Merged in DM-495	No		No
DM-400	WEF	RZ2	Free water saving devices - offered on bills and online (shower heads, hose triggers, tap inserts, shower timer etc)	Yes	Yes	No	Merged in DM-496	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-401	WEF	RZ3	Free water saving devices - offered on bills and online (shower heads, hose triggers, tap inserts, shower timer etc)	Yes	Yes	No	Merged in DM-497	No		No
DM-402	WEF	RZ4	Free water saving devices - offered on bills and online (shower heads, hose triggers, tap inserts, shower timer etc)	Yes	Yes	No	Merged in DM-498	No		No
DM-403	WEF	RZ5	Free water saving devices - offered on bills and online (shower heads, hose triggers, tap inserts, shower timer etc)	Yes	Yes	No	Merged in DM-499	No		No
DM-404	WEF	RZ6	Free water saving devices - offered on bills and online (shower heads, hose triggers, tap inserts, shower timer etc)	Yes	Yes	No	Merged in DM-500	No		No
DM-405	WEF	RZ7	Free water saving devices - offered on bills and online (shower heads, hose triggers, tap inserts, shower timer etc)	Yes	Yes	No	Merged in DM-501	No		No
DM-406	WEF	RZ8	Free water saving devices - offered on bills and online (shower heads, hose triggers, tap inserts, shower timer etc)	Yes	Yes	No	Merged in DM-502	No		No
DM-407	WEF	RZ1	Hospital Audits & Retrofit programme	Yes	Yes	No	Considered to be in base through work of the company, facilities managers and third party providers and that further reductions will be limited due to hospitals having large water needs - screened out	No		No
DM-408	WEF	RZ2	Hospital Audits & Retrofit programme	Yes	Yes	No	Considered to be in base through work of the company, facilities managers and third party providers and that further reductions will be limited due to hospitals having large water needs - screened out	No		No

Passed Screening Stage Filter										
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-409	WEF	RZ3	Hospital Audits & Retrofit programme	Yes	Yes	No	Considered to be in base through work of the company, facilities managers and third party providers and that further reductions will be limited due to hospitals having large water needs - screened out	No		No
DM-410	WEF	RZ4	Hospital Audits & Retrofit programme	Yes	Yes	No	Considered to be in base through work of the company, facilities managers and third party providers and that further reductions will be limited due to hospitals having large water needs - screened out	No		No
DM-411	WEF	RZ5	Hospital Audits & Retrofit programme	Yes	Yes	No	Considered to be in base through work of the company, facilities managers and third party providers and that further reductions will be limited due to hospitals having large water needs - screened out	No		No
DM-412	WEF	RZ6	Hospital Audits & Retrofit programme	Yes	Yes	No	Considered to be in base through work of the company, facilities managers and third party providers and that further reductions will be limited due to hospitals having large water needs - screened out	No		No
DM-413	WEF	RZ7	Hospital Audits & Retrofit programme	Yes	Yes	No	Considered to be in base through work of the company, facilities managers and third party providers and that further reductions will be limited due to hospitals having large water needs - screened out	No		No
DM-414	WEF	RZ8	Hospital Audits & Retrofit programme	Yes	Yes	No	Considered to be in base through work of the company, facilities managers and third party providers and that further reductions will be limited due to hospitals having large water needs - screened out	No		No
DM-415	WEF	RZ1	Hotel efficiency packs	Yes	Yes	Yes		Yes		Yes

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-416	WEF	RZ2	Hotel efficiency packs	Yes	Yes	Yes		Yes		Yes
DM-417	WEF	RZ3	Hotel efficiency packs	Yes	Yes	Yes		Yes		Yes
DM-418	WEF	RZ4	Hotel efficiency packs	Yes	Yes	Yes		Yes		Yes
DM-419	WEF	RZ5	Hotel efficiency packs	Yes	Yes	Yes		Yes		Yes
DM-420	WEF	RZ6	Hotel efficiency packs	Yes	Yes	Yes		Yes		No
DM-421	WEF	RZ7	Hotel efficiency packs	Yes	Yes	Yes		Yes		No
DM-422	WEF	RZ8	Hotel efficiency packs	Yes	Yes	Yes		Yes		No
DM-423	WEF	RZ1	Integrated water & energy efficient retrofit programme delivered by third parties	Yes	Yes	Yes		Yes		Yes
DM-424	WEF	RZ2	Integrated water & energy efficient retrofit programme delivered by third parties	Yes	Yes	Yes		Yes		Yes
DM-425	WEF	RZ3	Integrated water & energy efficient retrofit programme delivered by third parties	Yes	Yes	Yes		Yes		Yes
DM-426	WEF	RZ4	Integrated water & energy efficient retrofit programme delivered by third parties	Yes	Yes	Yes		Yes		Yes
DM-427	WEF	RZ5	Integrated water & energy efficient retrofit programme delivered by third parties	Yes	Yes	Yes		Yes		Yes
DM-428	WEF	RZ6	Integrated water & energy efficient retrofit programme delivered by third parties	Yes	Yes	Yes		Yes		No
DM-429	WEF	RZ7	Integrated water & energy efficient retrofit programme delivered by third parties	Yes	Yes	Yes		Yes		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-430	WEF	RZ8	Integrated water & energy efficient retrofit programme delivered by third parties	Yes	Yes	Yes		Yes		No
DM-431	WEF	RZ1	Online consumption information and advice for large users	Yes	Yes	No	Screened out as in base	No		No
DM-432	WEF	RZ2	Online consumption information and advice for large users	Yes	Yes	No	Screened out as in base	No		No
DM-433	WEF	RZ3	Online consumption information and advice for large users	Yes	Yes	No	Screened out as in base	No		No
DM-434	WEF	RZ4	Online consumption information and advice for large users	Yes	Yes	No	Screened out as in base	No		No
DM-435	WEF	RZ5	Online consumption information and advice for large users	Yes	Yes	No	Screened out as in base	No		No
DM-436	WEF	RZ6	Online consumption information and advice for large users	Yes	Yes	No	Screened out as in base	No		No
DM-437	WEF	RZ7	Online consumption information and advice for large users	Yes	Yes	No	Screened out as in base	No		No
DM-438	WEF	RZ8	Online consumption information and advice for large users	Yes	Yes	No	Screened out as in base	No		No
DM-439	WEF	RZ1	Strawberry Production efficient irrigation roll out	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-440	WEF	RZ2	Strawberry Production efficient irrigation roll out	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-441	WEF	RZ3	Strawberry Production efficient irrigation roll out	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-442	WEF	RZ4	Strawberry Production efficient irrigation roll out	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-443	WEF	RZ5	Strawberry Production efficient irrigation roll out	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-444	WEF	RZ6	Strawberry Production efficient irrigation roll out	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-445	WEF	RZ7	Strawberry Production efficient irrigation roll out	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-446	WEF	RZ8	Strawberry Production efficient irrigation roll out	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-447	WEF	RZ1	Leaking toilets (domestic) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-448	WEF	RZ2	Leaking toilets (domestic) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-449	WEF	RZ3	Leaking toilets (domestic) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-450	WEF	RZ4	Leaking toilets (domestic) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-451	WEF	RZ5	Leaking toilets (domestic) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-452	WEF	RZ6	Leaking toilets (domestic) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-453	WEF	RZ7	Leaking toilets (domestic) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-454	WEF	RZ8	Leaking toilets (domestic) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-455	WEF	RZ1	Leaking toilets (non-household) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-456	WEF	RZ2	Leaking toilets (non-household) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-457	WEF	RZ3	Leaking toilets (non-household) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-458	WEF	RZ4	Leaking toilets (non-household) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-459	WEF	RZ5	Leaking toilets (non-household) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-460	WEF	RZ6	Leaking toilets (non-household) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-461	WEF	RZ7	Leaking toilets (non-household) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-462	WEF	RZ8	Leaking toilets (non-household) - repair of	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-463	WEF	RZ1	Retrofit dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-464	WEF	RZ2	Retrofit dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-465	WEF	RZ3	Retrofit dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-466	WEF	RZ4	Retrofit dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-467	WEF	RZ5	Retrofit dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-468	WEF	RZ6	Retrofit dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-469	WEF	RZ7	Retrofit dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-470	WEF	RZ8	Retrofit dual or variable flush (non-household) - Installing dual or variable flush systems to existing toilets	Yes	Yes	Yes		No	Option excluded because it had insignificant yield, or was not supported by customer preference surveys, or was otherwise included in the Water Efficiency Plan.	No
DM-471	WEF	RZ1	On-line account and billing with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-472	WEF	RZ2	On-line account and billing with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-473	WEF	RZ3	On-line account and billing with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-474	WEF	RZ4	On-line account and billing with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-475	WEF	RZ5	On-line account and billing with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-476	WEF	RZ6	On-line account and billing with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-477	WEF	RZ7	On-line account and billing with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-478	WEF	RZ8	On-line account and billing with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-479	WEF	RZ1	Non household on-line account information with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		Yes

