Drought Plan 2019
Annex 4: Supply interventions

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Version 1

from Southern Water

Contents

Introduction

This annex to the Drought Plan 2019 describes all the supply interventions that the company plans to implement to increase the volume of water resources available during a drought event. Table 1 lists all the feasible options available as well as an indicative order in which they would be used. It does not necessarily mean that all these options will be required in a drought event.

The supply interventions are described in more detail by option type in each of the subsequent sections below. Where interventions are specific to a water resource zone (WRZ) this information is presented.

Table 1 Summary of supply side drought intervention measures and indicative phasing

Actions	Maximise river abstractions	Maximise pumping from groundwater sources	Intra-company transfers	Enhancing abstraction at existing sources	Inter-company transfers	Re-commission unused sources	Drought Orders and Permits	Drought Orders and Permits	Emergency tankering	Emergency desalination
Trigger	Impending drought	Impending drought	Impending drought	Drought	Drought	Drought	Drought	Severe drought	Severe drought	Severe Drought
DO (Ml/d)	No additional Deployable Output (DO) (optimising abstraction within licence to ensure groundwater can recharge)	No additional DO (optimising abstraction within licence to ensure groundwater can recharge)	No additional DO (optimising transfers to manage available water resources)	Benefit dependent on status of assets at time of drought	31.74*	14.36	Up to ~140**	Up to ~131	~1 (DO dependent upon certified potable water tanker fleet size)	30 (can be scaled to meet deficit)
Location	Company wide	Company wide	HR, HSW HSE,HW, SN, SW,SB, SH, KME, KMW WRZs	Company wide	Imports from Portsmouth Water, Affinity Water, South East Water and Wessex Water	Site in the Test Valley, Stourmouth (severe drought trigger)	HSW, IoW, SN, SW, KMW and SH WRZs	IoW, HR, HSW, HSE, SN, SW, KME, KMW, KT and SH WRZs	Company Wide	Coastal zones
Timeline from trigger to implementation	Undertaken during winter months when river flows are higher to allow groundwater levels to recover	Undertaken during summer months	1 week	Dependent upon infrastructure required typically between 1-3 months	1 month	Dependent upon infrastructure required typically between 1-3 months	Up to 3 months after TUBS depending on season	7 days of notice after Secretary of State approves.	1 month	12-18 months

Actions	Maximise river abstractions	Maximise pumping from groundwater sources	Intra-company transfers	Enhancing abstraction at existing sources	Inter-company transfers	Re-commission unused sources	Drought Orders and Permits	Drought Orders and Permits	Emergency tankering	Emergency desalination
Permissions needed / constraints	None (all within licence)	None (all within licence)	None	None (all within licence)	Constant contact with the water companies in the South East	Consult with the EA and NE.	Liaison with the EA and NE on impacts to SPA, SAC, SSSI or Ramsar sites.	Liaison with NE on impacts to SAP, SAC, SSSI or Ramsar sites.	Liaise with DWI plus local authorities, highways agency and police	Liaison with the EA and NE
Risk associated	Environmental (uncertainty on the volumes of water available for additional abstraction. Rivers may already experience lower flows and a minimum ecological flow needs to be maintained)	Environmental (lower groundwater levels). Careful assessment needed when determining which aquifers are less vulnerable.	None	Environmental	- Cost - These options depend on the drought status of the other water companies. - Pain share agreements for two transfers, developing agreements for others	- Water quality - Environmental (lower groundwater levels) - Costs to asset investment	Environmental risks as set out in the associated Environmental Assessment Report for each Drought Permit and order.	Environmental risks as set out in the associated Environmental Assessment Report for each Drought Permit and Order.	- Cost per Ml/d Environmental and Public disturbance due to increased tanker traffic.	-Environmental -Infrastructure (both power and water distribution network)

* Includes new 15Ml/d transfer from Portsmouth water to South Hampshire
**Includes River Test surface water source and Candover augmentation scheme drought options available at earlier drought triggers

Operation of company's own sources

If a drought is threatened and develops, the company will review the operation of its sources, and, where appropriate, ensure that sources operate in an appropriate 'drought mode', for example, by conserving storage in reservoirs. This would normally involve changing the balance of groundwater and surface water abstraction to protect future supplies in the event of drought conditions becoming more serious.

Typical operational responses include:

- Maximising abstraction from run-of-river sources in order to rest groundwater or reservoir sources during the early stages of drought. This maximises their availability at later stages of the drought when river flows are reduced to such a level that abstraction is constrained by flow conditions on the licence;
- Maximising pumping from groundwater sources where this will have little impact on availability later in the drought, in order to rest more vulnerable groundwater sources or surface water reservoirs that can then be used in later stages of a drought; and
- Increasing company transfers from areas that are not as significantly drought affected in order to alleviate abstraction from groundwater or reservoirs within the drought affected area.

Inter-company bulk transfers

The company has a number of bulk supply agreements with neighbouring water companies that cover bulk imports and exports. The terms and conditions of these transfers are set out in the bulk supply agreements. The company is in discussions to update some of its existing bulk supply agreements including the addition of drought clauses. These contracts are intended to be completed by March 2020 (see Table 1Table 2). During a drought the company will ensure it maintains close communication with its neighbouring water companies to ensure the drought situation is understood by all parties. If there is a need to change a bulk import or export, this approach ensures that Southern Water can make a decision in a timely manner in accordance with the Drought Plan.

Southern Water plans public water supply to be reliable up to and including droughts of severity of 1 in 200 year likelihood of occurrence. Source deployable ouputs are estimated in respect of achieving that reliability, subject to implementation of water use restrictions and other drought management measures in line with the company Drought Plan. Supplies to other companies are based on those deployable outputs. Agreements of bulk supplies from Southern Water to other companies are designed for droughts up to and including 1 in 200 year drought events. In real time, as droughts develop, it is not known how severe they will become. There is a risk a drought may develop to be an event more severe than 1 in 200 year likelihood. In view of that risk, source outputs will be managed to ensure some output will remain available if a more severe drought occurs. For this reason it may be neccesary to reduce outputs in droughts less severe than 1 in 200 year likelihood. This reduction will be done as part of 'pain share' discussions with bulk supply recipients. ‘Pain share’ discussions will also occur in relation to the supplies received that we have contracted from other companies as droughts approach the 1:200 event characteristics.

It is not possible to be prescriptive as to how volumes available for bulk transfers will vary during any specific drought as this depends on a number of factors. These factors will include such issues as: the relative status of available supplies, both at the time and expected in the future; and demand restrictions in place for each water company.

