Appendix 8

Environmental Monitoring Plan

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1. Introduction

The following report provides a summary of our environmental monitoring plan, which supports the Drought Plan 2019. Monitoring and mitigation requirements have been identified through the environmental assessment of supply-side drought actions that may require a drought permit.

1.1 Background

The purpose of the monitoring plan is to provide a summary of the existing monitoring in place, and to identify where additional monitoring will be required for potential drought permits. The plan covers all the stages of drought planning and monitoring from normal, pre-drought, conditions through to post drought recovery. It summarises the predicted impacts during drought if a permit were permitted and the need for monitoring and mitigation.

The in-drought and post-drought monitoring combined with up to date baseline (before drought) monitoring enable us to distinguish the impacts of our actions from the natural effects of drought and inform mitigation requirements during implementation of a permit. The monitoring contributes to the improvement of our drought plan, as it will help to inform the implementation of the drought permits.

The Environment Agency (Environment Agency)[1] has stated that our plan should include the following:

- "The feature(s) to be monitored
- Responsibility, location, timing, frequency, methods of monitoring
- How you'll use new monitoring data to improve your understanding of:
  - The normal (non-drought) conditions at a site / water body
  - The environmental sensitivity of a site / water body
  - The risk of your drought actions
- How you will assess the environmental effects of your actions during and after a drought
- How the data collected will be used to define and activate triggers (e.g. based on quantity, quality and ecological criteria to activate, refine and alter your drought or mitigation measures)."

The Environment Agency already collects a large amount of physio-chemical, ecological and hydrological data that is relevant to the Drought Permits. Standard Environment Agency methods are used throughout. It is considered that the routine data gathered by the Environment Agency, along with any additional monitoring undertaken by Anglian Water, generally allows good coverage and enables long-term trend analysis of any changes caused by a Drought Permit. Where there are data gaps identified, additional monitoring has been proposed.

The monitoring plan will be annually reviewed with the Environment Agency to ensure that any changes in routine monitoring are identified, and that monitoring is continued where it is required for the drought permits. The baseline monitoring data will also be continuously reviewed to ensure that any required changes to the environmental assessments or Drought Plan actions are identified.

The following chapters give a summarised assessment of the potential effects of the proposed Drought Permits, the need for monitoring and mitigation and a high-level overview of the monitoring and mitigation plan for the predicted impacts. A separate detailed monitoring plan, which is not presented in this report, has been developed which includes further detail on monitoring locations, parameters, and frequency.

Further information on the proposed permits and their potential impact on the environment is available in Appendix 7: Environmental Assessments, and the individual Environmental Assessment Reports and Habitats Regulation Assessments (HRAs) are available on request. This work is also support by a Strategic Environmental Assessment.

[1] *Environment Agency, "Drought plan guideline extra information, Environmental Assessment for Water company Drought Plans", September 2017.*

2. River Nene intake (Pitsford Reservoir)

2.1 Background

We abstract from the River Nene. In periods of drought, we may seek a drought permit which proposes a 50% reduction in Minimum Residual Flow (MRF) immediately downstream of the intake to help refill Pitsford Reservoir.

The environmental assessment demonstrates that the proposed drought permit would result in low-moderate environmental risk in winter, and a moderate environmental risk in summer. Any adverse effects on environmental variables would be temporary, however, and the predicted changes are not thought to result in a permanent effect on WFD status, although a temporary deterioration for the duration of the drought is likely.

2.2 Description of proposed drought permit

The proposed drought permit will take the form of a winter or summer authorisation to allow increased refilling of Pitsford Reservoir through a 50% reduction in the MRF from the River Nene. Based on the worst historic reference drought of 1933-1935, this reduction could be needed for up to 18 months, although would only be applied for in periods of six months at a time, in line with Environment Agency guidance. The worst historic reference drought is estimated to be approximately 1 in 200 year severity.

The assessment is based on a reduction in MRF from the current 34.1Ml/d to 17.05Ml/d within the period from October to March (inclusive) for a winter permit and April to September (inclusive) for a summer permit.

The permit would be required if there is a risk of compromising our ability to refill Pitsford Reservoir. This is likely to only occur in a severe, multi-season drought. Under the most likely scenario, a winter drought permit would be sought after a dry winter and summer, enabling us to refill the reservoir during the following winter. This typically corresponds to a natural increase in flows (and hence water available for abstraction) and a reduced sensitivity for the majority of potential environmental receptors. However, should drought conditions continue to present a significant risk to supply, a summer drought permit may also be considered as an option.

2.3 Description of the need for monitoring and mitigation

The potential impact of the proposed drought permit option was reviewed via the environmental assessment, summarised in Appendix 7: Environmental Assessment Summary. Table 1 identifies the need for monitoring and mitigation in relation to those impacts.

2.4 Mitigation measures

Where impacts are predicted to be of moderate or higher significance, the related mitigation measures and their proposed triggers are outlined in Table 2.

Table 1: Predicted impacts and the need for monitoring and mitigation

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Reduction of river flow	Direct	During drought	River Nene downstream of Duston Mill intake	17.05Ml/d	Low	See other features.	No additional monitoring required	No
Reduction of river level	Direct	During drought	River Nene	<2.5cm	Low	In summer months, if navigation usage starts to exceed river flow capacity, then levels could start to fall.	No additional monitoring required.	Yes - measures undertaken to reduce lock usage in summer months.
Navigation	Cumulative (reduction in river levels, changes to vegetation and sediment transport)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Wash	Moderate	Low-Moderate Moderate	Water levels should be maintained in both winter and summer, meaning navigation should remain functional. There is a risk of a decrease in levels in summer due to increased lock usage, as well as a higher risk of algal blooms causing weed choking.	No additional monitoring.	Yes
Recreation	Cumulative (impact on fisheries, water levels, water quality and aesthetics)	Winter drought Summer drought	River Nene: downstream of Wansford intake to Dog-in-a-Doublet	Low Moderate	Low-Moderate Moderate	Recreational activities such as angling, walking and cycling may be affected by a decrease in the visual appearance of the river, with the risk of algal blooms and reduced flows.	Yes	Yes
Other Abstraction licences	Direct (reduction in river and groundwater flow) Depends on the other licence types	Winter drought Summer drought	River Nene: downstream of Wansford intake to Guyhirn	Moderate	Moderate Moderate-High	Possible impact on ability to abstract.	Yes	Yes
Water Quality	Direct (reduction in river flow)	Winter drought Summer drought	River Nene: downstream of Wansford intake to Nene Washes	Low	Low Low-Moderate	Slight increase in phosphate, DO, ammonia and iron concentrations.	Yes	Yes
Ecology, Fish	Cumulative (reduction in river flow and changes to water quality)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low	Low Low-Moderate	It is unlikely that there would be a detrimental impact on fish health as a result of a reduction in river flow or levels. In summer increases in temperature may impact water quality which may place stress on fish populations.	Yes	Yes
Ecology, fish spawning in back channels	Cumulative (reduction in river flow and levels, and changes to sediment transport)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Wash	Low	Low Low-Moderate	Due to structural controls it's expected levels will be maintained in line with the main river.	Yes	Yes
Ecology, fish passage	Cumulative (reduction in river flow, water levels and water quality)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Wash	Low Moderate	Low-Moderate Moderate-High	A decrease in flow associated with the drought permit could impact fish migration, with lower flows creating barriers to fish passes.	Yes	Yes
Ecology, macroinvertebrates	Cumulative (reduction in river flow, chemical water quality and changes to sediment transport)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low Moderate	Low Moderate	Reduced water quality may impact the macroinvertebrate community. DO sags, stagnation and algal blooms may impact species of interest that have a high oxygen demands.	Yes	Yes
Ecology, macrophytes	Indirect (reduction in river flow and water quality)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low	Low	Impact on rare macrophyte species in the reach is considered low.	Yes	Yes
Ecology, phytobenthos	Indirect (reduction in river flow and water quality)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low Moderate	Low Moderate	Increased phosphate levels and reduced flows significantly increase the risk of algal blooms in summer months.	No	No