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-480	WEF	RZ2	Non household on-line account information with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		Yes
DM-481	WEF	RZ3	Non household on-line account information with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		Yes
DM-482	WEF	RZ4	Non household on-line account information with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		Yes
DM-483	WEF	RZ5	Non household on-line account information with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		Yes
DM-484	WEF	RZ6	Non household on-line account information with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-485	WEF	RZ7	Non household on-line account information with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-486	WEF	RZ8	Non household on-line account information with specific water efficiency tips and other information	Yes	Yes	Yes		Yes		No
DM-487	WEF	RZ1	Non household audits and retro-fits	Yes	Yes	Yes		Yes		No
DM-488	WEF	RZ2	Non household audits and retro-fits	Yes	Yes	Yes		Yes		No
DM-489	WEF	RZ3	Non household audits and retro-fits	Yes	Yes	Yes		Yes		No

				Passed Screening Stage Filter						
GIS ID	Option Type	SEW WRZ	WRMP Option Name	Coarse Screening	Fine Screening	Revised Feasible List	Reason for Exclusion from Revised Feasible List	Modelled List	Reason for Exclusion from Modelled List	Preferred Plan
DM-490	WEF	RZ4	Non household audits and retro-fits	Yes	Yes	Yes		Yes		No
DM-491	WEF	RZ5	Non household audits and retro-fits	Yes	Yes	Yes		Yes		No
DM-492	WEF	RZ6	Non household audits and retro-fits	Yes	Yes	Yes		Yes		No
DM-493	WEF	RZ7	Non household audits and retro-fits	Yes	Yes	Yes		Yes		No
DM-494	WEF	RZ8	Non household audits and retro-fits	Yes	Yes	Yes		Yes		No
DM-495	WEF	RZ1	Free water saving devices - offered on bills and online	Yes	Yes	Yes		Yes		Yes
DM-496	WEF	RZ2	Free water saving devices - offered on bills and online	Yes	Yes	Yes		Yes		Yes
DM-497	WEF	RZ3	Free water saving devices - offered on bills and online	Yes	Yes	Yes		Yes		Yes
DM-498	WEF	RZ4	Free water saving devices - offered on bills and online	Yes	Yes	Yes		Yes		Yes
DM-499	WEF	RZ5	Free water saving devices - offered on bills and online	Yes	Yes	Yes		Yes		Yes
DM-500	WEF	RZ6	Free water saving devices - offered on bills and online	Yes	Yes	Yes		Yes		No
DM-501	WEF	RZ7	Free water saving devices - offered on bills and online	Yes	Yes	Yes		Yes		No
DM-502	WEF	RZ8	Free water saving devices - offered on bills and online	Yes	Yes	Yes		Yes		No

Appendix 7F: Potential Climate Change Impacts on Feasible Options

This appendix comprises the Review of Potential Climate Change Impacts on South East Water's Feasible Options List. This report was prepared by HR Wallingford in September 2012 (Report TN MAR4966-04 R1).

HR Wallingford
Working with water

South East Water: Climate change studies to support the draft Water Resources Management Plan

Review of potential climate change impacts on South East Water's feasible options list

TN-MAR4966-04 R1 September 2012

Document information

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Technical subject	Review of potential climate change impacts on South East Water's feasible options list
Client	South East Water
Client Representative	Jonathan Barnes (WRMP Programme Manager)
Project No.	MAR4966
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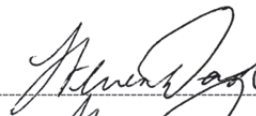
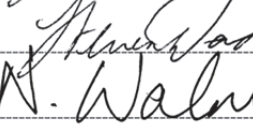
Project Manager	Steven Wade
Project Director	Nigel Walmsley

Document history

Date	Release	Prepared	Approved	Authorised	Notes
17/09/12	1.0	SDW	SDW	NWA	Originally prepared by Nathan Wield but he has now left the company to join Scottish Water

Prepared 

Approved 

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Contents

Tables

Figures

1. Introduction

Climate change projections for south east England indicate warming of between approximately 1 and 5 degC by the 2050s and significant changes in seasonal patterns of precipitation[1]. These changes will affect both river flows and groundwater recharge.

The EA Water Resources Planning Guidelines requires consideration of future climate change for options as well as existing schemes. The guidelines suggest that simplified approaches with a reduced number of climate projections may be used for options screening and appraisal (p59, EA, 2012).