The company adopts the policy that the general principles of the provision of inter-company bulk supplies rely on mutual support and equitable ‘pain share’ with regards to the provision of supplies during a drought. The importance of a ‘pain share’ arrangement was highlighted during the 2004-07 drought when there was an obligation to maintain a bulk export at the contracted rate. The receiving company had not implemented any restrictions on water use whereas Southern Water had implemented restrictions on its own customers supplied from the same resource. The company would therefore seek to implement a pain share arrangement for all bulk supplies when necessary. During the onset of a drought, Southern Water would begin communications with relevant neighbouring companies. It will normally be expected that should a company need to seek restraint from its customers or, to restrict the water use of its customers, in order to maintain the supply to Southern Water, then Southern Water should also be seeking restraint from its customers or to restrict the water use of its customers.

We will continue to liaise with neighbouring companies to ensure there is mutual transparency and understanding around respective plans to seek constraint from, and place restrictions on, customers. We will ensure ‘pain share’ principles are agreed and included in all the updated and new contracts.

The hydrological trigger levels used for the management of inter-company bulk supplies will be the same as those for the company’s own sources. This ensures that there is an equitable approach to the management of supplies available. Under drought conditions, the availability of supplies for transfer will be informed by reservoir control curves, groundwater trigger levels and, where applicable, river flow recession curves.

There are a number of stages at which decisions with regard to the provision of supplies will be reviewed and undertaken as follows:

- Under normal conditions, the volumes will remain at full rates under the terms of the bulk supply agreement;
- As drought trigger levels are approached and possibly breached, there will be discussion as to whether the full bulk supply agreement volumes can be provided. It is generally expected that the deployable outputs in the Water Resources Management Plan would still be available up to the drought trigger level and towards severe drought; and
- As trigger levels are breached and the situation deteriorates, further discussion would take place in order to determine if a reduction in volume can be managed.

Notwithstanding the above, Table 2 sets out details of the arrangements with neighbouring water companies for bulk supplies and shared resources during a drought.

Table 2 Summary of bulk supply arrangements during drought events

WRZ	Name and Capacity (Ml/d) of Bulk Supply	Time constraints	Description
Portsmouth Water			
HSE	Import from Portsmouth Water to Hampshire Peak= +15 MDO= +15 ADO= +15	Planned bulk transfer from 2019 onwards	New import from Portsmouth Water into Southern Water HSE WRZ. Availability of this bulk supply was confirmed by Portsmouth Water during discussions in AMP5 and reconfirmed during discussions in early 2019 and will be available up to and including the scenarios represented in Portsmouth Water's WRMP. Portsmouth Water has confirmed that their forecast surplus is sufficient to provide [the initial 15Ml/d into Hampshire] bulk supply without the need for additional resource developments and for this to be reliable up to and including droughts of 1 in 200 year severity. It is assumed that the bulk supply could be at risk in an extreme (1 in 500 year) drought event, unless supported by a Drought Order covering Southern Water and Portsmouth Water's Lower Itchen sources. Southern Water has assumed supply availability may reduce by 50% in an extreme drought event based on a best estimate of resource availability.
SN	Import from Portsmouth Water to Water Supply Works near Pulborough Peak= +15 MDO= +15 ADO= +15	Current bulk transfer	Southern Water would seek to maximise its import from Portsmouth Water during a drought event, subject to the terms of the contract. Alternatively Portsmouth may seek to reduce it. This reflects the different impacts that a drought of different severity or duration can have on different supply areas which have different mixes of water sources and demand pressures. As a drought situation develops the companies will hold regular discussions to agree the volumes of bulk supplies. There is uncertainty with regards to the availability of the bulk supply in an extreme (1 in 500 year) drought event. Southern Water has assumed supply availability may reduce by 50% in an extreme drought event based on a best estimate of resource availability.
SW	Import from Portsmouth Water via North Arundel rather than Pulborough Source Peak= +0	Current bulk transfer	There is a bulk supply agreement from Portsmouth Water into the Central supply area (15 Ml/d, generally supplies Pulborough Source, when used), which can be brought in to the Sussex Worthing WRZ directly at North Arundel. This is intended only for use in extreme conditions – i.e. modelling suggests that DO failures occur in either SN or SB, not SW; this capability would therefore only be required during outage events and not under normal system operation. If the transfer was used it would mean that the 15 Ml/d import to SN from Portsmouth

WRZ	Name and Capacity (Ml/d) of Bulk Supply	Time constraints	Description
	MDO= +0 ADO= +0		Water was not available. There is a net gain of 4Ml/d (transfer in 8Ml/d, losing 4Ml/d of North Arundel output) This option cannot be implemented simultaneously with the option above.
		South East Water*	
SN	Export to South East Water (SEW) from Weir Wood reservoir Peak= -5.4 MDO= -5.4 ADO= -5.4	Current bulk transfer from present to 2020/21 New contract to be finalised by March 2020).	The agreed contractual volume is 5.4 Ml/d for the average day and peak day condition. However, during drought periods, the volumes will be subject to change based on discussions involving pain/share agreements. A renewal of this agreement is currently being renegotiated between SEW and SWS due for completion in March 2020.
SH	Export to South East Water at Darwell reservoir Peak= -12.0 MDO= -8.0 ADO= -8.0	Current bulk transfer from present to 2027/28. (Draft new contract for continuation by March 2020). Supply due to be taken directly from Bewl from 2025 onwards	Under the terms of the contract South East Water is permitted to abstract up to 8 Ml/d over any rolling 28 day period and up to 12 Ml/d during any period as long as it does not exceed the condition above. It has been agreed with South East Water that Southern Water should assume a limit of 4Ml/d under extreme droughts – i.e. greater than a 1 in 200 year return period). The abstraction takes place from the Darwell reservoir. There is intention to alter the Bewl-Darwell transfer to remove the risk of transfer of invasive species into Darwell but the transfer into Darwell is to be maintained until 2025 when South East Water will implement an alternative.
KM	Export to South East Water at Walderslade (Capacity is 0)	No longer required	There is no specific contract for this small supply which is covered under the general terms and conditions of the licence conditions. This supply is no longer required at South East Water's request (required for emergency use only), so is a potential resilience option for South East Water only.
KME	Export to South East Water at Pitfield Peak= -0.5 MDO= -0.1 ADO= -0.1	N/A	There is no specific contract for this small supply which is covered under the general terms and conditions of the licence conditions
KME	Export to South East Water at Bewl reservoir and Water Supply Works near Rochester Peak= -18.8 (same in extreme drought) MDO= -12.3 (-11.03 in extreme drought) ADO= -12.3 (-11.03 in	(Draft new contract for continuation by March 2020).	Under the terms of the River Medway Scheme agreement, South East Water can take their entitlement at Bewl Water and a WSW near Rochester. The maximum volume of water that South East Water can take at Bewl Water is governed by the abstraction licence which was issued to Southern Water. The relevant maximum volumes are 4750Ml/a and 20Ml/d. The overall amount available to South East Water from the supplies at Bewl and the WSW near Rochester is defined as 25% of the yield of the River Medway Scheme (RMS). The yield is the deployable output calculated for WRMP19 and subsequently shared with South East Water. As a drought situation develops the companies hold regular discussions to agree any restrictions or concessions for bulk supplies. The nature of the bulk supply will depend on how both companies are affected by any given drought. Planned works to increase capacity at the WSW near Rochester in early AMP7 will provide additional peak supply to South East Water which are included in the DO assessment.