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Water Framework Directive	Cumulative, short-term, non-permanent	During drought	River Nene	Moderate	Low-Moderate	WFD status would change from Good to Poor over the duration of a drought but return quickly.	None in addition to mitigation of other features.	None in addition to mitigation of other features.
HRA, Internationally	Cumulative, short-term, non-permanent	During drought	Sites downstream of intake	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	No
Nationally designated sites	Cumulative, short-term, non-permanent	During drought	Sites downstream of intake	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	No
Local Wildlife Sites	Direct and indirect effects through changes in supply of water	Both	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low	Low	From the information available for the review, we cannot rule out effects, particularly where wetland features for LWS are dependent upon flow or levels in secondary channels.	Yes	No

Table 2: Predicted impacts of moderate significance and higher, proposed measures and proposed triggers for their use

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
Navigation and recreation	The water levels are controlled by locks, tilting gates and weirs where a minimum navigable depth of 1.8m must be maintained. The number of boat users will be lower in winter; therefore the risk of impact is low. In the summer at the peak of navigation there will be an increase in lock operations and a higher demand for water. This may reduce the levels in the river and affect navigation. The is a compounded impact if there is an increase in algal blooms and weed choking which may impact navigation and reduce aesthetic appearance.	Monitoring of level data in comparison to the minimum navigable depth. Dialogue with the navigation authority.	Abstract water gradually over a 24-hour period and cease abstraction immediately if lock operation is compromised or restricted or where the water level at South Bridge and Bedford Road Sluice drops below 57.11 and 55.86mODN respectively. Potential funding towards weed cutting and dredging at known problem locations on the navigation channel and de-silting of key navigation locks, if required. Contact with all potentially affected licensed abstractors between Duston Mill and Wansford, to understand any live issues after the implementation of the Drought Permit. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows, if necessary.
Ecology, Fisheries	Deterioration in water quality may impact fish communities; the effects are more pronounced in summer when flows are naturally lower.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Cessation rules to halt abstraction if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts. Open dialogue with local angling groups in order to address any concerns. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.
Ecology, fish passage	Restricted migration in summer due to higher temperatures and lower dissolved oxygen (DO) levels resulting in increased risk of algal blooms, stagnation or choking of river sections.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Cessation rules if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.
Ecology, macroinvertebrates	Reduction in water quality may impact macroinvertebrate communities. Impacts on water quality more significant in summer as an increase in temperature and phosphate levels increases the risk of algal blooms and consequential DO sags. Risk of sedimentation and reduced flows already stressors for community.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Cessation rules to halt abstraction if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.
Ecology, macrophytes and phytobenthos	Reduction in water quality may impact macrophyte communities. Impacts on water quality more significant in summer as an increase in temperature and sunlight increases the risk of algal blooms and consequential DO sags.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Cessation rules if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.

3. River Nene Intake (Rutland Water)

3.1 Background

We abstract from the River Nene and may seek a drought permit which proposes a 50% reduction in MRF immediately downstream of the intake on the River Nene in both summer and winter to help refill Rutland Water during drought conditions.

The environmental assessment demonstrates that the proposed drought permit would result in low environmental risk in winter, and a moderate to high environmental risk in summer. Any adverse effects on environmental variables would be non-permanent, however, and the predicted changes are not thought to result in a permanent effect on WFD status, although a temporary deterioration for the duration of the drought is likely.

3.2 Description of proposed drought permit

The drought permit may take the form of a winter or summer authorisation to allow increased refilling of Rutland Water through a 50% reduction in the MRF from 125Ml/d for December to April and 150Ml/d for May to November to 62.5Ml/d for December to April and 75Ml/d for May to November.

The permit would be required if there is a risk of compromising our ability to refill Rutland Reservoir. This is likely to only occur in a severe, multi-season drought. Under the most likely scenario, a winter drought permit would be sought after a dry winter and summer, enabling Anglian Water to refill Rutland Water during the following winter. This typically corresponds to a natural increase in flows (and hence water available for abstraction) and a reduced sensitivity for the majority of potential receptors. However, should drought conditions continue to present a significant risk to supply, a summer drought permit may also be considered as an option.

3.3 Description of the need for monitoring and mitigation

The potential impact of the proposed drought permit option was reviewed via the environmental assessment, summarised in Appendix 7: Environmental Assessment Summary. Table 3 identifies the need for monitoring and mitigation in relation to those impacts.

3.4 Mitigation measures

Where impacts are predicted to be of moderate or higher significance, the related mitigation measures and their proposed triggers are outlined in Table 4.

Table 3: Predicted impacts and the need for monitoring and mitigation

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Reduction of river flow	Direct	During drought	Downstream of intake	50% reduction	Low	See other features.	Yes - during and after drought to ensure recovery.	No
Reduction of river level	Direct	Prolonged drought	River Nene	Low	Low	The water levels approaching or going below those prescribed in the permit.	Yes - during drought to ensure levels don't fall below permit or navigable water levels. Siltation monitoring upstream of locks in fluvial reaches and downstream of Dog-in-a-Doublet in the tidal reach.	Yes- temporarily raising the MRF when requires, and management of sluices at Dog-in-a-Doublet & Stanground.
Navigation	Cumulative (reduction in river levels, changes to vegetation and sediment transport)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Wash	Moderate	Low-Moderate Moderate	Water levels should be maintained in both winter and summer, meaning navigation should remain functional. There is a risk of a decrease in levels in summer due to increased lock usage, as well as a higher risk of algal blooms causing weed choking.	No additional monitoring.	Yes
Recreation	Cumulative (impact on fisheries, water levels, water quality and aesthetics)	Winter drought Summer drought	River Nene: downstream of Wansford intake to Dog-in-a-Doublet	Low Moderate	Low-Moderate Moderate	Recreational activities such as angling, walking and cycling may be affected by a decrease in the visual appearance of the river, with the risk of algal blooms and reduced flows.	Yes	Yes
Other abstraction licences	Direct (reduction in river and groundwater flow) Depends on the other licence types	Winter drought Summer drought	River Nene: downstream of Wansford intake to Guyhirn	Moderate	Moderate Moderate-High	Possible impact on ability to abstract.	Yes	Yes
Water quality	Direct (reduction in river flow)	Winter drought Summer drought	River Nene: downstream of Wansford intake to Nene Washes	Low	Low Low-Moderate	Slight increase in phosphate, DO, ammonia and iron concentrations.	Yes	Yes
Ecology, fish	Cumulative (reduction in river flow and changes to water quality)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low	Low Low-Moderate	It is unlikely that there would be a detrimental impact on fish health as a result of a reduction in river flow or levels. In summer increases in temperature may impact water quality which may place stress on fish populations.	Yes	Yes
Ecology, fish spawning in back channels	Cumulative (reduction in river flow and levels, and changes to sediment transport)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Wash	Low	Low Low-Moderate	Due to structural controls it's expected levels will be maintained in line with the main river.	Yes	Yes
Ecology, fish passage	Cumulative (reduction in river flow, water levels and water quality)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Wash	Low Moderate	Low-Moderate Moderate-High	A decrease in flow associated with the drought permit could impact fish migration, with lower flows creating barriers to fish passes.	Yes	Yes

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Ecology, macroinvertebrates	Cumulative (reduction in river flow, chemical water quality and changes to sediment transport)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low Moderate	Low Moderate	Reduced water quality may impact the macroinvertebrate community. DO sags, stagnation and algal blooms may impact species of interest that have a high oxygen demands.	Yes	Yes
Ecology, macrophytes	Indirect (reduction in river flow and water quality)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low	Low	Impact on rare macrophyte species in the reach is considered low.	Yes	Yes
Ecology, phytobenthos	Indirect (reduction in river flow and water quality)	Winter drought Summer drought	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low Moderate	Low Moderate	Increased phosphate levels and reduced flows significantly increase the risk of algal blooms in summer months.	No	No
Water Framework Directive	Cumulative, short-term, non-permanent	During drought	River Nene	Low	Low	The proposed drought permit will not have a permanent effect on the overall status of the River Nene at Wansford. The WFD status is unlikely to achieve Good whilst the proposed drought permit is in operation however, it is also unlikely to achieve Good under the current MRF.	None in addition to mitigation of other features	None in addition to mitigation of other features
HRA, Internationally	Cumulative, short-term, non-permanent	Winter drought Summer drought	Sites downstream of intake	Negligible Low	Negligible Low	In summer drought increased phosphate concentration may have a significant effect on some features of the Nene Washes.	Yes- weekly water quality sampling	Yes- cessation if water quality deteriorates substantially
Nationally designated sites	Cumulative, short-term, non-permanent	During drought	Sites downstream of intake	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	No
Local Wildlife Sites	Direct and indirect effects through changes in supply of water.	Both	River Nene: downstream of Wansford intake to the Dog-in-a-Doublet	Low	Low	From the information available for the review, we cannot rule out effects, particularly where wetland features for LWS are dependent upon flow or levels in secondary channels.	Yes	No