This note provides a review of the potential impacts of climate change on feasible options, as identified in the Draft 2014 WRMP Options Appraisal, Feasible Options Report (Jacobs, 2012). It provides a high level assessment for a range of different options and a more detailed assessment for the surface water options identified.

1.1 AN OVERVIEW OF POTENTIAL CLIMATE CHANGE IMPACTS ON OPTIONS

The climate change vulnerability and impacts assessments completed for South East Water for Deployable Output assessment suggest significant changes in river flows and small reductions in groundwater levels by the 2030s. For example, hydrological modelling suggests changes in summer flows of between plus one percent and minus 46 percent for the River Ouse and between plus 13 percent and minus 27 percent for the River Thames. Some river catchments, with very little groundwater storage will be more affected by climate change than others.

Overall surface water schemes are expected to be at greater risk than groundwater schemes and those without storage at the greatest risk of all. Some allowances for climate change can be made in scheme designs, for example groundwater boreholes can be dug a few metres deeper, but the range of possible impacts large and can't be incorporated in all schemes. Table 1 provides a qualitative view of the impacts on different option types.

Surface water schemes are regarded as most at risk and therefore the main section of this note presents the changes in flows (and impacts) for these schemes before providing a qualitative summary of other options.

Table 1.1 High level view of potential climate change risks for different options types

Option types	Climate risk	Comments
Surface water schemes	Medium to High	Run of river schemes will be affected by changes in summer flows, which may drop more frequently below "hands off flow" conditions Schemes with storage may make use of increased winter flow but dry winters can not be ruled out and these may still present some risk.
Groundwater schemes	Low to Medium	Modelled reductions in groundwater levels are small and can be accommodated in scheme design. However there are still risks for springs and sources that may be affected by sea level rise and water quality issues.
Water treatment	Low	Improvements in water treatment are

[1] http://ukclimateprojections.defra.gov.uk/22290

		likely to unaffected by climate change (unless poorly designed)
Water transfers	Low	These should be guaranteed based on a legal agreement between companies.
Demand management	Low	Demand management schemes should still deliver under climate change scenarios
Effluent re-use	Low	These schemes should be robust as the abstraction is typically a percentage of effluent returns
Conjunctive use	Low to Medium	Although conjunctive use should be more robust than surface water only schemes, they still may be affected by climate change

1.2 METHODOLOGY FOR SURFACE WATER OPTIONS APPRAISAL

The approach adopted builds on the hydrological modelling completed to assess the impacts of climate change on baseline Deployable Output, which used the UK Climate Projections 2009 (UKCP09), Medium Emissions scenario for the 2030s.

The full UKCP09 data set of 10,000 projections were downloaded for the South East England and Thames river basins. For options assessment this data set was reduced in a series of steps to 100, then 20 projections and finally three for options appraisal.

Box 1 Reducing the number of climate change projections for options appraisal

A smaller sample size of 100 was selected using a method called Latin Hypercube Sampling (LHS). By using this method it is possible to rapidly select scenarios that largely span the uncertainty range and consider the joint probabilities between changes in seasonal temperature and precipitation.

These 100 climate scenarios were used to perturb the original climate data and formed the input for the HYSIM models to project the impact of climate change on river flows. The outputs from this modelling were assessed to provide a set of 100 monthly flow factors for each location.

Previous analysis of the climate data had shown reservoir levels to be sensitive to a change in both annual and winter rainfall. Therefore these relationships were used to select a suitable set of 20 flow factors, which were used for the Deployable Output assessment.

Finally, diagnostic plots, such as that show in Figure 1.1, were used to select just three scenarios that provide a reasonable characterisation of the larger data set. Figure 1.1 shows changes in winter and summer flow volumes for the River Ouse at Barcombe according to a set 100 scenarios, the selected 20 scenarios (red diamonds) and finally three scenarios (with background highlighting). The three scenarios selected cover the possibilities of much lower winter and summer flows, no change in winter flows and a small reduction in summer flows and a significant increase in winter and no change in simmer flows.

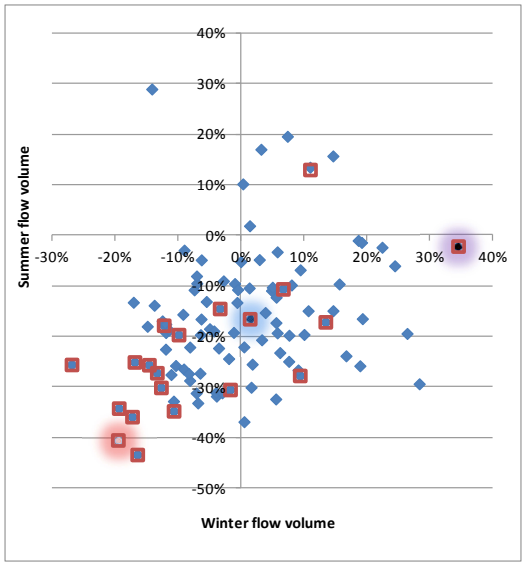


Figure 1.1 Projected changes in seasonal flow volumes for the River Ouse at Barcombe and 2030s Medium Emissions scenario used for identification of smaller sets of UKCP09 projections for options appraisal.

Hydrological models of the Ouse and its sub-catchments, Cuckmere, Thames and Medway (from the Future Flows project) were used in a similar way to derive simplified scenarios.

The climate change scenarios to use for each option were identified based on the proximity to the available hydrological models. Where possible the corresponding model's flow factors were taken to be representative of those expected for each option. Where the option location was outside of a modelled catchment, a review of the baseflow and underlying catchment geology of the option was undertaken to provide a match to a suitable model.

For those options identified within WRZs 6, 7 and 8, Future Flows data for the Medway at Teston were also available, with the same approach undertaken to determine the scenarios, which we have referred to as "wet", "mid" and "dry". Due to the geology, geographical location and flow characteristics, the flows for Medway can be assumed to representative for the options for resource zones 6, 7 and 8.

The appropriate flow factors and full modelled time series were used by the JACOBS team for assessing the impacts on all surface water reservoir options.