WRZ	Name and Capacity (Ml/d) of Bulk Supply	Time constraints	Description
	extreme drought)		
KME	Export to South East Water at Sheldwich Peak= -7.39 MDO= -6.79 ADO= -6.80	(Draft new contract for continuation by March 2020).	As part of the Sheldwich scheme, South East Water can take its entitlement. There is also the provision for South East Water to pump water into the Eastling main at Stockbury Valley and take water out at another location. However, the net maximum daily and annual average volumes that South East Water is entitled to remain the original volumes given in the Sheldwich scheme agreement.
		Affinity Water	
KT	Export to Affinity Water South East at Deal Peak / MDO / ADO = -0.07 Increase to -2.0 in 2025, then -4.0 in 2029	Current bulk supply contract	This was agreed with Affinity Water South East in AMP6
KT	Import from Affinity Water South East at Napchester Peak= +0.1 MDO= +0.1 ADO= +0.1	N/A	There is no specific contract for this small supply which is covered under our general terms and conditions of our licence conditions
		Wessex Water	
HA	Export to Wessex Water Peak= -0.41 MDO= -0.31 ADO= -0.33	N/A	The volume of the transfer reflects the take over recent years. In the event of a drought we would discuss with Wessex Water the relative resource position in the Chute area and agree what action is required to mitigate the impact of the drought.

Pain share protocols

Import from Portsmouth Water to Hampshire

General drought management - Pain Share protocol

Contract is being finalised in June 2019. The Public Inquiry outcome (Section 20 Operating Agreement between SWS and EA) recognises the possible need for a Lower Itchen Drought Order to maintain the bulk supply for severe and extreme drought.

Portsmouth Water has confirmed the supply should be available in drought events of up to and including 1 in 200 year severity.

As drought develops Southern Water and Portsmouth Water will undertake Drought Management by implementing their current drought management plans.

Accordingly Portsmouth Water and Southern Water should progressively increase monitoring and review of their water resource and supply- demand balance situations and, should share situation reports regularly, monthly to weekly, depending on stage of drought development.

The two companies should also agree joint statements to the Press (Media) and customers.

Should it become apparent that the full Supply may become unavailable the two companies should meet to ensure complete joint understanding of the reason and the overall options for maintaining supplies. The two companies should establish and work to an overall management plan that makes the best overall use of resources, including their conservation, with due consideration of environmental impacts of operations and respective costs.

Where this joint management approach involves one or other company incurring costs over and above that which it would incur if progressing individually, the additional cost should be reasonably shared. Such cost estimates and subsequent actual costs must be made available to the company in auditable detail in this circumstance.

The options for managing demand should be considered. It will normally be expected that should Portsmouth Water need to seek restraint by its customers or, to restrict water use of its customers, in order to maintain the Supply to Southern Water, then Southern Water should also be seeking restraint by its customers or be restricting water use of its customers.

It does not necessarily follow that should Southern Water already be seeking restraint by its customers or be restricting water use by its customers, Portsmouth Water has to do this. However under this circumstance, Portsmouth Water should at least have a clear plan as to when it would implement those measures on its customers and, should share this plan with Southern Water.

Specific issues of the River Itchen and River Test

The specific circumstances of this Supply are that it is made from Portsmouth Water's licensed abstraction near the tidal limit of the River Itchen, while Southern Water has licensed abstractions upstream that reduce the river flow that eventually flows to Portsmouth Water's abstraction point. Southern Water also makes wastewater (treated effluent) discharges to the River Itchen upstream of Portsmouth Water's abstraction. A significant discharge is made approximately half-way between Southern Water's abstractions and Portsmouth Water's abstraction. It is recognised these Southern Water operations can have a significant impact on the river flow available to Portsmouth Water's abstraction.

The Environment Agency (EA) has set abstraction licence conditions within Southern Water's abstraction licences and within Portsmouth Water's abstraction licence that are consistent relative to the respective river flow and influences upstream of the respective abstraction points. To this end Southern Water's abstractions are constrained when River Flow falls to 198 Ml/d at the EA's river flow gauging station at Allbrook and Highbridge and, Portsmouth Water's abstraction is constrained when river flow falls to 194 Ml/d at the EA's Riverside Park gauging station.

The management, review and communication of these operational issues should be transparently exchanged between Southern Water and Portsmouth Water during drought management.

From Southern Water's perspective, the abstraction licence conditions set by the EA on its River Test abstraction licence also have an influence on its overall resource position as drought develops

and, under some circumstances a reduced abstraction availability on the River Test can influence the need for more abstraction from the River Itchen.

A Public Inquiry was held in March 2018 to hear Southern Water's concerns about the abstraction licence conditions proposed by the EA for Southern Water's abstraction licences on the River Test and River Itchen The Public Inquiry process resulted in a Water Resources Act Section 20 Operating Agreement being signed between the EA and Southern Water, within which Southern Water accepted the EA's proposed licence changes but, with a protocol for management of drought by drought permits and drought orders by Southern Water on the River Test and River Itchen. This Agreement is expected to be in force for the Initial Period of the Supply contract.

The Section 20 Agreement recognises that, in so far as there is a choice during low flows, it could be environmentally preferable to abstract more water at Portsmouth Water's abstraction on the River Itchen and less at Southern Water's points of abstractions. The Section 20 Agreement also expects that, in so far as Southern Water has any choice during low flows, the balance of abstraction from the River Test and River Itchen should be managed to the environmental preference of the EA and Natural England with respect to sequencing respective drought permits and drought orders.

In preparing the Section 20 Agreement with the EA, Southern Water agreed with Portsmouth Water that, should a drought order (likely to be a drought order, not drought permit) be needed on the River Itchen purely to allow Portsmouth Water to continue abstracting in order to continue to provide the Supply, then Southern Water will take responsibility for the application and environmental commitments of that drought order, including their costs.

Import from Portsmouth Water to WSW near Pulborough

There is no formal pain share clause in the current contract. However, upon entering a drought the companies will open up dialogue to agree the approach that would be taken and discuss relevant pain share agreements.

Import from Portsmouth Water via North Arundel rather than Pulborough Source

There is no formal pain share clause in the current contract. However, upon entering a drought the companies will open up dialogue to agree the approach that would be taken and discuss relevant pain share agreements.

Export to South East Water (SEW) from Weir Wood reservoir

No formal pain share clause in the current contract. Companies must operate in a reasonable manner, typically when the company (ies) enters a drought, a dialogue will take place between the donor/recipient companies as to the operation of the transfer and discuss relevant pain share agreements.