Table 4: Predicted impacts of moderate significance and higher, proposed measures and proposed triggers for their use

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
Navigation and other human uses including other abstraction licences	Water level in the main channel is controlled by locks, tilting gates and weirs, and is therefore not perceived to change as a result of the reduction in the MRF. However, during summer months when usage is higher, the number of lockages may have to be monitored and restricted in order to maintain water levels downstream. Furthermore, the increased risk of algal blooms in summer may increase weed choking, which could further impact navigation. Most of the other abstractors have cessation restrictions based on an MRF at Orton flow gauge (seven at 170Ml/d and the remainder at 137Ml/d) and are operational between December and April. Since the existing MRF for this period is 125Ml/d at Wansford (estimated to be equivalent to about 135Ml/d at Orton) the vast majority of the abstractions would already have ceased without a drought permit being in place.	Trigger mitigation if water levels drop more than the expected amount, i.e. levels to be maintained at Water Newton Lock, Orton Lock and Stanground Lock are 7.98mAOD, 4.11mAOD and 2.8mODN respectively, whilst water levels at Bodsey Bridge must be maintained at 99.45mAOD.	Water to be abstracted gradually over a 24-hour period and abstraction to cease immediately if lock operation is compromised or restricted. Cease abstraction immediately if water levels drop more than expected amount, i.e. levels to be maintained at Water Newton Lock, Orton Lock and Stanground Lock are 7.98mAOD, 4.11mAOD and 2.8mODN respectively, whilst water levels at Bodsey Bridge must be maintained at 99.45mAOD. Flexible and dynamic approach to setting the MRF will be employed, thus carefully considering changes to downstream demands and other abstractors. This process will be informed and backed up by continuous flow and level monitoring and with near-daily contact between the Environment Agency and the lock keeper at Dog-in-a-Doublet Sluice and with the Middle Level Commissioners as required. De-silting of key navigation locks when flows are approaching the trigger permit, if required. Contact with all potentially affected licensed abstractors downstream of the intake, to understand any live issues after the implementation of the Drought Permit.
Ecology, Fisheries	Water quality deterioration and increased risk of DO sags may impact fisheries health in summer. Both early and summer spawners potentially affected by reduction in MRF; gravel spawners most likely to be impacted.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated, or if water levels drop below the temporary MRF. Exact levels to be defined.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Abstraction to be stopped or reduced if water quality requirements are not met, or if flows drop below the temporary MRF. Open dialogue with local angling groups in order to address any concerns. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.
Ecology, macroinvertebrates	Reduced water quality may impact macroinvertebrate community. DO sags, stagnation and algal blooms may impact species of interest that have a high oxygen demands.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated. Exact levels to be defined.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Abstraction to be stopped or reduced if sampling data levels do not meet water quality requirements. Abstraction suspended if the flow drops below the temporary reduced MRF. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation.

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
Ecology, macrophytes, phytoplankton and phytobenthos	Impact on rare macrophyte species in the reach is considered negligible	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated. Exact levels to be defined.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Abstraction to be stopped or reduced if sampling data levels do not meet water quality requirements. Abstraction suspended if the flow drops below the temporary reduced MRF. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation.
HRA, Internationally designated sites	In summer, increased phosphate concentration may have a significant effect on some of the qualifying features of the Nene Washes European site.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated. Exact levels to be defined.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Abstraction to be stopped or reduced if sampling data levels do not meet water quality requirements. Abstraction suspended if the flow drops below the temporary reduced MRF. Flexible and dynamic approach to setting the MRF will be employed, thus carefully considering changes to downstream demands and other abstractors. This process will be informed and backed up by continuous flow and level monitoring and with near-daily contact between the EA and the lock keeper at Dog-in-a-Doublet Sluice and with the Middle Level Commissioners as required. Temporary phosphate stripping at Wittering and Stibbington WRCs to reduce orthophosphate levels in the river. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation.

4. River Great Ouse Intake (Grafham Water)

4.1 Background

Anglian Water abstract from the River Great Ouse to fill Grafham Water. During drought conditions we may seek a drought permit in two stages: either maintaining the current MRF of 136Ml/d but increasing abstraction from 75% to 100% of the excess flow (Stage 1) or reducing the MRF to 68Ml/d and abstracting up to 75% of the excess flow (Stage 2).

The Environmental Assessment concluded that the proposed Stage 1 drought permit would result in low environmental risk in winter and low to moderate environmental risk in summer. The proposed Stage 2 drought permit would likely result in low to moderate environmental risk in winter and moderate to high environmental risk in summer. It is not considered likely that implementation of the drought permit would result in permanent changes to the WFD status of the impacted waterbodies, however a temporary deterioration for the duration of the drought is likely.

4.2 Description of proposed drought permit

The drought permit on the River Great Ouse may take the form of a winter or summer. The current licence allows abstraction of 75% of flow in excess of the MRF, subject to licence and pump capacity constraints. It is proposed that a drought permit would be considered in two stages:

- Stage 1: Existing MRF, abstraction at up to 100% of the flow in excess of the MRF
- Stage 2: Reduced MRF, abstraction at up to 75% of the flow in excess of the MRF

Stage 2 allows greater abstraction than Stage 1 when the flow is below 340Ml/d, so would be likely to be applied for in the later stages of a drought. Usage would be expected to revert to Stage 1 when sufficient flow recovery has occurred.

The permit would be required if there is a risk of compromising our ability to refill Grafham Water. This is likely to only occur in a severe, multi-season drought. Under the most likely scenario, a winter drought permit would be sought after a dry winter and summer, enabling us to refill Grafham Water during the following winter. This typically corresponds to a natural increase in flows (and hence water available for abstraction) and a reduction in the sensitivity of physio-chemical and biological receptors to impact. However, should drought conditions continue to present a significant risk to supply, a summer drought permit may also be considered as an option. Note that summer is defined as April to September (inclusive) and winter as October to March (inclusive).

4.3 Description of the need for monitoring and mitigation

The potential impact of the proposed drought permit option was reviewed via the environmental assessment, summarised in Appendix 7: Environmental Assessment Summary. Table 5 and

Table 6 identify the need for monitoring and mitigation for Stage 1 and Stage 2 respectively.

4.4 Mitigation measures

Where impacts are predicted to be of moderate or higher significance, the related mitigation measures and their proposed triggers are outlined in Table 7.

Table 5: Predicted impacts and the need for monitoring and mitigation - Stage 1

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Reduction of river flow	Direct	During drought	River Great Ouse: downstream of Offord intake to Denver	136Ml/d	Low	See other features.	Yes -Current monitoring considered sufficient, but continued communication with Environment Agency advised to ensure any unforeseen issues are identified immediately.	No
Reduction of river level	Direct	Winter drought	River Great Ouse: downstream of Offord intake to Denver	Moderate	Moderate	In summer months, if navigation usage starts to exceed river flow capacity, then levels could start to fall.	Yes - throughout the implementation of a permit.	Yes - measures undertaken to reduce lock usage if water levels reach the minimum navigation retention level 11.12mAOD.
Navigation	Direct (reduction in river levels)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low Moderate	Reductions to river levels may cause lock operations to be limited which may restrict boat movements, as well affecting stationary boats if falling below the minimum draught . Algal blooms may cause the river to choke, inhibiting navigation.	Yes	Yes
Recreation	Cumulative (impact on fisheries, water levels, water quality and aesthetics)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low Low-Moderate	The predicted negative impact on fish health and migration has the potential to affect anglers. The occurrence of algal blooms may degrade the aesthetic quality of the River Great Ouse.	Yes	Yes
Other abstraction licences	Indirect (reduction in river flow)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low Moderate	During summer, water is abstracted from a tidal reach of the river into the Counter Drain for IDBs to abstract for spray irrigation. Reduced flow may mean the IDBs' demand cannot be met.	Yes	Yes
Water quality	Direct (reduction in river flow)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	Phosphate, orthophosphate and ammonia concentrations risk increasing to a level that has potential to impact the WFD status of the water body. BOD is expected to show a temporary deterioration.	Yes	Yes
Ecology, fish	Indirect (reduction in water quality)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low Moderate	Deterioration in water quality (BOD, ammonia and temperature increases) and algal communities may affect fish communities. Effects are more pronounced in summer.	Yes	Yes
Ecology, fish spawning in back channels	Indirect (reduction in river flow)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	Both early and summer fish spawning species will be affected by a change in water level. There is potentially a greater reduction in flows during winter but there are more fish spawning in the summer period.	Yes	Yes
Ecology, fish passage	Indirect (reduction in river flow and levels)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low Moderate	Reductions in 'trigger' flows that initiate eel and trout migration from the estuary may cause mortalities. Deterioration in water quality may also impede migration in the channel.	Yes	Yes