For sites with no appropriate model a set of guidance figures were used based on the full DO assessment and average impacts of climate change for the Medium Emissions 2030s scenario, as follows:

Option type	**Flashy catchment (clay)**	**'Slow' catchment (Groundwater dominated)**
Reservoirs (winter storage)	-6%	-9%
Run of river (summer flows)	-17%	-9%
Other affected sources, e.g. groundwater		-2%

2. Simplified climate projections

Analysis of the projected climates for UKCP09 Thames and South East England river basins, and Stour Future Flows climatology, suggests changes temperature, PET and rainfall for dry, mid and wet scenarios as shown in Tables 2.1, 2.2 and 2.3

Table 2.1 Temperature changes for future climate scenarios

Temperature degC change		ID No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SEW	Dry	3386	1.2	0.5	2.0	0.8	0.9	1.9	2.4	2.1	1.6	3.4	2.7	2.7
	Mid	7422	1.6	2.3	1.6	2.1	0.4	2.8	2.9	1.1	0.8	1.3	2.5	2.1
	Wet	1565	3.1	3.1	2.7	1.9	1.5	2.2	2.0	1.5	1.5	1.8	2.5	4.3
Thames	Dry	7396	2.7	1.4	1.5	2.0	2.5	3.2	1.8	3.8	2.6	2.3	2.5	2.4
	Mid	974	1.2	0.3	1.4	1.3	2.4	2.3	1.9	2.6	2.2	2.3	3.3	1.2
	Wet	876	1.4	2.0	1.3	1.4	0.3	2.5	0.9	1.0	0.9	1.9	1.7	2.5

Table 2.2 PET percentage changes for future climate scenarios

PET % Change		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Future Flows	Dry	46.0	15.6	31.4	33.1	22.7	19.3	29.2	57.3	49.2	21.0	54.8	47.7
	Mid	32.0	38.2	26.1	23.7	36.1	48.4	55.6	55.8	48.3	48.8	46.3	46.9
	Wet	45.8	29.0	25.5	44.7	31.8	30.4	29.5	38.9	48.7	47.8	55.7	34.1

Table 2.3 Rainfall percentage changes for future climate scenarios

Rainfall % Change		ID No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SEW	Dry	3386	-11.3	-5.3	-22.4	-2.2	3.5	-20.4	-19.4	-36.0	-27.8	12.1	-6.1	23.5
	Mid	7422	27.1	36.6	3.0	11.1	-7.3	3.4	-41.5	-17.1	2.1	-4.3	-16.1	24.4
	Wet	1565	48.7	58.1	23.1	-4.9	-9.5	-8.5	-13.8	22.4	6.8	-2.6	28.4	32.8
Thames	Dry	7396	-3.6	27.4	10.5	5.7	8.8	-21.9	-13.5	-57.2	-16.6	2.4	-23.4	15.0
	Mid	974	-4.3	6.8	1.5	-2.0	9.4	5.3	-10.7	9.4	-21.3	6.0	26.3	-8.3
	Wet	876	-8.8	9.5	-5.4	-1.3	-18.3	-28.0	-20.6	-13.5	61.6	21.4	33.3	31.1
Future Flows	Dry		19.5	-2.9	-8.5	12.5	-1.8	2.6	-13.2	-11.3	5.2	15.8	2.4	-7.3
	Mid		15.0	10.6	11.3	-0.7	-12.7	-4.1	-12.0	-12.5	-12.9	10.0	15.9	3.8
	Wet		14.1	12.5	-5.2	-10.6	13.8	6.8	23.2	-28.5	1.5	3.4	22.6	11.0

East England **Thames**

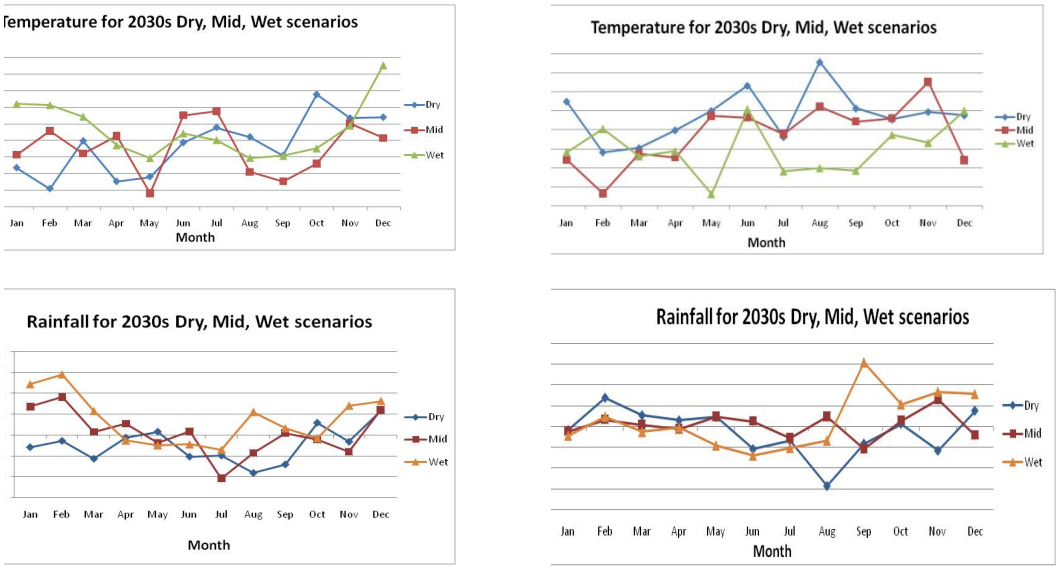
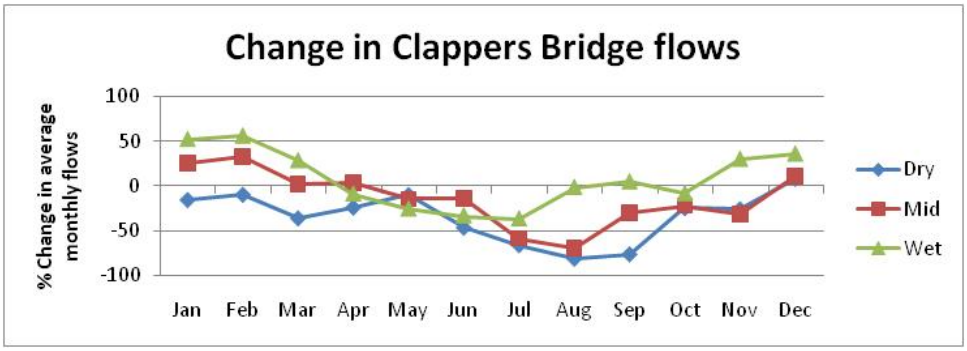


Figure 2.1 Simplified climate change scenarios for South East England and the River Thames

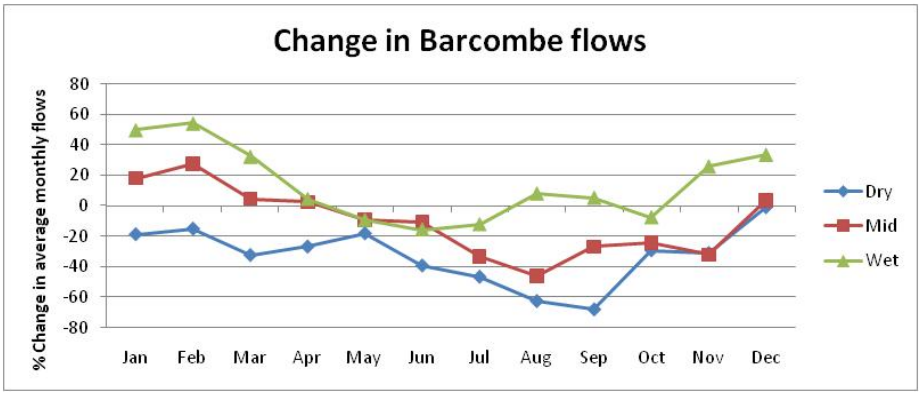
3. Simplified climate change and river flow scenarios for options appraisal

The following tables summarise the data used for each surface water option.