Export to South East Water at Darwell reservoir

Pain share clause in contract. When the storage in Darwell reservoir is 250Ml below its control curve and Bewl is below its curve such that transfer to Darwell should not be made, a pain share arrangement will come into operation. This is only expected to be necessary during Drought Management or other exceptional circumstances. In a pain sharing mode of operation the yield from the scheme will be determined on a weekly basis and will be based on the storage levels in each of the reservoirs. The yield of the enhanced Bewl Darwell transfer scheme is split between the two companies such that SWS are entitled to 9/17ths of the transfer and SEW 8/17ths of the transfer.

Export to South East Water at Bewl reservoir and WSW near Rochester

Pain share agreement will be included in the new contract. When either or both companies experience a drought, they have agreed to discuss the operation of the transfer and relevant pain share agreements.

Export to Affinity Water South East at Deal

This was agreed with Affinity Water South East in AMP6. In the event of a drought we would discuss relevant pain share agreements.

Export to Wessex Water

In the event of a drought we would discuss with Wessex Water the relative resource position in the Chute area and agree what action is required to mitigate the impact of the drought as well as discussing relevant pain share agreements.

Small supply agreements

As well as bulk supplies there are a number of small supply agreements which are more informal arrangements, intended to be updated as resilience connection agreements.

Export to South East Water at Walderslade

There is no specific contract for this small supply which is covered under the general terms and conditions of the licence conditions. This supply is no longer required at South East Water's request (required for emergency use only), so is a potential resilience option for South East Water only.

Export to South East Water at Pitfield

No formal pain share clause, when either or both companies experience a drought, they have agreed to discuss the operation of the transfer and relevant pain share agreements'.

Export to South East Water at Sheldwich

Pain share agreement will be included in the new contract. When either or both companies experience a drought, they have agreed to discuss the operation of the transfer and relevant pain share agreements.

Import from Affinity Water South East at Napchester

There is no specific contract for this small supply. In the event of a drought we would discuss relevant pain share agreements.

Supplies to major customers

In the event of a severe drought, the company would hold discussions with major customers with regards to the water resources position and their supply (Table 3). There may be no provision in a commercial contract which covers supplies during drought conditions.

The company will follow the Wholesale Contract (OpenWater, February 2017) which clearly sets out the roles and responsibilities for wholesale and retail companies during a drought event. This includes implementation of water efficiency measures and the imposition of Temporary Use Bans and Drought Orders which may affect non household customers.

Table 3 Summary of bulk supplies to major customers

WRZ	Name and capacity (Ml/d) of bulk supply	Time constraints	Description	Pain Share Clause
Hampshire Southampton East	Export to an oil refinery Max 25Ml/d	n/a	Southern Water has an agreement to supply a maximum of 25 Ml/d and an average of 10 Ml/d of treated water from Test surface water to an oil refinery at Fawley. The refinery's main source of supply is a transfer from Bournemouth Water.	*There is no pain share clause, upon entering a drought the companies would open up dialogue to agree the approach that would be taken.*
Sussex Hastings	Export to a commercial customer from Darwell reservoir Max 0.7 Ml/d	N/A	Southern Water has a commercial customer that requires significant volumes of water for its manufacturing activities in East Sussex. Due to the location of the manufacturing plant, the company has agreed that the company can take water directly from a gravity-fed main out of Darwell Reservoir. A meter has been installed to measure the volume of water used to enable the company to bill them as a regular commercial customer.	*There is no pain share clause, upon entering a drought the companies would open up dialogue to agree the approach that would be taken.*

Re-commissioning of unused sources

The company has a limited number of sources that, for a variety of reasons, were never commissioned or have since been decommissioned. Southern Water maintains a list of these sources and site plans and, during the course of a drought, it would consider options for re-introduction of these sites. The sources listed in Table 4 are those the company considers to be viable options to use during a drought event. These options are also reviewed as part of the development of the Water Resources Management Plan.

Table 4 Summary of sites with potential to be re-commissioned during a drought

Site Name	Water Resource Zone	Licence (if applicable)	Yield	Actions required
Site in the Test Valley	Hampshire Rural	n/a	4.36 Ml/d	*Southern Water still own the assets and the land. It would require a Drought Order and some investment in the assets (e.g. re-commission borehole, pumps and treatment)*
Stourmouth	Kent Thanet	10/41/431001	10 Ml/d	*Needs new asset. Increased abstraction could be available through a Drought Permit*

Enhancing abstraction at existing sources

The company uses industry standard methodologies which have been enhanced with the use of stochastic rainfall generator to determine the deployable output of each of its sources. In most cases the amount of water that can be abstracted is limited either by the abstraction licence or the hydrological yield of the source. However, in some cases, the constraint may include the treatment capacity of the works or the capacity of the distribution system. Where the constraint is the hydrological yield of the source or a physical constraint, then the company will consider further investment in the source to improve its yield. In other cases where the output of the source is limited by the abstraction licence, then the company may seek to increase the output by applying for a Drought Permit/Order (see discussion later in this annex).

The company keeps an up-to-date list of the constraints on each of its sources, and can therefore respond quickly during a drought to identify schemes where investment will improve the supply-demand balance. However, in some cases these schemes will be complex and require large-scale engineering, which is not possible to complete within the normal timeframe of a drought. Examples of these interventions include but are not limited to the following:

- Physical lowering of pumps within boreholes
- Installing variable speed drive pumps
- Refurbishment of boreholes
- Installation of telemetry to allow accurate remote control

Distribution network modifications

Modifications to the distribution network, including re-zoning of district metering areas (DMAs), can improve the flexibility of the distribution system, allowing the company to rest some sources and abstract more water from others. This approach can be particularly useful in areas where there are few other intervention strategies; however, the actual impact on resource availability over the course of a drought may be limited.

Tankering

The tankering of water from adjacent WRZs and from other companies into WRZs that are most affected by drought would be considered in a severe drought. The feasibility of this option depends on the availability of water in neighbouring WRZs, as well as practical issues such as tanker capacity and road access. On the basis of past drought events, however, there is likely to be limited resource availability across the supply area and neighbouring companies could be similarly affected and seeking to conserve their own resources. Tankering has been used by the company historically to address specific localised issues and therefore remains a measure in our Drought Plan.

Drought Permits and Orders (supply-side)

Under drought conditions, where a serious deficiency of supplies is threatened or exists, which has been caused by an exceptional shortage of rainfall, the company may require recourse to Drought Permits and/or Drought Orders in order to increase abstraction and/or conserve water storage to help maintain essential water supplies to its customers.

For existing licensed sources, Drought Permits and / or Drought Orders are used to temporarily vary abstraction licence conditions to maintain or increase the amount of water that can be abstracted, help conserve reservoir storage or aid winter reservoir refill. The types of abstraction licence changes that may be sought by the company under Drought Permits or Orders comprise one of, or a combination of, the following:

- Reductions in reservoir releases to support downstream abstraction;
- Relaxation to Minimum Residual Flow (MRF) conditions;
- Increases in the abstraction volumes authorised in the licence;
- Reductions in reservoir compensation flows; and/or
- Variations to groundwater abstraction licence constraints.