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Ecology, macroinvertebrates	Cumulative (reduction in river flow, chemical water quality and changes to sediment transport)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	No permanent changes expected due to a Winter permit implementation. In the summer, reduced flows and impacts to water quality may increase the risk of DO sags, thus affecting macroinvertebrate communities.	Yes	Yes
Ecology, macrophytes	Cumulative (reduction in river flow and water quality)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	Predicted increases in orthophosphate concentrations and decreases in flow increases the risk of eutrophication which could potentially affect rare species.	Yes	Yes
Ecology, phytobenthos	Cumulative (reduction in river flow and water quality)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	Predicted increase in phosphate and nitrate concentrations could cause diatom or algae blooms, or changes in diatom communities.	Yes	Yes
Water Framework Directive	Cumulative, short-term, non-permanent	During drought	River Great Ouse	Moderate	Low-Moderate	WFD status would change from Good to Poor over the duration of a drought but would return quickly.	None in addition to mitigation of other features.	None in addition to mitigation of other features.
HRA, Internationally	Cumulative, short-term, non-permanent	During drought	River Great Ouse: downstream of Offord intake to Denver	Moderate	Moderate	Water quality deterioration (notably ammonia and orthophosphate) arising from implementation of the Drought Permit under summer conditions has the potential to result in likely significant effects on some interest features of the Ouse Washes European sites.	Yes - water quality monitoring, baseline plus additional sampling during drought.	No
Nationally designated sites	Cumulative, short-term, non-permanent	During drought	River Great Ouse: downstream of Offord intake to Denver	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	No
Local Wildlife Sites	Direct and indirect effects through changes in supply of water.	Both		Low	Low	From the information available for the review, we cannot rule out effects, particularly where wetland features for LWS are dependent upon flow or levels in secondary channels.	Yes	No

Table 6: Predicted impacts and the need for monitoring and mitigation - Stage 2

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Reduction of river flow	Direct	During drought	River Great Ouse: downstream of Offord intake to Denver	82Ml/d	Low	See other features.	Yes -spot flow gauging of secondary channels between Offord and St Ives to monitor flows in the back channels.	No
Reduction of river level	Direct	Summer drought	River Great Ouse: downstream of Offord intake to Denver	Moderate	Moderate-High	In summer months, if navigation usage starts to exceed river flow capacity, then levels could start to fall.	Yes - data water level and on boat numbers and lock use between Offord and Hermitage Lock to be considered for a summer permit.	Yes- measures undertaken to reduce lock usage in summer.
Navigation	Direct (reduction in river levels)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low High	Low-Moderate Moderate-High	Reductions to river levels may cause lock operations to be limited which may restrict boat movements, as well affecting stationary boats if falling below the minimum draught . Algal blooms may cause the river to choke, inhibiting navigation.	Yes - same as Stage 1	Yes - same as Stage 1
Recreation	Cumulative (impact on fisheries, water levels, water quality and aesthetics)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	The predicted negative impact on fish health and migration has the potential to affect anglers. The occurrence of algal blooms may degrade the aesthetic quality of the River Great Ouse.	Yes - same as Stage 1	Yes - same as Stage 1
Other abstraction licences	Indirect (reduction in river flow)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low Moderate	During summer, water is abstracted from a tidal reach of the river into the Counter Drain for IDBs to abstract for spray irrigation. Reduced flow may mean the IDBs' demand cannot be met.	Yes - same as Stage 1	Yes - same as Stage 1
Water quality	Direct (reduction in river flow)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Moderate High	Moderate Moderate-High	Phosphate, orthophosphate and ammonia concentrations risk increasing to a level that has potential to impact the WFD status of the water body. BOD is expected to show a temporary deterioration.	Yes - same as Stage 1	Yes - same as Stage 1
Ecology, fish	Indirect (reduction in water quality)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low High	Low-Moderate Moderate-High	Deterioration in water quality (BOD, ammonia and temperature increases) and algal communities may affect fish communities, effects are more pronounced in summer.	Yes - same as Stage 1	Yes - same as Stage 1
Ecology, fish spawning in back channels	Indirect (reduction in river flow)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Moderate High	Moderate Moderate-High	The majority of the fish species present will be spawning in the summer period, these species will be affected by a change in water level. There is potentially a greater reduction in flows during winter but there are more fish spawning in the summer.	Yes - same as Stage 1	Yes - same as Stage 1
Ecology, fish passage	Indirect (reduction in river flow and levels)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Moderate High	Moderate Moderate-High	Reductions in 'trigger' flows that initiate eel and trout migration from the estuary may cause mortalities. Deterioration in water quality may also impede migration in the channel.	Yes - same as Stage 1	Yes - same as Stage 1
Ecology, macroinvertebrates	Cumulative (reduction in river flow, chemical water quality and changes to sediment transport)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	No permanent changes expected due to a Winter permit implementation. In the summer, reduced flows and impacts to water quality may increase the risk of DO sags, thus affecting macroinvertebrate communities.	Yes - same as Stage 1	Yes - same as Stage 1

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Ecology, macrophytes	Cumulative (reduction in river flow and water quality)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	Predicted increases in orthophosphate concentrations and decreases in flow increases the risk of eutrophication which could potentially affect rare species.	Yes - same as Stage 1	Yes - same as Stage 1
Ecology, phytobenthos	Cumulative (reduction in river flow and water quality)	Winter drought Summer drought	River Great Ouse: downstream of Offord intake to Denver	Low Moderate	Low-Moderate Moderate	Predicted increase in phosphate and nitrate concentrations could cause diatom or algae blooms, or changes in diatom communities.	Yes - same as Stage 1	Yes - same as Stage 1
Water Framework Directive	Cumulative, short-term, non-permanent	During drought	River Great Ouse	Moderate	Low-Moderate	WFD status would change from Good to Poor over the duration of a drought but would return quickly.	None in addition to mitigation of other features.	None in addition to mitigation of other features.
HRA, Internationally	Cumulative, short-term, non-permanent	During drought	River Great Ouse: downstream of Offord intake to Denver	Moderate	Moderate	In summer drought water quality deterioration (notably ammonia and orthophosphate) has the potential to result in likely significant effects on some interest features of the Ouse Washes European sites.	Yes- monitoring of water quality	No
Nationally designated sites	Cumulative, short-term, non-permanent	During drought	River Great Ouse: downstream of Offord intake to Denver	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	No
Local Wildlife Sites	Direct and indirect effects through changes in supply of water.	Both		Low	Low	From the information available for the review, we cannot rule out effects, particularly where wetland features for LWS are dependent upon flow or levels in secondary channels	Yes	No

Table 7: Predicted impacts of moderate significance and higher, proposed measures and proposed triggers for their use (Stage 2)

