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Drought Plan: Environmental Assessment Report – River Derwent

Final

Report for Yorkshire Water Services Ltd

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Glossary

Abstraction Licence

The authorisation granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) to allow the removal of water from a source.

Biochemical Oxygen Demand (referred to as BOD)

The amount of oxygen that would be consumed if all the organic material in one litre of water were oxidised by bacteria and protozoa.

Compensation Releases

Water company licences that authorise abstractions from a reservoir may have conditions imposed, whereby specified amount of water has to be released into the watercourse, downstream of the reservoir in order to compensate the river for the abstraction.

Discharge Consent

A written consent issued by the Environment Agency permitting the discharge of specific pollutants into the aquatic environment. Discharge consents have conditions attached to them that limit the amount and concentration that can be discharged to ensure that there is no threat to the environment.

Drought Order

An authorisation granted by the Secretary of State (England) or Welsh Ministers (Wales) under drought conditions which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.

Drought Permit

An authorisation granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) under drought conditions which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.

Environmental Drought

Environmental droughts arise from reduced water flows in rivers and streams. In the summer raised temperatures may further exacerbate drought conditions. Such conditions cause physiological stress to living organisms, the degree of stress increasing with drought severity and time.

Environmental Quality Ratio (EQR)

EQRs express the current condition of a biological quality element such as macroinvertebrates or fish. This is achieved by comparing the observed value of the appropriate metric (for example WHPTASPT) calculated from samples with the value of the same metric expected at WFD reference state.

Local Wildlife Sites (LWS)

Local Wildlife Sites are non-statutory designations. They are areas which are locally important for the conservation of wildlife. They are identified and selected for the significant habitats and species that they contain.

Lotic-Invertebrate Index Flow Evaluation (referred to as LIFE)

Is a method that allows the aquatic invertebrate community recorded at a site to be scored according to its dependence on current velocity. The LIFE value obtained can be compared to that predicted for the site under normal flow conditions and may show if the invertebrate community is experiencing flow related stress. Comparing observed and predicted scores for each gives an Environmental Quality Index (EQI) that is used as a measure of stress experienced at a site from low flow. A value of 1.0 indicates that the invertebrate community has the flow sensitivity predicted for the site. A value of less than 0.975 indicates the possibility of significant stress due to low flow.



Macroinvertebrate

Macroinvertebrates are small, but visible with the naked eye, animals without backbones (insects, worms, larvae etc.). Waterbodies have communities of aquatic macroinvertebrates. The species composition, species diversity and abundance in a given waterbody can provide valuable information on the relative health and water quality of a waterway.

Natural Environment and Rural Communities (NERC) Act Section 41

The Natural Environment and Rural Communities (NERC) Act came into force on 1 October 2006. Section 41 of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The NERC Act Section 41 list contains many of England's rarest and most threatened species. The lists are known as the Section 41 habitats of principal importance (also known as 'priority habitats') and the Section 41 species of principal importance (also known as 'priority species').

рΗ

A measure of the acidity of alkalinity of a liquid based on a logarithmic scale of concentration of hydrogen ions. < 7 is acidic, > 7 is alkaline.

Ramsar site

Internationally important wetland site.

Special Area of Conservation (SAC)

Special Area of Conservation – Designated under the European Habitats Directive (1991)

Special Protection Area (SPA)

Special Protection Area – Classified under the European Birds Directive (1979)

Site of Special Scientific Interest (SSSI)

A site given a statutory designation by Natural England or Natural Resources Wales because it is particularly important, on account of its nature conservation value.

Supply Drought

A supply drought occurs when water sources are at low levels due to a lack of rainfall. Water companies manage resources to ensure public supplies do not run out.

Walley Hawkes Paisley Trigg (referred to as WHPT)

Is a method that allows the aquatic invertebrate communities recorded at a site to be scored according to their tolerance to environmental pressures such as organic pollution. WHPT can be expressed as a score (the sum of values for each taxon in a sample), as an average score per taxon (ASPT) and as the number of scoring taxa (N-taxa). WFD status is based on ASPT and N-taxa. WHPT was introduced as the basis for the UK's river invertebrate status classification under the Water Framework Directive in the second River Basin Management Plans, published in 2015.