Drought Permits or Drought Orders can also be used to authorise the abstraction of water from a specified water source where there is no existing abstraction licence.

Application for Drought Permits and/or Drought Orders in winter may be sought in order to:

- Reduce the risk of Drought Orders / Permits in the following summer;
- Assist the recovery of water supply resources which have been excessively depleted as a result of drought; and
- Maintain water supply in drought affected areas.

Drought Permits and Drought Orders require applications to be made to the Environment Agency or the Secretary of State, respectively. They are granted for specified periods up to a maximum of 6 months and can be extended by up to a further 6 months (maximum limit of 1 year). Each Drought Permit / Order will likely require environmental monitoring and appropriate measures to mitigate adverse environmental effects; further details are provided in the Environmental Monitoring Plan (Annex 5).

Drought Orders may go further than Drought Permits. They can deal with discharges of water, abstractions and discharges by individuals or organisations other than the water undertaker affected and can also relate to water supply and treatment obligations.

Companies will normally be expected to have applied their powers to introduce Temporary Use Bans on water use under the WIA 1991 (as amended by the FWMA 2010) as fully as appropriate before implementing Drought Permits or Orders. The Environment Agency will likely be more supportive of applications for Drought Permits or Orders where appropriate temporary water use restrictions have been or will be implemented first.

The Drought Permit and Order options included in the Drought Plan are presented in Table 5. This includes a summary of the the varied licence conditions which would be applied for, the applicable drought trigger for application, and the maximum supply benefit. Detailed environmental assessments have been carried out in support of the Drought Plan – further information is provided in Annex 9: Options Appraisal as well as Annexes 11 to 13 (Habitats Regulations Assessment, Strategic Environmental Assessment and Water Framework Directive Assessment, respectively).

The licence changes proposed under Drought Permits and Orders involve a range of temporary licence variations depending on the nature of the source and the existing licence condtions. The changes may include:

- relaxing the minimum residual flow (MRF) constraints which prevent abstraction occurring when river flows fall below a particular level for groundwater sources (Lukely Brook, Caul Bourne);
- relaxing groundwater level conditions (Shalcombe);
- relaxing MRF constraints on surface water abstractions used either for direct supply or for reservoir refill (Eastern Yar; River Test, Lower Itchen, Pulborough, Stourmouth, Bewl, Powdermill, Darwell)
- recommissioning an unused source (Site in the Test valley)
- allowing for the operation of an augmentation scheme (Candover);
- reducing the compensation release requirement from storage reservoir (Weir Wood);
- increasing allowable abstraction volumes on a daily basis (North Arundel, North Deal); and
- removing a seasonal constraint on abstraction (Faversham).

When a licence is temporarily varied under a Drought Order or Permit, the amount of extra water made available under the revised licence conditons can depend on a number of factors, including how the drought progresses, the season, and storage conditions in reservoirs and aquifers. If drought conditions worsen, then it is possible river flows or groundwater levels may fall below the revised licence condions, and the yield benefits of the Drought Order or Permit may be restricted. The yield benefits of licence changes which allow increased abstraction to support storage reservoirs will depend on the levels of the reservoirs at the time of the licence changes.

Table 5 shows the amount of additional water we have assessed as being made available by the Drought Permits and Orders under drought to severe drought conditions. For surface water sources, the benefits have been assessed in relation to river flows expected during a 1 in 200 year drought event and align with the values cited in our revised draft 2019 Water Resource Management Plan. For the groundwater sources on the Isle of Wight and in North Kent we are in the process of developing groundwater models which will help to improve our understanding of source yields during severe droughts.

Table 5 contains four Drought Permit / Order options which are required as part of implementation of the Test Candover and Itchen Interim Abstraction Scheme set out in the s20 agreement. Under this agreement, the Test surface water Drought Permit will need to be applied for in 'normal' conditions and potentially implemented in the 'drought' stage. The Lower Itchen sources Drought Order covers both the abstraction licences of Southern Water's Lower Itchen sources and Portsmouth Water's abstraction at Gaters Mill since any change to the former will have an impact on the latter.

Table 5 Summary of Drought Permit and Drought Order options

Option & Source Type	WRZ	Drought Order / Permit conditions	Drought Trigger	Max Yield Benefit Ml/d
		Western Area		
Lukely Brook Groundwater source	Isle of Wight	Remove requirement for Minimum Residual Flow condition at the Sheep Dip Weir on the Lukely Brook. Provision of a temporary compensation flow release of 0.4Ml/d to the Lukely	Drought conditions	4.0

Option & Source Type	WRZ	Drought Order / Permit conditions	Drought Trigger	Max Yield Benefit Ml/d
		Brook via a temporary pipeline.		
Caul Bourne Groundwater source	Isle of Wight	Reduce the Minimum Residual Flow in the Caul Bourne from 4l/s (0.3Ml/d) to 2l/s (0.15Ml/d) Remove the constraint that limits abstraction to 40Ml (1.3Ml/d) within a 30-day period when the flow drops beneath 20l/s (1.7Ml/d)	Severe drought conditions	1.8
Shalcombe Groundwater source	Isle of Wight	Remove abstraction licence constraint that limits abstraction to 0.35Ml/d when groundwater levels at an observation borehole are equal to or less than 70mAOD. This would allow abstraction up to the 1.0Ml/d daily peak abstraction licence limit.	Severe drought conditions	0.65
Eastern Yar Augmentation Scheme Surface water source	Isle of Wight	Reduction to the Minimum Residual Flow conditions: River Medina 1) reduce from 2.7Ml/d to 1.7Ml/d River Medina 2) reduce from 5Ml/d to 4Ml/d This will allow increased abstraction for transfer and augmentation of flows in the River Eastern Yar.	Severe drought conditions	1.0
Site in the Test Valley Groundwater source	Hampshire Rural	Recommission unlicensed site in the Test Valley with abstraction authorised up to 4.36Ml/d.	Severe drought conditions	4.36
River Test Surface water source (Drought Permit)#	Hampshire Southampton West & Hampshire Southampton East	Relax the Test Total Flow condition in the abstraction licence from 355Ml/d to 265Ml/d	Normal conditions	80.0
River Test Surface water source (Drought Order)#	Hampshire Southampton West & Hampshire Southampton East	Relax the Test Total Flow condition in the abstraction licence from 355Ml/d to 200Ml/d	Severe drought conditions	Up to 80.0 (not additional to the Drought Permit – the Drought Order replaces the Permit