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
Navigation and other human uses including other abstraction licences	Water levels controlled by locks, tilting gates and weirs. Navigation reduces during winter meaning ease of maintenance of the navigation retention level of 11.12mAOD should improve. In summer, the ability to maintain the navigation retention level of 11.12mAOD will be reduced due to lower flows and evaporation.	Mitigation to be triggered if water levels fall below the required levels (i.e. 11.12mAOD).	Water to be abstracted gradually over a 24-hour period and abstraction to cease immediately if lock operation is compromised or restricted. Abstraction to cease immediately if water levels drop below 11.12mAOD or below the temporary reduced MRF. Flexible and dynamic approach to setting the MRF will be employed, thus carefully considering changes to downstream demands and other abstractors. This process will be informed and backed up by continuous flow and level monitoring and with near-daily contact with the Environment Agency. Open dialogue with licenced abstractors to commence as soon as possible to identify any issues. Variable abstraction to allow occasional pulses of water throughout the system to aid in the flushing of pollutants and prevent stagnation. Reduce abstraction during busy navigation times, with dredging or weed clearance on the main navigation channel if required. Remedial work to any of the lock structures between Offord and Hermitage Lock which cannot provide adequate draught to be evaluated. Review planned preventative maintenance in the sewerage network to ensure if a storm occurs after long dry period that the sewerage infrastructure does not block and cause spill into the river. Further knowledge of other abstraction licence conditions or infrastructure to be obtained prior to permit application.
Water quality	Reduced dilution of nutrients expected for sustained period. Increased phosphate/orthophosphate and nitrate likely, and risk of ammonia influx from combined sewage outfalls (CSOs) after storm conditions. Impacts more severe in summer and for a Stage 2 permit.	Deterioration in WFD classification for individual element	Cessation if water quality parameters fall below acceptable levels. Temporary phosphate removal at Anglian Water WRCs, specifically: Huntingdon and Cotton Valley WRCs, where phosphate removal would be expected to ensure that concentrations would not exceed 0.53mg/l in summer and 0.45 mg/l in winter. Ammonia removal at storm tanks, CSOs and WRCs so that they are below the target concentrations, if required. Variable abstraction to allow occasional pulses of water throughout the system to aid in the flushing of pollutants and prevent stagnation.
Ecology, Fisheries	Increased BOD and algal activity may impact fish communities. Effects are more pronounced in summer with increased ammonia and temperature induced deterioration. Risk of stagnation and DO sags, which may have a significant impact on fish health during Stage 2 summer permit. Early and summer spawners potentially affected by reduction in MRF; gravel spawners most likely to be impacted.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the acceptable levels, or if the worse than anticipated.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Cessation rules to halt abstraction if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts, or if water levels drop below the temporary MRF. Open dialogue with local angling groups in order to address any concerns. Bubblers on standby if DO levels drop below required levels. This is considered a last resort. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.
Ecology, fish passage	Limited impacts on winter migration. For a summer permit, a lack of attraction flow and water quality deterioration may impact migration regardless of Drought Permit implementation. Drought Permit will increase this risk.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Cessation rules to halt abstraction if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts, or if water levels drop below the temporary MRF. Open dialogue with local angling groups in order to address any concerns. Bubblers on standby if DO levels drop below the required levels threshold. This is considered a last resort. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
Ecology, macroinvertebrates	Reduced flows and increase in orthophosphates and nitrates may cause increased algal growth and eutrophication, which in turn may increase the risk of DO sags, thus affecting macroinvertebrate communities. Diurnal DO sags in the backchannels connected to the Great Ouse, could impact on macroinvertebrate species with a high oxygen demand. Impact likely for both a Stage 1 and Stage 2 summer Drought Permit.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Cessation rules to halt abstraction if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation. Bubblers on standby if DO levels drop below the required levels threshold. This is considered a last resort. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.
Ecology, macrophytes and phytobenthos	Predicted increases in orthophosphate concentrations and decreases in flow have the potential to change the community structure of macrophytes and algae. Increased risk of eutrophication potentially impacting on rare species. Impact likely for both a Stage 1 and Stage 2 Drought Permit.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river when taking water samples. Cessation rules if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts. Variable abstraction to be employed to allow occasional pulses of water to aid in flushing of pollutants and prevent stagnation. Bubblers on standby if DO levels drop below the required levels threshold. This is considered a last resort. Flows to isolated backchannels to be supplemented if necessary, with the possibility of 'pump over' water into stranded backchannels at lower flows.
HRA; Internationally designated sites	Water quality deterioration (notably ammonia and orthophosphate) arising from implementation of the Drought Permit under summer conditions has the potential to result in likely significant effects on some interest features of the Ouse Washes European sites.	Trigger mitigation if water quality deteriorates below acceptable levels, or if the impact on water levels is worse than anticipated.	Cessation rules to halt abstraction if water quality deteriorates below acceptable levels, or if water levels are affected by greater than expected amounts. Temporary phosphate removal at Anglian Water WRCs, specifically: Huntingdon and Cotton Valley WRCs, where phosphate removal would be expected to ensure that concentrations would not exceed 0.53mg/l in summer and 0.45 mg/l in winter. Ammonia removal at storm tanks, CSOs and WRCs so that they fall below the target concentrations, if required Variable abstraction to allow occasional pulses of water throughout the system to aid in the flushing of pollutants and prevent stagnation.

5. Alton Water

We abstract from the River Gipping and previously included details of a drought permit which proposes a 50% reduction in MRF immediately downstream of the intake to help refill Alton Water during drought conditions. However this is considered to potentially cause damaging adverse effects on the environment and we are currently working with the Environment Agency to explore a new drought permit option. This will be detailed in the next Drought Plan update, due to be published as a draft in 2021.

6. River Colne Augmentation (Ardleigh Reservoir)

6.1 Background

We abstract from the River Colne in order to fill Ardleigh reservoir. At times of low flow, the river flow (and hence the abstraction) can be supported by an augmentation scheme using water abstracted from nearby boreholes. During drought conditions we may seek a drought permit that would allow an increased rate of augmentation.

The environmental assessment demonstrates that the augmentation of flows between Cook's Mill and East Mills is predicted to have a slight positive effect on the water quality of the River Colne due to increased dilution capacity. It is deemed unlikely that the temporary flow augmentation and water quality improvement would result in changes to fish, macroinvertebrate, macrophyte or algal communities of the augmented reach.

It was determined that there are no mechanisms whereby potential impacts from the proposed drought action on the River Colne (e.g. impacts on flow, water level, flooding, water chemistry or habitat loss) could have a likely significant effect on any of the European sites (SAC/SPA/Ramsar sites) or nationally designated sites (e.g. SSSIs) identified within the study area, or on the Water Framework Directive (WFD) status of the affected waterbodies. However, other abstractors within a 3km vicinity may be impacted by a drawdown in groundwater levels.

6.2 Description of proposed drought permit

The water abstracted from four groundwater sources is used for the purposes of public water supply and/or augmenting the River Colne at two specified augmentation points near Cook's Mill and near Balkerne to increase the yield of the intake for Ardleigh Reservoir. A total combined quantity of 10,000Ml of water can be abstracted from the boreholes over a five-year period. In addition, there are also conditions on the maximum quantity that can be abstracted in any 24-hour period. The abstraction licence also contains water quality conditions to restrict discharge into the River Colne when quality is poor (based on concentrations of chloride, sodium and iron and temperature) and aeration of the abstracted water is required prior to discharge.

The purpose of the proposed drought permit would be to temporarily increase the licensed abstraction at two groundwater sources by 3Ml/d each to provide additional augmentation to the River Colne. The groundwater abstracted would be piped to Cook's Mill, where it would be discharged to the River Colne. This would increase the peak daily abstraction from groundwater from 16Ml/d to 22Ml/d. However, 4Ml/d goes directly to public water supply, so the peak river augmentation would increase from 12Ml/d to 18Ml/d. There would be no change in the total quantity of water that can be abstracted in a five year period.

It is assumed that augmentation would cease when flows are higher than the maximum abstraction at the intake. Therefore, when flows are higher than 36Ml/d, baseline augmentation and thus drought permit abstraction would not be implemented.

6.3 Description of the need for monitoring and mitigation

The potential impact of the proposed drought permit option was reviewed via the environmental assessment, summarised in Appendix 7: Environmental Assessment Summary. Table 10 identifies the need for monitoring and mitigation in relation to those impacts.