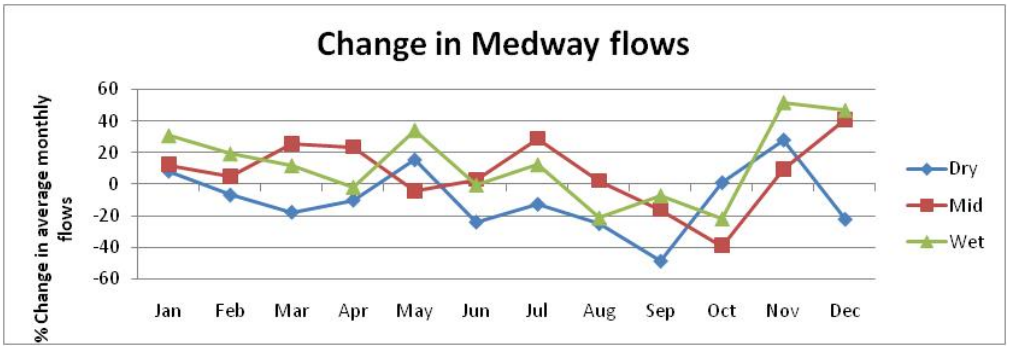
Option:	Goose Green Reservoir
Option reference ID:	SEW-RES-RZ2-1510
Resource zone:	WRZ2
Representative model:	HYSIM Clappers Bridge
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



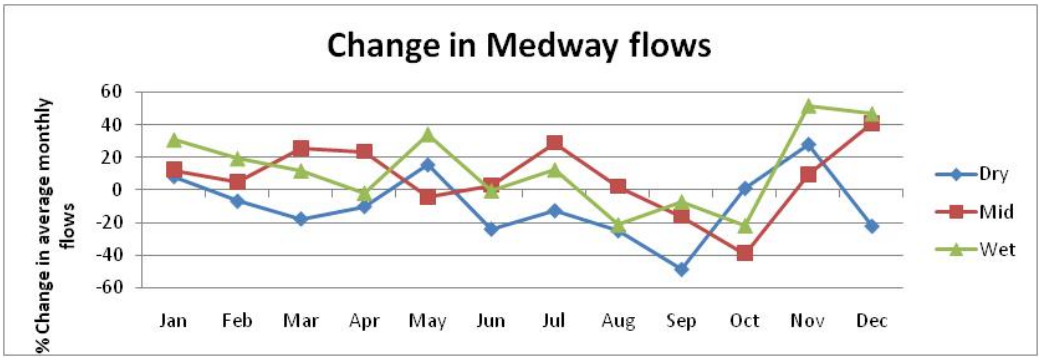
Option:	Laughton Reservoir
Option reference ID:	SEW-RES-WRZ2-1522
Resource zone:	WRZ2
Representative model:	HYSIM Barcombe Mills
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



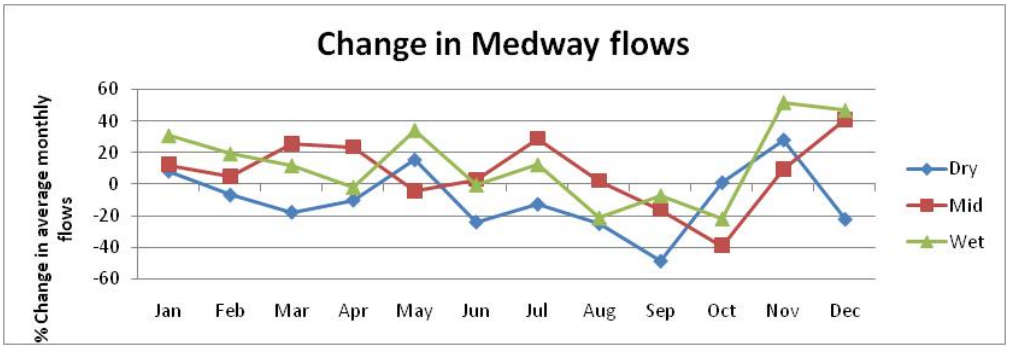
Option:	Bewl Water
Option reference ID:	SEW-RES-WRZ7-1030
Resource zone:	WRZ7
Representative model:	Medway Future Flows (see Appendix)
Climate:	Stour Future Flows



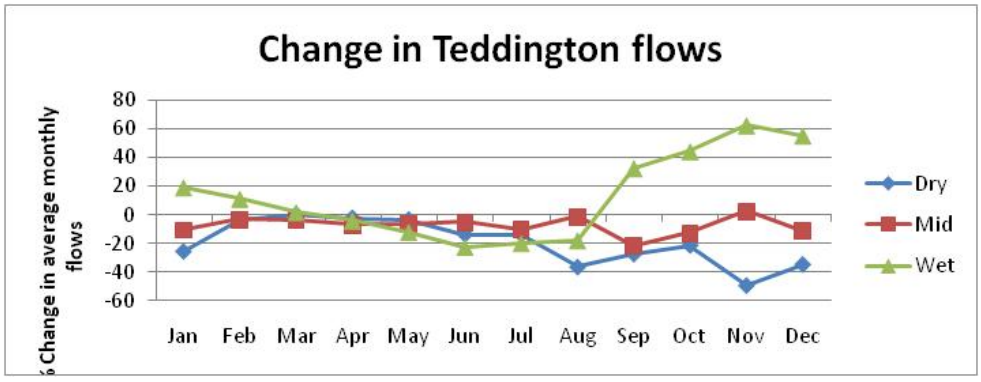
Option:	License alteration at Springfield
Option reference ID:	SEW-ESW-WRZ6-1047
Resource zone:	WRZ6
Representative model:	Medway Future Flows (see Appendix)
Climate:	Stour Future Flows