Option & Source Type	WRZ	Drought Order / Permit conditions	Drought Trigger	Max Yield Benefit Ml/d
				once flows fall below 265 Ml/d)
Candover Augmentation Scheme Groundwater source#	Hampshire Southampton East	Drought Order to operate the Preston Candover river augmentation scheme boreholes. To allow up to 27Ml/d and 3750Ml/year (20.8Ml/d over 6 months). This would enable additional DO at our River Itchen Works	Impending drought conditions	20.8Ml/d over 6 months
Lower Itchen (Southern Water and Portsmouth Water) Groundwater and Surface water sources#	Hampshire Southampton East	Southern Water may need to apply for a Drought Order to reduce the flow condition controlling Portsmouth's abstraction licence from 194 Ml/d to 150 Ml/d and reduce the flow condition in the River Itchen at Allbrook and Highbridge from 198 Ml/d to 160 Ml/d controlling Southern Water's Lower Itchen surface and groundwater sources.	Severe drought conditions	38.0 from Southern Water's Lower Itchen sources
		Central Area		
Pulborough (1) Surface water source	Sussex North	Reduce Minimum Residual Flow at Pulborough Source Weir from 63.65Ml/d to 53.65Ml/d, allowing greater surface water abstraction.	Drought conditions	10.0
Pulborough (2) Surface water source	Sussex North	Reduce Minimum Residual Flow at Pulborough Source Weir from 63.65Ml/d to 43.65Ml/d, allowing greater surface water abstraction.	Drought conditions	20.0
Pulborough (3) Surface water source	Sussex North	Reduce Minimum Residual Flow at Pulborough Source Weir from 63.65 Ml/d to 33.65Ml/d, allowing greater surface water abstraction.	Severe drought conditions	23.0
Weir Wood reservoir Surface water source	Sussex North	Reduce statutory compensation flow from Weir Wood reservoir to the River Medway: From 3.64Ml/d to 0.04Ml/d in November to April; and	Severe drought conditions	3.6 (winter) 5.4 (summer)

Option & Source Type	WRZ	Drought Order / Permit conditions	Drought Trigger	Max Yield Benefit Ml/d
		5.64Ml/d to 0.06Ml/d in May to October.		
East Worthing Groundwater source	Sussex Worthing	Increase abstraction licence daily limit from 4.5Ml/d to 7.0Ml/d between October and December inclusive.	Drought conditions	2.5 (Oct to Dec only)
North Arundel Groundwater source	Sussex Worthing	Increase abstraction licence daily limit from 4.5Ml/d to 7.0Ml/d.	Severe drought conditions	2.5
		Eastern Area		
Stourmouth Surface water source	Kent Thanet	Revise licence conditions to impose Minimum Residual Flow at 100Ml/d on River Great Stour to allow increased abstraction (maximum 10Ml/d).	Severe drought conditions	6.5
North Deal Groundwater source	Kent Thanet	Increase daily peak abstraction licence limit from 2.73Ml/d to 4.0Ml/d.	Severe drought conditions	1.27
Faversham Groundwater sources	Kent Medway East	Remove abstraction licence condition preventing abstraction during the months of October to April inclusive.	Severe drought conditions	15.0
Bewl Water reservoir / River Medway Scheme Stage 1 Surface water source	Kent Medway West	In a second dry winter following a dry summer, reduce the Minimum Residual Flow on the River Medway Scheme From 200Ml/d in November to January to 150Ml/d From 250Ml/d in February to 150Ml/d From 275Ml/d in March and April to 150Ml/d	Drought conditions	3.0
Bewl Water reservoir / River Medway Scheme Stage 2 Surface water source	Kent Medway West	In a third dry winter following two successive dry summers, reduce the Minimum Residual Flow in the River Medway From 200Ml/d in November to January to 150Ml/d From 250Ml/d in February to 150Ml/d	Severe drought conditions	4.0

Option & Source Type	WRZ	Drought Order / Permit conditions	Drought Trigger	Max Yield Benefit Ml/d
		From 275Ml/d in March and April to 150Ml/d Modify the Bewl Water reservoir regulation release factor from 1.1 to 1.0 to support abstraction from the River Medway		
Bewl Water reservoir / River Medway Scheme Stage 3 Surface water source	Kent Medway West	In a third dry summer after three dry winters, reduce the Minimum Residual Flow in the River Medway at Teston for abstractions at three locations: From 350Ml/d in May to August to 275Ml/d Modify the Bewl Water reservoir regulation release factor from 1.1 to 1.0 to support abstraction from the River Medway.	Severe drought conditions	1.0
Bewl Water reservoir / River Medway Scheme Stage 4 Surface water source	Kent Medway West	In the winter following a third dry summer, reduce the Minimum Residual Flow requirement in the River Medway in relation to Bewl pumped refill. From 200Ml/d in November to January to 0Ml/d From 250Ml/d in February to 0Ml/d From 275Ml/d in March and April to 0Ml/d Cease all Bewl Water reservoir regulation release support for abstraction from the River Medway at one location.	Severe drought conditions	16.2
Powdermill reservoir Surface water source	Sussex Hastings	Reduce the Minimum Residual Flow in the River Brede from 6.2Ml/d to 2Ml/d to allow additional abstraction from the River Brede to Powdermill reservoir	Severe drought conditions	1.8

Option & Source Type	WRZ	Drought Order / Permit conditions	Drought Trigger	Max Yield Benefit Ml/d
Darwell reservoir (1) Surface water source	Sussex Hastings	Reduce the Minimum Residual Flow in the River Rother in June to September from 28.5Ml/d to 10Ml/d to allow additional abstraction from the River Rother to Darwell reservoir.	Severe drought conditions	2.5
Darwell reservoir (2) Surface water source	Sussex Hastings	Reduce the Minimum Residual Flow in the River Rother in March to May from 40Ml/d to 10Ml/d to allow additional abstraction from the River Rother to Darwell reservoir.	Severe drought conditions	3.8

 # The Test surface water Drought Permit and Drought Order and the Candover Augmentation Scheme and Lower Itchen sources Drought Orders are required as part of the s20 agreement.

Environmental impacts and monitoring

The potential environmental impacts of the Drought Permits / Orders included in the Drought Plan have been assessed in accordance with the Environment Agency's Drought Plan guidance. A detailed Environmental Assessment Report for each Drought Permit / Order option has been prepared in parallel to the development of the Drought Plan and these have also informed the statutory environmental assessment processes (HRA, SEA and WFD assessments, as reported in Annexes 11 to 13). Where a designated site and/or environmentally sensitive receptor is potentially affected by a Drought Permit or Order, potential impacts have been assessed, including any likely 'in combination', cumulative effects with other Drought Permits/Orders, other drought management measures and, where applicable, other Drought Plan measures of other water companies or the Environment Agency. Cumulative impacts with other projects, plans or programmes have also been considered.

The HRA, SEA and WFD assessment reports (Annexes 11, 12 and 13, respectively) summarise the environmental impacts of each Drought Permit / Order.