6.4 Mitigation measures

Where impacts are predicted to be of moderate or higher significance, the related mitigation measures and their proposed triggers are outlined in Table 11.

Table 8: Predicted impacts and the need for monitoring and mitigation

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Reduction of river flow	Direct	Drought for two winters and a summer	River Colne	Low	Low	See other features.	Yes - continuous monitoring of flow, surface water levels and groundwater levels.	No
Reduction impact on GW levels	Direct	During drought	Nearby boreholes	Low	Low	Potential reduction of GW levels.	No	No
Other abstractors	Indirect, short- term	During drought	3km radius; 14 other GW abstractors	Moderate	Moderate	Possible impact on ability to abstract.	Yes	Yes
Water quality	Indirect, short-term, non-permanent	During drought	River Colne	Low	Low	There is the possibility for surface water improvements due to the greater dilution of nutrients and other pollutants, however this is dependent on the quality of the groundwater.	No	No
Ecology, Fisheries	Cumulative effects, non-permanent	During drought	River Colne	Negligible	Negligible	If water quality deterioration is prolonged the risks to fish health could be more significant.	No	No
Ecology, fish passage	Indirect, short-term, non-permanent	During drought	River Colne	Negligible	Negligible	Negligible impacts on migration due to the weir structure at East Mills.	No	No
Ecology, macroinvertebrates	Cumulative effects, long-term, non-permanent	During drought	River Colne	Negligible	Negligible	Flows, levels and water quality are unlikely to be significantly, permanently affected therefore impacts to the macroinvertebrate community is considered negligible.	No	No
Ecology, macrophytes	Indirect, short-term, non-permanent	During drought	River Colne	Negligible	Negligible	Flows, levels and water quality are unlikely to be significantly, permanently affected therefore impacts to the macrophyte community is considered negligible.	No	No
Ecology, phytobenthos	Cumulative effects, long-term, non-permanent	During drought	River Colne	Negligible	Negligible	Flows, levels and water quality are unlikely to be significantly, permanently affected therefore impacts to the phytobenthos community is considered negligible.	No	No
HRA, Internationally designated sites	Cumulative, short-term, non-permanent	During drought	Sites within the study area	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	No
Nationally designated sites	Cumulative, short-term, non-permanent	During drought	Sites within the study area	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	
Local Wildlife Sites	Direct and indirect effect through changes in supply of water	During drought	Sites within the study area	Low	Low	From the information available for the review, we cannot rule out effects, particularly where wetland features for LWS are dependent upon flow or levels in secondary channels.	Yes	No

Table 9: Predicted impacts of moderate significance and higher, proposed measures and proposed triggers for their use

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
Other licenced abstractors	Drawdown in a localised area of the Chalk aquifer (approximately 3km from the Lower Colne boreholes) may impact fourteen groundwater abstraction licences (two industrial, one potable, and 11 agricultural).	Trigger if groundwater levels fall below acceptable levels.	Anglian Water to write to all abstractors with permitted rights within the potentially affected area to explain the drought permit and provide a contact to whom subsequent abstraction problems can be reported. Anglian Water to contact all abstractors with permitted rights within the potentially affected area to identify potential derogation issues and confirm any required mitigation measures, such as pump lowering. Cessation rules if groundwater levels fall below acceptable levels and the above mitigation measures are no longer appropriate.

7. Wellington Wellfield: Stoke Ferry Intake

7.1 Background

We abstract from Wellington Wellfield to substitute for abstraction from the River Wissey during periods when flows are high and water quality is reduced. This can operate at any time of the year. We may seek a drought permit which increases the annual license quantity from Wellington Wellfield and nearby Denton Lodge. The permit will be used when drought conditions require topping up of existing water resources.

The environmental assessment demonstrates that the proposed drought permit would have negligible environmental risk and any adverse effects on environmental variables would be non-permanent. The predicted changes are not thought to result in any deterioration in WFD status. However, there is a possibility that other groundwater abstractors may be impacted through additional drawdown as a result of the permit. A low to moderate risk is considered.

7.2 Description of proposed drought permit

We may seek a drought permit which increases the average daily licensed quantities by 10Ml/d to support Stoke Ferry WTW. The abstraction will be split between Wellington Wellfield and the adjacent Denton Lodge borehole:

- Wellington Wellfield licence increase from 15 Ml/d to 17 Ml/d.
- Denton Lodge licence increase from 7.3 Ml/d to 11.1 Ml/d.

Once abstracted, the water would be blended with surface water from the River Wissey for public water supply. It is considered that the impacts of a potential drought permit on groundwater is the same regardless of applying for a summer or winter permit. As per current guidance, the drought permit would cover a six month period, and it is understood that reapplication for a further six months would be permissible.

7.3 Description of the need for monitoring and mitigation

The potential impact of the proposed drought permit option was reviewed via the environmental assessment, summarised in Appendix 7: Environmental Assessment Summary. Table 12 identifies the need for monitoring and mitigation in relation to those impacts.

7.4 Mitigation measures

Where impacts are predicted to be of moderate or higher significance, the related mitigation measures and their proposed triggers are outlined in Table 13.

Table 10: Predicted impacts and the need for monitoring and mitigation

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Reduction of river flow	Direct	Winter	River Wissey and Little Ouse	Negligible	Negligible	See other features.	Yes - continuous flow and water level monitoring whilst permit in action.	No
Reduction of GW level	Direct	Winter and Summer	19 GW locations	<0.1m	Moderate	Potential reduction of GW levels.	Yes - groundwater level monitoring.	No
Other Abstraction licences	Indirect, short- term	Winter and Summer	3.5km radius	Low	Low-Moderate	Possible impact on ability to abstract.	Yes - groundwater level monitoring.	Yes - if potential derogation issues confirmed with other abstractors, then mitigations measures such as pump lowering may be required.
Water quality	Indirect, temporary, short-term	Winter and Summer	River Wissey and Little Ouse	Negligible	Negligible	Increased concentration.	Yes - weekly monitoring at six pre-determined locations.	No
Ecology, Fisheries	Cumulative effects, non-permanent on-permanent	Summer drought period	River Wissey and Little Ouse	Negligible	Negligible	If water quality deterioration is prolonged the risks to fish health could be more significant.	Yes - no ecological monitoring required but visual inspection of river with water quality monitoring.	No
Ecology, fish passage	Indirect, short-term, non-permanent	Winter and Summer	River Wissey and Little Ouse	Negligible	Negligible	Impacts on migration.	No	No
Ecology, macroinvertebrates	Cumulative effects, long-term, non-permanent	Winter and Summer drought	River Wissey and Little Ouse	Negligible	Negligible	Reduction in the population of communities.	No	No
Ecology, macrophytes and phytobenthos	Indirect, short-term, non-permanent	Winter and Summer drought	River Wissey and Little Ouse	Negligible	Negligible	Increase in communities, which may impact water quality and navigation.	No	No
WFD	Cumulative effects, long-term, non-permanent	During drought	River Wissey and Little Ouse	Negligible	Negligible	WFD status change.	No	No
HRA, Internationally designated sites	Cumulative, short-term, non-permanent	During drought	Sites within the study area	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	No
Nationally designated sites	Cumulative, short-term, non-permanent	During drought	Sites within the study area	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	

Table 11: Predicted impacts of moderate significance and higher, proposed measures and proposed triggers for their use

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
Groundwater levels and other groundwater abstractors	Drawdown is predicted to increase under drought permit conditions. Five nearby abstractions may be impacted by an additional Lodge.	Mitigation triggered when groundwater levels fall below acceptable levels.	Cessation rules if groundwater levels fall below pre-agreed levels. Regular liaison meetings to be held with the Environment Agency to review the drought monitoring data, to identify any concerns that may arise and to agree appropriate actions. Anglian Water should contact all abstractors with permitted rights within the potentially affected area to identify potential derogation issues and confirm any required mitigation measures, such as pump lowering. Communication to be maintained for the duration of any future drought permit to ensure any adverse effects are promptly identified. Identification of local Anglian Water or Environment Agency boreholes in the event that abstractors/protected rights boreholes cannot be used for monitoring.