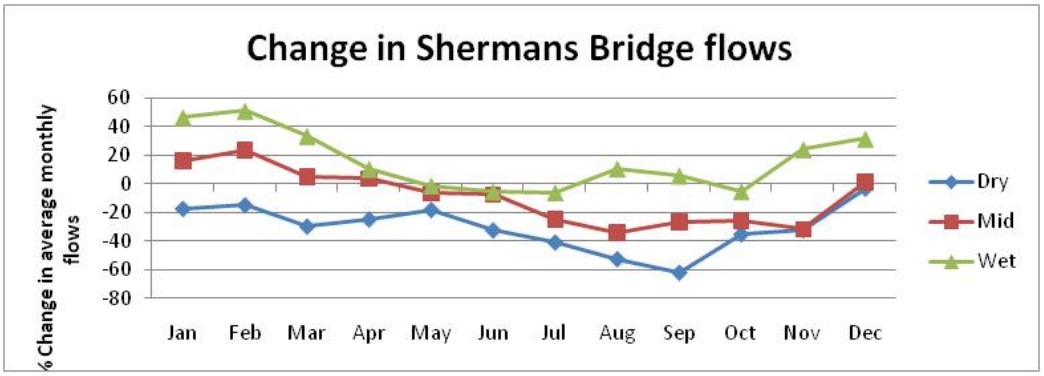
Option:	Broad Oak reservoir
Option reference ID:	SEW-RES-WRZ8-1072
Resource zone:	WRZ8
Representative model:	Medway Future Flows (see Appendix)
Climate:	Stour Future Flows



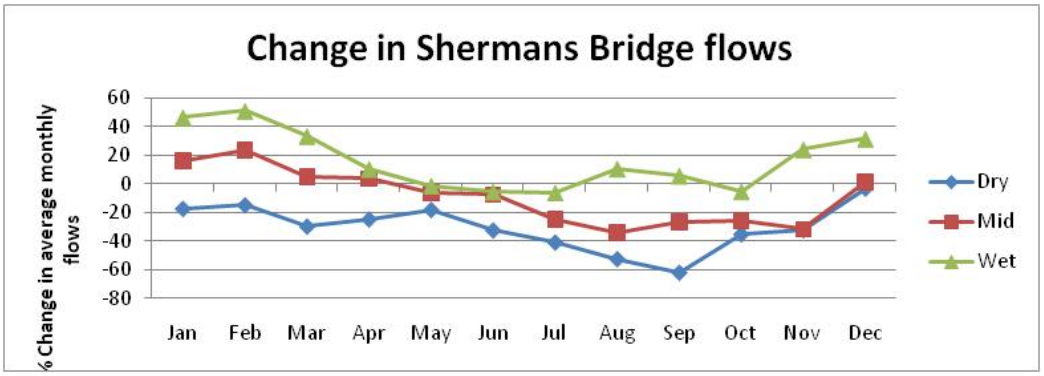
Option:	Beech Hill – Lodden and Blackwater
Option reference ID:	SEW-RES-WRZ4-1200
Resource zone:	WRZ4
Representative model:	Thames Teddington
Climate:	UKCP09 Thames river basin Temperature and Rainfall dataset



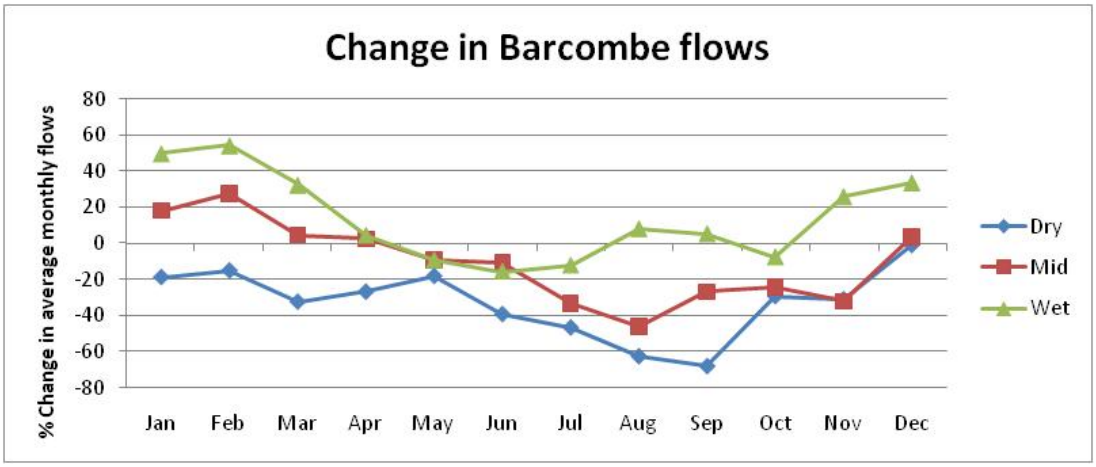
Option:	New Arlington reservoir
Option reference ID:	SEW-RES-WRZ3-1260
Resource zone:	WRZ3
Representative model:	HYSIM Shermans Bridge
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



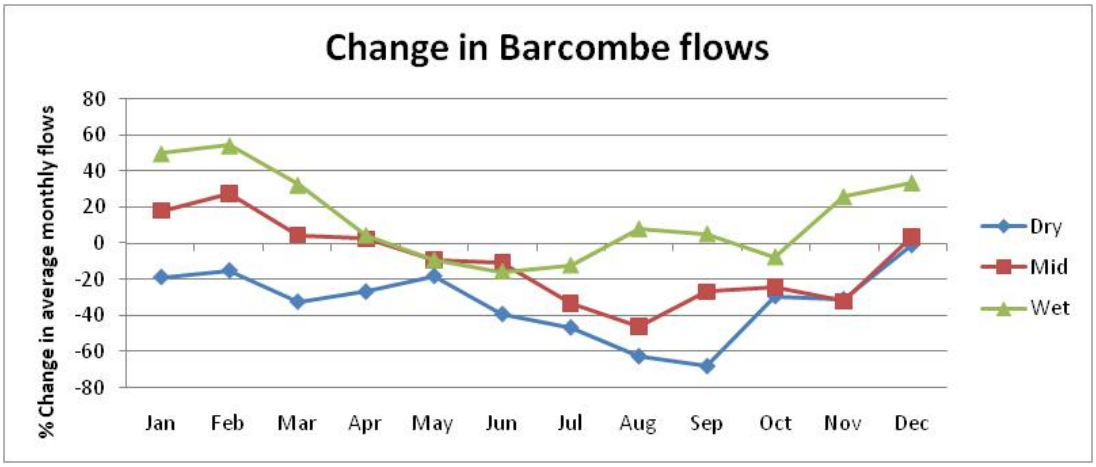
Option:	New Arlington reservoir
Option reference ID:	SEW-RES-WRZ3-1270
Resource zone:	WRZ3
Representative model:	HYSIM Shermans Bridge
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