The Environmental Assessment Reports set out the required environmental monitoring of specified environmental features for:

- Baseline (non-drought) conditions to address identified evidence gaps and/or augment historic baseline environmental datasets
- In-drought monitoring – firstly, requirements prior to implementing a Drought Permit/Order, then during implementation and finally following cessation of the Drought Permit/Order.

These monitoring requirements are consolidated into Annex 5: Environmental Monitoring Plan of this Drought Plan.

The Environmental Assessment Reports also identify the potential mitigation measures that may be required to reduce the identified potential impacts of the Drought Permit/Order. These are also consolidated into the Environmental Monitoring Plan (Annex 5).

The Environmental Assessment Reports (EARs) have been discussed and reviewed by the Environment Agency and final versions of each report have been issued to the Environment Agency. Each EAR covers all of the permutations of Drought Permits / Orders for a given water source (for example, all three stages of the Pulborough Drought Permits/Orders are included in the Pulborough EAR).

For the highest priority Drought Permit/Drought Orders (Test Surface Water, Lower Itchen, Candover and Stages 1 and 2 of the Bewl Water/River Medway Scheme), the monitoring and mitigation measures have been agreed and the EARs have been updated to be “application ready”.

We have identified a number of further improvements to be made to the EARs in the future to take account of new information arising from a variety of activities, including from groundwater modelling developments, new baseline monitoring and findings from Water Industry National Environment Programme (WINEP) investigations. These future improvement actions are set out in an action log for each EAR which we have shared with the Environment Agency.We are committed to continuing to work with the Environment Agency and Natural England to make these further improvements as the new evidence becomes available.

As part of the EAR preparation, we have worked with the Environment Agency and Natural England to develop the Environmental Monitoring Plan and appropriate mitigation measures for each Drought Permit/Order (see Annex 5 for further details). A final version of the detailed monitoring schedule for Drought Permits/Orders in the Kent and South London area of the Environment Agency has been issued and we are in the final stages of agreeing the detailed monitoring schedule for the Solent and South Downs area for the higher priority and lower priority Drought Orders/Permits (monitoring for the highest priority sites has already been agreed). We are committed to delivering the agreed baseline monitoring programmes as set out in Annex 5.

For some Drought Permits/Orders, dialogue is continuing with the Environment Agency and Natural England to confirm the mitigation measures. We are committmed to agreeing these mitigation measures as soon as practicable and Table 6 indicates the target timescales following further discussion and, in many cases, completion of walkover surveys during summer 2019. The timescales reflect the relative likelihood of requiring implementation of the drought permit and/or the environmental sensitivity of the water environment: for higher priority locations, the timescales are autumn 2019 (following completion of summer walkover surveys). For the lower priority locations, the timescales are spring 2020.

The EARs would be updated before any application is made for a Drought Permit or Order to take account of any new monitoring or other evidence, and to reflect the prevailing drought conditions and the antecedent effects of the drought on the environment. We will update all of the EARs again in 2020/21 taking account of the Drought Plan baseline monitoring findings and any other new evidence as part of our programme of updating the Drought Plan.

In view of the potential higher frequency of needing to apply for the Test surface water Drought Permit compared with other Drought Permits / Orders, we have agreed with the Environment Agency as part of the s20 agreement that we will provide updated application documents (including the EAR) on a twice-yearly basis.. In line with this commitment, updated EARs for the Test Surface Water Drought Permit have been prepared in October 2018 and again in May 2019. The Environment Agency has agreed to review these application documents on each occasion and provide feedback to Southern Water on any actions required to ensure they are ‘application ready’. Southern Water

has also agreed to share the application documents (including the EAR) with interested stakeholders and arrange to meet with the stakeholders to discuss any comments or concerns in order to ensure the need for the Drought Permit and its impact are understood. The Environment Agency accepts that so long as Southern Water has carried out these steps to engage with stakeholders, the absence of stakeholder engagement or consent will not be a barrier to the Environment Agency accepting that a Drought Permit application is 'application ready'. This 'application ready' approach is an integral part of the Drought Permit application process set out in the s20 agreement.

Table 6 Drought Permits/Orders where mitigation measures remain to be agreed

Drought Permit or Order	Target Timescales for Agreeing Mitigation Measures
Pulborough	Autumn 2019
Caul Bourne	Autumn 2019
Shalcombe	Autumn 2019
Eastern Yar Augmentation Scheme	Autumn 2019
Lukely Brook	Autumn 2019
Test Valley	Autumn 2019
Bewl Water/River Medway Scheme (Stages 3 and 4)	Autumn 2019
Darwell reservoir	Autumn 2019
East Worthing	Spring 2020
North Arundel	Spring 2020
Weir Wood reservoir	Spring 2020
North Deal	Spring 2020

Sequencing of Drought Permit and Drought Order implementation

We have taken account of the findings of the environmental assessments of each Drought Permit and Drought Order, along with the Water Resource Zone source characteristics and discussions with the environmental regulators, to develop the prioritised sequencing of Drought Permit / Order implementation. Taking account of our statutory supply duties, we plan to implement those Drought Permits / Orders which have been assessed as having the least environmental impact ahead of those assessed as having greater environmental impact in the applicable Water Resource Zones. Table 7 sets out the sequencing of Drought Permit / Order implementation in each Water Resource Zone. The precise phasing during a drought will take into account the prevailing environmental conditions informed by the in-drought monitoring activities set out in Annex 5.

These sequencing principles are reflected in Annex 1 of the s20 agreement between the Environment Agency and Southern Water signed on 29 March 2018 in relation to the implementation of the Test Surface Water Drought Permit and Drought Order, Candover Augmentation Scheme Drought Order and Lower Itchen sources Drought Order. Aquatic environmental monitoring of prevailing drought conditions in the River Test and River Itchen will be used to help inform the final sequencing of Drought Order implementation in any future drought event, as well as taking account of Southern Water's supply duties.

Table 7 Sequencing of Drought Permit / Order implementation

Option & Source Type	WRZ	Drought Trigger	Sequencing of implementation in the WRZ
Lukely Brook Groundwater source	Isle of Wight	Drought conditions	1
Caul Bourne Groundwater source	Isle of Wight	Severe drought conditions	2
Shalcombe Groundwater source	Isle of Wight	Severe drought conditions	3
Eastern Yar Surface water source	Isle of Wight	Severe drought conditions	4
Test Valley Groundwater source	Hampshire Rural	Severe drought conditions	1
Test surface water Drought Permit Surface water source	Hampshire Southampton West Hampshire Southampton East	Drought conditions	1
Test surface water Drought Order Surface water source	Hampshire Southampton West Hampshire Southampton East	Severe drought conditions	2#
Candover Augmentation Scheme Groundwater source	Hampshire Southampton East	Severe drought conditions	2#
Lower Itchen Sources Groundwater and surface water sources	Hampshire Southampton East	Severe drought conditions	2#
Pulborough (1) Surface water source	Sussex North	Drought conditions	1
Pulborough (2) Surface water source	Sussex North	Drought conditions	2
Pulborough (3) Surface water source	Sussex North	Severe drought conditions	3
Weir Wood reservoir Surface water source	Sussex North	Severe drought conditions	4