8. River Wensum (Costessey Boreholes)

8.1 Background

The River Wensum is a Special Area of Conservation (SAC) from near its source downstream to Hellesdon Mill on the north-western outskirts of Norwich. We currently abstract from the River Wensum. When required, the groundwater source at Costessey is used to supplement water supply. To maintain security of supply, we have proposed a drought action for the Costessey groundwater source that would allow a temporary increase in the maximum annual licensed abstraction rate. This increase in groundwater abstraction has the potential to impact groundwater dependent features within the study area as well as flows and river levels within the River Wensum.

The environmental assessment concludes that there is potential for up to moderate adverse effects on in-stream ecology as a result of the predicted reduction in flows on the River Wensum.

8.2 Description of proposed drought permit

It is possible that during a severe drought, flows in the River Wensum may be reduced, such that use of the River Wensum abstraction is compromised. In the event of a severe drought, it is proposed that the Costessey groundwater source could be used to support the supplies. To achieve this, the drought permit would support a temporary increase in the maximum annual licensed abstraction rate at Costessey groundwater source from 2000Ml/yr to 4800Ml/yr. As per current guidance, the drought permit would cover a six month period, and it is understood that reapplication for a further six months would be permissible.

From April 2019 a Hands Off Flow (HOF) value of 27Ml/d will apply for abstraction from the river intake. A drought permit application may be triggered by a flow of about 80Ml/d; this represents a small operating margin above the HOF plus average abstraction. A drought permit may also be triggered by poor water quality at the intake during periods of low flow.

8.3 Description of the need for monitoring and mitigation

The potential impact of the proposed drought permit option was reviewed via the environmental assessment, summarised in Appendix 7: Environmental Assessment Summary. Table 14 identifies the need for monitoring and mitigation in relation to those impacts.

8.4 Mitigation measures

Where impacts are predicted to be of moderate or higher significance, the related mitigation measures and their proposed triggers are outlined in Table 15.

Table 12: Predicted impacts and the need for monitoring and mitigation

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Reduction of river flow	Indirect	During drought	River Wensum	Moderate, SAC flows	High	Reduction in the SAC flows and see other features.	Yes - continuous flow and surface water levels in the river and at Costessey Pits should be monitored during the drought permit. Monitoring should be continued after the drought to ensure drought permit no longer needed, and demonstrate recovery.	Yes - abstraction suspended if the flow drops below the temporarily reduced HOF.
Reduction of river level	Indirect	During drought	River Wensum	<0.02m	Negligible	See other features.	No	No
Navigation	Indirect (reduction in river levels)	Winter drought Summer drought	Reaches of the Wensum, Yare, Tud and Spixworth Beck within 5km of the Costessey boreholes	Negligible	Negligible	River level changes in these watercourses are expected to be negligible.	No	No
Recreation	Indirect (reduction in river levels)	Winter drought Summer drought	Reaches of the Wensum, Yare, Tud and Spixworth Beck within 5km of the Costessey boreholes Costessey Pits and Taverham Lake	Moderate	Moderate	The modelled reduction in groundwater levels may affect Costessey Pits and Taverham Lake, which could negatively affect fishing stocks and recreational uses. A reduction in levels may cause a deterioration in water quality, which could also negatively impact fishing stocks.	Yes	Yes
Other abstraction licences	Indirect (reduction of groundwater flow)	Winter drought Summer drought	Any abstraction sites within a 5km radius of Costessey boreholes.	Moderate	Moderate	Groundwater drawdown may affect other groundwater abstractors within a 5km radius of the Costessey boreholes.	Yes	Yes
Water quality	Indirect (reduction of groundwater and river flow)	Winter drought Summer drought	Reaches of the Wensum, Yare, Tud and Spixworth Beck within 5km of the Costessey boreholes	Low Moderate	Low-Moderate Moderate	There is the potential for increased concentrations of pollutants, due to lower river flows and the associated decrease in dilution capacity. The impacts are expected to be greater in summer, due to lower residual flows than in winter.	Yes	No
Ecology, fish	Cumulative effects (reduction of river flow, water levels, water quality and sediment transport)	Winter drought Summer drought	Reaches of the Wensum, Yare, Tud and Spixworth Beck within 5km of the Costessey boreholes Other groundwater dependent waterbodies (floodplain ditches, minor waterbodies	High Moderate	Moderate-High Moderate	The predicted change in flows may result in adverse effects on the fish community present. No significant impacts are expected as long as DO saturation is above 60%. Other issues could be caused by increased sedimentation and velocity changes.	Yes	Yes
Ecology, macroinvertebrates	Cumulative effects (reduction of river flow, water levels and water quality)	Winter drought Summer drought	Reaches of the Wensum, Yare, Tud and Spixworth Beck within 5km of the Costessey boreholes	Moderate	Moderate	The reduction in river flow may detrimentally affect the macroinvertebrate community present within the River Wensum. Negligible impact is expected in the River Tud, River Yare and Spixworth Beck.	Yes	Yes

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Ecology, macrophytes	Indirect (reduction of river flow)	Winter drought Summer drought	Reaches of the Wensum, Yare, Tud and Spixworth Beck within 5km of the Costessey boreholes	Moderate High	Low-Moderate Moderate-High	The reduction in river flow may detrimentally affect the macrophyte community present within the River Wensum. This includes the Ranunculion fluitantis and Callitricho-Batrachion vegetation species, a qualifying feature of the River Wensum SSSI. Negligible impact is expected in the River Tud, River Yare and Spixworth Beck.	Yes	Yes
Water vole	Indirect (reduction of river levels)	Winter drought Summer drought	Reaches of the Wensum, Yare, Tud and Spixworth Beck within 5km of the Costessey boreholes Costessey Pits	Moderate	Moderate-High	Change in river depth in the Wensum is not expected to affect water vole refuges. Impacts may occur for water voles found in the Costessey Pits, which may dry out under the drought permit.	No	No
Water Framework Directive	Cumulative, short-term, non-permanent	During drought	River Wensum	Low Moderate	Low-Moderate Moderate	WFD status deterioration is likely, the adverse effects will be temporary and subtle in nature.	None in addition to mitigation of other features.	None in addition to mitigation of other features.
HRA, SAC/SSSI feature: Desmoulin's whorl snail	Cumulative (reduction of groundwater levels, groundwater chemistry, habitat loss)	Winter drought Summer drought	SSSI Units 38-39 and Hellesdon Meadows (Units 40-44)	Moderate	Moderate-High	Habitat deterioration could occur in Land Units 40-44 due to a decrease in groundwater levels.	Yes	Yes
Nationally designated sites	Cumulative, short-term, non-permanent	During drought	Costessey on Swannington Upgate Common SSSI, Sweetbriar Road Meadows SSSI and Bowthorpe Marsh LNR	Negligible	Negligible	No mechanisms from the proposed drought permit that could have a likely significant effect on the sites.	No	No
Local Wildlife Sites	Direct and indirect effects through changes in supply of water.	Both	Water dependent sites within 5km of the Costessey boreholes	Low	Low	From the information available for the review, we cannot rule out effects, particularly where wetland features for LWS are dependent upon flow or levels in secondary channels.	Yes	No

Table 13: Predicted impacts of moderate significance and higher, proposed measures and proposed triggers for their use