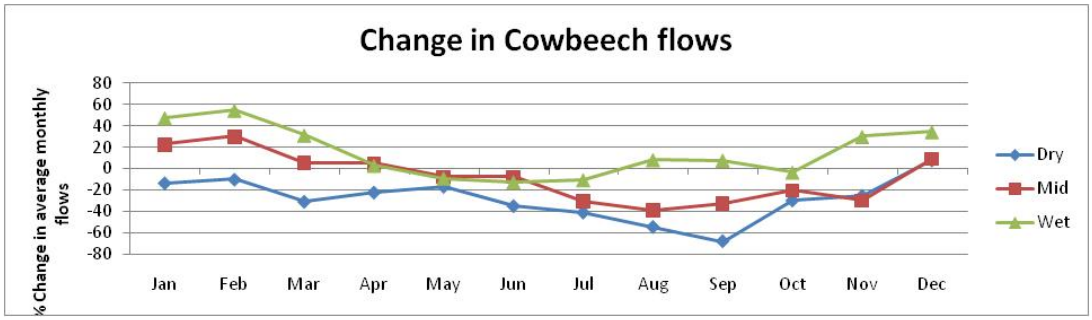
Option:	Clay Hill reservoir
Option reference ID:	SEW-RES-WRZ2-1341
Resource zone:	WRZ2
Representative model:	HYSIM Barcombe Mills
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



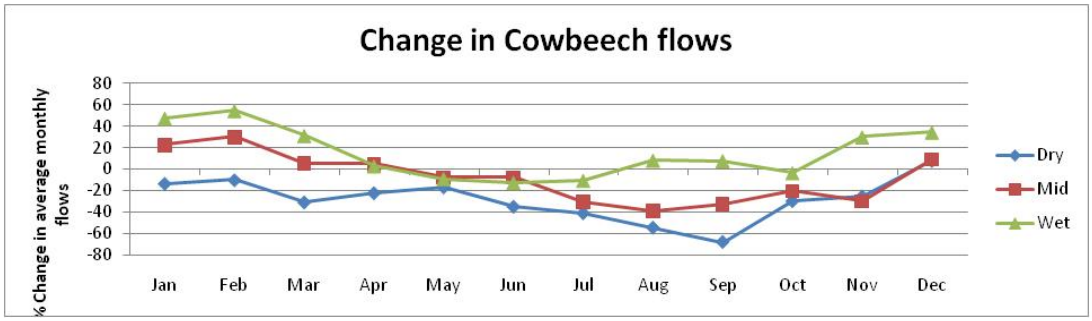
Option:	Broyle reservoir
Option reference ID:	SEW-RES-WRZ2-1350
Resource zone:	WRZ2
Representative model:	HYSIM Barcombe Mills
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



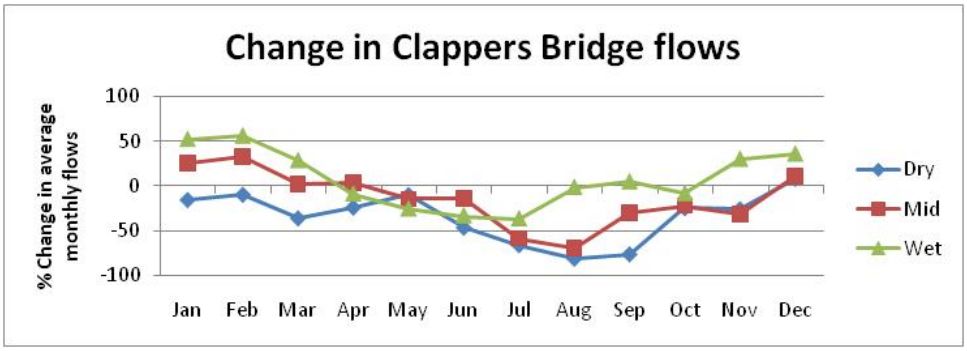
Option:	Broad Farm reservoir
Option reference ID:	SEW-RES-WRZ3-1593
Resource zone:	WRZ3
Representative model:	HYSIM Cowbeech
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



Option:	Raise Ardingly reservoir
Option reference ID:	SEW-RES-WRZ2-1730
Resource zone:	WRZ2
Representative model:	HYSIM Cowbeech
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



Option:	Transfer Adur to Ardingly reservoir
Option reference ID:	SEW-RES-WRZ2-1910
Resource zone:	WRZ2
Representative model:	HYSIM Clappers Bridge
Climate:	UKCP09 South East England river basin Temperature and Rainfall dataset



3.1 HIGH LEVEL CLIMATE CHANGE OPTION IMPACT ASSESSMENT

A high level climate change impact assessment was undertaken for the other feasible options deemed sensitive to climate change, and for those options where making an informed judgement was possible. The results of this review are summarised below.