East Worthing Groundwater source	Sussex Worthing	Drought conditions	1
North Arundel Groundwater source	Sussex Worthing	Severe drought conditions	2
North Deal Groundwater source	Kent Thanet	Severe drought conditions	1
Stourmouth Surface water source	Kent Thanet	Severe drought conditions	2
Faversham Groundwater source	Kent Medway East	Severe drought conditions	1
Bewl Water reservoir / River Medway Scheme Stage 1 Surface water source	Kent Medway West	Drought conditions	1
Bewl Water reservoir / River Medway Scheme Stage 2 Surface water source	Kent Medway West	Severe drought conditions	2
Bewl Water reservoir / River Medway Scheme Stage 3 Surface water source	Kent Medway West	Severe drought conditions	3
Bewl Water reservoir / River Medway Scheme Stage 4 Surface water source	Kent Medway West	Severe drought conditions	4
Powdermill Surface water source	Sussex Hastings	Severe drought conditions	1
Darwell (1) Surface water source	Sussex Hastings	Severe drought conditions	2
Darwell (2) Surface water source	Sussex Hastings	Severe drought conditions	3

sequencing will be in accordance with the provisions set out in the s20 agreement

Unprecedented drought leading to emergency measures

There is no clear distinction between 'severe' or 'extreme' drought conditions. The actions taken by the company will vary, depending on the risks and uncertainties at the time including hydrological conditions, time of year, customer response to water use restrictions and long-term weather forecasts. Hence, although it is not possible to strictly define different drought conditions, it is possible to give a range of actions that will be taken to maintain essential water supplies to customers as drought conditions become more severe.

As a drought develops, a range of supply-side and demand-side actions are available including Drought Permits and Drought Orders to improve the supply-demand balance position. The company will make full use of all other measures before considering whether the severity of drought conditions mean that Emergency Drought Orders might be required.

The actions that would be taken in advance of the application for Emergency Drought Orders are summarised as follows:

- Applications for Drought Permits or Drought Orders to maintain abstraction through reductions in MRFs, river regulation releases from reservoirs and/or reservoir compensation flow releases;
- Applications for Drought Orders to prohibit or limit the abstraction of water by third parties, in order to allow the company to maintain or increase its authorised abstractions;
- Applications for Drought Orders to vary discharges to the environment; and
- Applications for Drought Orders to limit or restrict the use of water for certain activities as stated in the Drought Direction 2011.

It should be noted that some of the measures above may also need other consents, such as discharge consents and planning permissions.

Emergency Drought Orders, amongst other measures, can allow water companies to restrict supplies to customers through the imposition of rota cuts and/or the introduction of standpipes. These measures exist to deal with the possibility of a drought much worse than any seen in the last century or more in the UK. Emergency Drought Orders to restrict water supplies have not been put in place in the England since 1976. Ministers have made it clear that such measures should be avoided at all costs and introduced only as a last resort. If similar conditions to those experienced in 1976 were to occur again, there should not be the need for an Emergency Drought Order given the investment by water companies since then to improve resilience to drought.

The legislation governing Emergency Drought Orders is contained within the Water Resources Act 1991 and gives powers to the Secretary of State on application by the water company to make such provision as appears to him/her to be expedient with a view to meeting the supply deficiency. In practice, such powers are generally held to include the following water use restriction measures:

- To limit the use of water for such purposes as it considers necessary (i.e. further measures not specified in the Drought Direction 2011);
- To introduce rota cuts; and
- To set up and supply water by means of standpipes or water tanks.

Emergency Drought Orders may be granted for a period of 3 months and cannot be extended by the Secretary of State beyond 5 months.

In the event of Emergency Drought Orders being authorised and implemented to further restrict water use, the company will give as much warning (minimum 72 hours) as is possible to the local Fire Authority before it decides to enact an Emergency Drought Order. The company will also take all reasonable measures to secure adequate supplies of water for the Fire Authority's use in the event of fire. Fire Authorities will be consulted closely during all stages of a drought event (not just when considering Emergency Drought Orders) and will be made aware of the implications that any measures taken by the company might have on the availability of adequate supplies for firefighting. Due to the importance of water for firefighting, the London Fire and Emergency Planning Authority and other relevant local Fire Authorities in the Southern Water supply area will receive formal notice in writing of the introduction of an Emergency Drought Order, and the company will inform these Fire Authorities of any forecast shutdowns to the water distribution network.

An Emergency Drought Order could also be sought to further reduce MRFs or increase abstraction from licensed and unlicensed water sources, which is likely to lead to additional and more severe environmental impacts. The scope of monitoring, environmental assessment work and mitigation measures that might be required under such circumstances will be reviewed with the Environment Agency if drought conditions become more severe.

Other options considered

In parallel to the supply interventions previously explored, the company also considered the following three options. Table 8Table summarises the pros and cons associated to each of these options.

Table 8 List of additional options considered

Options	Wastewater recycling	Emergency desalination	New satellite boreholes
Deployable output (Ml/d)	Maximum 20Ml/d depending on the scale of the scheme	Maximum 10Ml/d depending on the scale of the scheme	Maximum 10Ml/d
Timeline from trigger to implementation	2 years	2 years	1 year
Risks associated	Poor quality of water may lead to a risk of drinking water compliance failure	Financial (high investment and energy cost) and environmental	Environmental (lower groundwater levels)

The triggers for these schemes would be breaching severe drought. The timeline is indicative and maybe longer, should there be planning issues or similar.

Emergency desalination

Emergency desalination plants may be introduced if it is felt that they represented a feasible option given the prevailing conditions. To date, this has been outside the experience of Southern Water and therefore may not be feasible, but is still an option for the company, especially for prolonged droughts. In addition, the introduction of these measures may require application for Emergency Measures, which are outside the scope of the company's Drought Plan.

A number of desalination schemes have been considered in our WRMP to balance the long-term supply with the demand, which will need further detailed assessment to confirm their feasibility. In a

very severe drought, and especially in a prolonged one, desalination schemes could provide a reliable water supply for customers, agriculture and businesses.

Construction of new satellite boreholes

New boreholes could be created at existing sources (where appropriate) to spread the load of abstraction and reduce the risk of existing boreholes failing. This intervention is part of the resilience options of Southern Water's Water Resources Management Plan, however due to the time needed to implement these schemes they are not considered to be part of the Drought Plan.

Wastewater recycling

Wastewater recycling is generally not considered to be an option within the timescale of a Drought Plan due to the lead in time of implementing such schemes. However if there is a scheme under development for the long-term Water Resources Management Plan, there could be potential to increase investment to accelerate this activity during a drought.