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
Recreation and other licenced abstractors	Groundwater drawdown at Costessey Pits 1, 2 and 3 and Taverham Lake may impact fish stocks and water sports. Groundwater drawdown may impact other licensed groundwater abstractors.	Trigger mitigation if reduced Trigger mitigation if reduced.	Regular liaison meetings to be held with the Environment Agency to review the drought monitoring data, to identify any concerns that may arise and to agree appropriate actions. Anglian Water should contact all abstractors with permitted rights within the potentially affected area to identify potential derogation issues and confirm any required mitigation measures, such as pump lowering, borehole deepening or compensation to other abstractors, if required. Reduced abstraction or cessation if groundwater levels fall too low. Fish removals to take place at Costessey Pits if water levels drop or water quality deteriorates significantly.
Ecology, fisheries	The predicted change in flows may result in adverse effects on the fish community present. The predicted change is outside the SAC targets for deviation from natural flow for low flow conditions. Therefore, there is potential for adverse impacts on migration, passage and spawning behaviour of these species.	Mitigation triggered if impact upon water level is more significant than predicted.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river. Cessation to halt abstraction if flow drops below the required rate. Open dialogue with local angling groups in order to address any concerns.
Ecology, macroinvertebrates	The predicted change in flows may result in adverse effects on the macroinvertebrate community present.	Mitigation triggered if impact upon flow is more significant than predicted.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river. Cessation to halt abstraction if flow drops below the required rate.
Ecology, macrophytes and phytobenthos	A winter permit would coincide with a reduction in the sensitivity of the main river channel - evaporative losses and water demand (e.g. for plant uptake) would be at a minimum. A late summer permit would see higher risk to increase in temperature and low DO but would coincide with the decrease in temperatures and receding of macrophytes and phytoplankton population.	Mitigation to be triggered if impact upon flow is more significant than predicted and there is potential for more significant water quality impacts.	Maintain regular communication with the Environment Agency to identify any potential issues and visual inspection of river. Cessation to halt abstraction if flow drops below the required rate.
Internationally/ nationally designated sites (River Wensum SAC/SSSI)	The predicted change in flow is outside the WFD targets for deviation from natural flow for low flow conditions. River Wensum SAC flow targets for individual qualifying features may not be met. Potential for habitat loss.	Mitigation measures to be put into place if groundwater levels at SSSI Units 38/39 and 40-44 fall below the level identified as potentially affecting the Desmoulin's whorl snail (i.e. 0.5mBGL), assuming groundwater level was above this threshold in baseline conditions.	Cessation rules if flow or water quality parameters fall below the required levels. Spray irrigation at SSSI Units 38/39 and implementation of the Water Level Management at SSSI Units 40-44 should groundwater level fall below the level identified. Mitigation measures will also only be implemented if land management improvements are put in place on SSSI Units 38/39 in order that the habitat is suitable for Desmoulin's whorl snail. Continued monitoring of the river level and groundwater level near SSSI units 38-39. Prepare a Water Level Management Plan, to include measures to retain suitable moisture conditions at the SSSI Units 40-44 to sustain a population of Desmoulin's whorl snail.

9. River Trent

9.1 Background

We abstract from the River Trent for Hall WTW. In times of low flow, we may wish to apply for a drought permit for its abstraction in order to maintain supplies to Lincolnshire. This would involve a reduced HOF of 1450Ml/d, compared to the HOF of 1700Ml/d specified in the licence.

The environmental assessment demonstrates that the proposed drought permit would result in minimal and temporary reductions in the water level and the net fluvial flow in the lower Trent, and that no significant adverse effects on environmental variables are expected. The predicted changes in flow are well within the maximum changes set out by UKTAG guidelines for maintaining Good Ecological Status, and are within the limits for High Ecological Status.

9.2 Description of proposed drought permit

The proposed drought permit would involve a reduced HOF of 1450Ml/d, compared to the HOF of 1700Ml/d specified in the licence. Based on the historic reference drought of 1976, this reduction could be needed for approximately two months.

The permit would slightly reduce net fluvial flows in the River Trent, for a limited period during a severe drought event. At the worst point of the adopted drought event (modelled flows for 1976 conditions, approximating to a 200-year return period event) the reduction in flow would be 1.4% for average abstraction, and up to 4.4% considering maximum daily abstraction rates. It has been found that this would have a minimal impact on areas of interest, including designated sites, ecology and water quality.

The 1976 conditions suggest that a threshold flow of around 2100Ml/d would be needed to allow for the expected time for the Environment Agency to make a decision on a drought permit application. With this threshold a drought permit might need to be applied for in over 20% of years, but they would nearly always turn out to be unnecessary.

The environmental assessment concluded that the overall status of the WFD waterbodies within and downstream of the River Trent are unlikely to be affected, and it is unlikely that the proposals would prevent the potential for the River Trent waterbodies identified to achieve their overall goal of Good Ecological Status in the future.

9.3 Description of the need for monitoring and mitigation

The potential impact of the proposed drought permit option was reviewed via the environmental assessment, summarised in Appendix 7: Environmental Assessment Summary. Table 16 identifies the need for monitoring and mitigation in relation to those impacts.

9.4 Mitigation measures

Where impacts are predicted to be of moderate or higher significance, the related mitigation measures and their proposed triggers are outlined in Table 17.

Table 14: Predicted impacts and the need for monitoring and mitigation

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
Reduction of river flow	Direct	Summer drought	North Muskham	Negligible	Negligible	See other features.	No	No
Reduction of river level	Indirect	Summer drought	River Trent	Negligible	Negligible	In summer months, if navigation usage starts to exceed river flow capacity, then levels could start to fall.	No	No
Navigation	Direct (reduction in river levels)	Winter drought Summer drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Negligible	Low	Slight reduction in flows should not have an impact on navigation.	No	No
Recreation	Cumulative effects (impact on fisheries, water levels, water quality and aesthetics)	Winter drought Summer drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Negligible	Low	Slight reduction in flow and water level should not have an impact on leisure boating or fishing.	No	No
Other abstraction licences	Direct (reduction in river flow)	Winter drought Summer drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Negligible	Low	Impact to other abstractors is not expected.	No	No
Water quality	Direct (reduction in river flow)	Winter drought Summer drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Negligible	Negligible	No impact to water quality expected from flow reductions.	No	No
Ecology, fish	Cumulative (reduction in river flow, water levels and water quality)	Winter drought Summer drought	River Trent: around Cromwell weir to Humber Estuary	Low	Low-Moderate	Certain structures, such as the Cromwell Weir, may become less passable due to a potential drop in river level, which could affect the migration of Atlantic salmon and lamprey.	Yes	Yes
Ecology, macroinvertebrates	Cumulative (reduction in river flow, chemical water quality and changes to sediment transport)	Winter drought Summer drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Negligible	Negligible	No significant adverse effects on macroinvertebrates are predicted.	No	No
Ecology, macrophytes	Indirect (reduction in river flow and water quality; change in sediment conditions)	Winter drought Summer drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Negligible	Negligible	No significant adverse effects on macrophytes are predicted.	No	No
Water Framework Directive	Cumulative, short-term, non-permanent	During drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Negligible	Negligible	The predicted reduction in water level (<1cm) is considered to be insignificant in terms of effects on the WFD elements.	No	No

Feature	Description				Predicted impact significance	Predicted impact description	Monitoring required?	Mitigation required?
	Type of effect	Timing	Scale	Magnitude				
HRA, Internationally	Cumulative, short-term, non-permanent	During drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Low	Low-moderate	Certain structures, such as the Cromwell Weir, may become less passable due to a potential drop in river level, which could affect the migration of Atlantic salmon and lamprey.	Yes, a dedicated study to understand the dimensions and hydraulics of Cromwell weir is needed given uncertainty associated with the reduction in water level in the event of implementation of the drought permit.	Yes
Nationally designated sites	Cumulative, short-term, non-permanent	During drought	River Trent: downstream of Newton-on-Trent to Humber Estuary	Negligible	Negligible	The proposed drought permit is not expected to have significant effects on the sites.	No	No

Table 15: Predicted impacts of moderate significance and higher, proposed measures and proposed triggers for their use

Feature/Receptor	Predicted impact (those of moderate significance or higher)	Proposed trigger for mitigation	Proposed mitigation measure
HRA, Internationally designated sites (Humber Estuary SAC/SPA/Ramsar site/SSSI)	Potential effects to lamprey migration and uncertainty regarding the passability of Cromwell weir.	Mitigation to be triggered if water levels drop below level pre-agreed with the Environment Agency/ Natural England.	Abstraction suspended if the flow drops below the temporarily-reduced HOF. Cessation if water quality deteriorates below acceptable levels or any impact on lamprey is recorded. Variable abstraction to allow occasional pulses if water throughout the system to aid in the flushing of pollutants and prevent stagnation. Initial survey to assess the passability of Cromwell Weir for salmon, eel and lamprey species, including an assessment of levels and flows in relation to the design of the structure If this initial review suggests that there are likely to be issues with fish passage then further investigation such as visual observation or fish tagging surveys to be considered.

Cover photo - Anglian Water's Grafham Water reservoir, an 806-hectare biological Site of Special Scientific Interest, southwest of Huntingdon in Cambridgeshire. It was designated an SSSI in 1986.