	Reference ID	GIS ID	Type of scheme	Option name	Min	Mid	Max
Groundwater	SEW-EGW-RZ4-2133	GW-41	Groundwater enhancement	West Ham (WH)/West Ham Park (WHP) increase licence	L	L	L
	SEW-ASR-RZ4-2139	GW-47	Groundwater enhancement	Hurley Closing the Gap	L	L	L
	SEW-ESW-RZ4-2143	GW-51	Groundwater enhancement	Hurley Closing the Gap	L	L	L
	SEW-EGW-RZ3-2150	GW-58	Groundwater enhancement	Cowbeech groundwater - New biological treatment	M	L	L
	SEW-EGW-RZ4-2181	GW-89	Groundwater enhancement	Lasham Beyond the Licence	M	L	L
	SEW-EGW-RZ4-2182	GW-90	Groundwater enhancement	Woodgarston beyond licence	M	L	L
	SEW-EGW-RZ4-2187	GW-96	Groundwater enhancement	Itchel Closing the gap	L	L	L
	SEW-EGW-RZ4-2188	GW-98	Groundwater enhancement	Boxalls Lane LGS Closing the Gap	L	L	L
	SEW-EGW-RZ2-2221	GW-130	Groundwater enhancement	Additional borehole at Sharnden (Coggins Mill)	L	L	L
	SEW-EGW-RZ3-2222	GW-131	Groundwater enhancement	Power Hill Beyond licence	L	L	L
	SEW-EGW-RZ2-2163	GW-73	Groundwater enhancement	New sources in Seaford Chalk	M	L	L
	SEW-NGW-RZ2-2164	GW-74	New groundwater	New sources in Eastbourne Chalk	L	L	L
	SEW-EGW-RZ1-2166	GW-76	Groundwater enhancement	Increase actual to licence at Tonbridge	L	L	L
	SEW-EGW-RZ4-2175	GW-83	Groundwater enhancement	Westham/Westham Park Increase DO to Aggregate Licence	L	L	L
	SEW-NGW-RZ5-2216	GW-125	Groundwater enhancement	Monkwood - new licence within chalk	L	L	L
	SEW-EGW-RZ2-2230	GW-141	Groundwater enhancement	Forest Row - closing the gap	L	L	L
Water transfers	SEW-RTR-RZ8-5012	TR-4	Inter-company / Regional Transfer	Transfer 10 Ml/d from SWS Medway Burham WTW to RZ8	L	L	L
	SEW-RTR-RZ7-5014	TR-7	Inter-company / Regional Transfer	SWS Medway (Burham) to RZ7 - no increase to Bewl WTW	L	L	L
	SEW-RTR-RZ7-5015	TR-7a	Inter-company / Regional Transfer	Transfer 14.6Ml/d from SWS Bewl Reservoir to SEW Bewl Bridge WTW	L	L	L
	SEW-CTR-RZ1-5190	TR-44	Company Transfer	Transfer SEW RZ2 to SEW RZ1 (Whitely Hill SR to Blackhurst SR via Horsted Keynes	L	L	L
	SEW-CTR-RZ1-5191	TR-44a	Company Transfer	Whitely Hill SR to Blackhurst SR via Horsted Keynes SR (Duplicate of Lft36)	L	L	L
	SEW-CTR-RZ7-5116	TR-31a	Company Transfer	SEW Transfer, Blackhurst to Bewl: RZ1 to RZ7 (pumped reverse)	L	L	L
	SEW-CTR-RZ7-5115	TR-33a	Company Transfer	SEW Transfer, Blackhurst to Bewl: RZ1 to RZ7 (pumped reverse)	L	L	L
	SEW-RTR-RZ8-5262	TR-53b	Inter-company / Regional Transfer	Reverse of existing Veolia SE (Barham) transfer (Lex09) to SEW RZ8 (Kingston) - 2	L	L	L
	SEW-RTR-RZ8-5263	TR-53c	Inter-company / Regional Transfer	Extension of reverse Veolia SE (Barham) transfer to SEW RZ8 (Kingston) - 2 Ml/d	L	L	L
	SEW-CTR-RZ2-5300	TR-57	Company Transfer	Transfer from SEW N Region (Surrey Hills) to Whitely Hill Reservoir	L	L	L
	SEW-CTR-RZ5-5340	TR-64	Company Transfer	RZ4 Surrey Hills to RZ5 via Ewshot	L	L	L
	SEW-CTR-RZ5-5341	TR-64a	Company Transfer	Surrey Hills SR toEwshot SR (duplicate of TR-1)	L	L	L
	SEW-CTR-RZ2-5380	TR-78	Company Transfer	Arlington Res to Barcombe Res - SEW Eastbourne (RZ3) to SEW Mid Sussex	L	L	L
	SEW-CTR-RZ3-5470	TR-78a	Company Transfer	Barcombe Reservoir to Arlington Reservoir (Reverse of Lft35)	L	L	L
	SEW-CTR-RZ2-5450	TR-85	Company Transfer	SEW RZ4 Surrey Hills to SEW RZ2 Whitely Hill	L	L	L
	SEW-CTR-RZ6-5521	TR-92a	Company Transfer	RZ1 (Blackhurst) to RZ6 (Aylesford) via East Peckham (reverse of Lft67)	L	L	L
	SEW-RTR-RZ4-5880	TR-134	Inter-company / Regional Transfer	Transfers from Thames Water's GUI zone to SEW RZ4	L	L	L
	SEW-RTR-RZ2-5970	TR-139	Inter-company / Regional Transfer	Transfer from Thames Water's GUI zone to SEW RZ2 - 15Ml/d	L	L	L
	SEW-RTR-RZ2-5971	TR-139a	Inter-company / Regional Transfer	Transfer from Thames Water's GUI zone to SEW RZ2 - 10Ml/d	L	L	L
	SEW-RTR-RZ2-5972	TR-139b	Inter-company / Regional Transfer	Transfer from Thames Water's GUI zone to SEW RZ2 - 15Ml/d	L	L	L
	SEW-RTR-RZ2-5973	TR-139c	Inter-company / Regional Transfer	Transfer from Thames Water's GUI zone to SEW RZ2 - 20Ml/d	L	L	L
	SEW-RTR-RZ2-5974	TR-139d	Inter-company / Regional Transfer	Transfer from Thames Water's GUI zone to SEW RZ2 - 25Ml/d	L	L	L
	SEW-RTR-RZ2-5975	TR-139e	Inter-company / Regional Transfer	Transfer from Thames Water's GUI zone to SEW RZ2 - 20Ml/d	L	L	L
Demand management	SEW-WEF-RZ1-6141	DM-263	Water Efficiency	Greywater re-use - Wastewater collected and re-used	L	L	L
	SEW-WEF-RZ1-6151	DM-271	Water Efficiency	Rainwater harvesting - internal and external daily use	L	L	L
	SEW-WEF-RZ1-6361	DM-439	Water Efficiency	Strawberry Production efficient irrigation roll out	L	L	L
Effluent Reuse	SEW-EFF-RZ2-3050	EF-5	Effluent re-use	Effluent reuse to River Ouse: source - Newhaven	L	L	L
	SEW-EFF-RZ2-3070	EF-7	Effluent re-use	Effluent reuse to River Ouse: source – Peacehaven	L	L	L
	SEW-EFF-RZ3-3090	EF-9	Effluent re-use	Effluent reuse to Wallers Haven: source - Bexhill	L	L	L
	SEW-EFF-RZ6-3110	EF-11	Effluent re-use	Aylesford effluent re-use at Aylesford	L	L	L
	SEW-EFF-RZ8-3140	EF-15	Effluent re-use	Indirect Use of effluent from Weatherlees - WwTW - into Great Stour	L	L	L
Conjunctive use	SEW-CON-RZ3-7010	CU-1	Conjunctive use	Conjunctive Use Schemes - Eastbourne Chalk block	M	L	L
	SEW-CON-RZ2-7080	CU-8	Conjunctive use	Conjunctive Use of Surface Water & Groundwater - River Ouse	M	M	L
	SEW-CON-RZ8-7120	CU-12	Conjunctive use	Conjunctive Use of Surface Water & Groundwater - Great Stour	L	L	L

Impact magnitude		Change in flows
	Low	0-5% reduction
	Medium	5-10%reduction
	High	>10% reduction

4. Closing remarks

A review of the potential impacts of climate change on the feasible options list was completed. This made use of UKCP09, modelled changes in flow for the Thames, Ouse and Medway and the existing DO impacts assessment for existing sources.

- For surface water options in catchments where models were available, climate change scenarios were applied to estimate changes in DO.
- For other options that would be affected by climate change, guidance figures were applied based on the available evidence.
- For many options, such as desalinisation, effluent re-use and demand side schemes the impacts of climate change were assumed to be zero.
- The WRSE options sheet was completed based on a central or 'mid' estimate from the UKCP09 Medium Emissions scenario for the 2030s time period.

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