Abbreviations

AOD	-	Above Ordnance Datum
BOD	_	Biochemical Oxygen Demand
CIEEM	_	Chartered Institute of Ecology and Environmental Management
DPG	_	Environment Agency (2020) Drought Plan Guideline
EcIA	_	Ecological Impact Assessment
EMP	_	Environmental Monitoring Plan
EQR	_	Ecological Quality Ratio
JNCC	_	Joint Nature Conservation Committee
LIFE	_	Lotic-invertebrate Index for Flow Evaluation
LNR	_	Local Nature Reserve
LWS		Local Wildlife Site
MI	_	Megalitres (1MI is equivalent to 1000 cubic metres or 1,000,000 litres)
NERC	_	Natural Environment and Rural Communities (refers to Section 41 of the Act)
NNR	_	National Nature Reserve
RHS	-	River Habitat Survey
SAC	-	Special Area of Conservation
SPA	-	Special Protection Area
SSSI	-	Site of Special Scientific Interest
WFD-		Water Framework Directive: Council of the European Communities 2000 Directive 2000/60/EC (OJ No L 327 22.12.2000) (establishing a framework for Community action in the field of water policy). As transposed into UK law by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. Statutory

- Instrument 2003 No. 3242 WHPT -Walley Hawkes Paisley Trigg (see Glossary)
- WwTW -Wastewater Treatment Works



Executive summary

This Environmental Assessment Report (EAR) provides an independent and robust assessment of the potential environmental effects of the implementation of Yorkshire Water Services Ltd's (YWSL) River Derwent drought option. The report has been prepared in support of a drought permit application by YWSL in autumn 2022.

The environmental assessment has been conducted in accordance with Government regulations and using the Environment Agency's 2020 Drought Plan Guideline (DPG)¹ and the Environment Agency's July 2020 'Environmental Assessment for Water Company Drought Plans- supplementary guidance'.

In accordance with the DPG, the environmental assessment comprises the following components:

- an assessment of the likely changes in hydrology (flow/level regime) due to implementing the proposed drought options;
- identification of the key environmental features that are sensitive to these changes and an assessment of the likely impacts on these features;
- identification of mitigation that may be required to prevent or reduce impacts on sensitive features; and
- recommendations for baseline, in-drought and post-drought permit monitoring requirements.

The environmental assessment focuses on the potential changes to water availability (levels and flows) and any consequent implications for geomorphology, water quality, ecology and other relevant environmental receptors, for example, landscape, navigation, recreation and heritage.

This EAR considers the impacts of the River Derwent drought option in Appendix A and Appendix B, with a summary presented in Sections 5 and 6. Cumulative impacts with other drought options listed in YWSL's Drought Plan 2022 are considered. The assessments undertaken confirm the features requiring consideration of monitoring and mitigation; which are summarised in Section 6 and provided in full in the Drought Plan 2022 Environmental Monitoring Plan (EMP).

Throughout the environmental assessment process, YWSL have proactively engaged key stakeholders, including the Environment Agency and Natural England.

Key stakeholders will be further during the drought permit application process.



¹ Environment Agency (2020) Water Company Drought Plan Guideline, April 2020.

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1 Introduction

1.1 Purpose of document

The Yorkshire Water Services Ltd (YWSL) Drought Plan 2022² was developed in line with the Environment Agency's Drought Plan Guideline (DPG)³. The DPG requires that water companies must demonstrate in their drought plan that they have met their responsibility to monitor, assess and where possible mitigate for the environmental impact of all their supply side drought options, including drought permits and drought orders. Drought permits/orders are management actions that, if granted, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment. Ultimately, the environmental assessments should inform choices on when and how to use the different supply side drought options considered in a drought plan.

The objective of this Environmental Assessment Report (EAR) is to provide an independent and robust assessment of the potential environmental effects of the implementation of the River Derwent drought permit.

This EAR has been prepared in support of a drought permit application in autumn 2022 to the Environment Agency, in accordance with the Water Resources Act 1991, as amended by the Environment Act 1995, the Water Act 2003 and subsequently the Water Act 2014.

The environmental assessment has been conducted in accordance with Government regulations and using the Environment Agency's 2020 DPG and the July 2020 'Environmental Assessment for Water Company Drought Plans - supplementary guidance'.

In accordance with the DPG, the environmental assessment comprises the following components:

- 1. an assessment of the likely changes in hydrology (flow/level regime) due to implementing the proposed drought options.
- 2. identification of the key environmental features that are sensitive to these changes and an assessment of the likely impacts on these features.
- 3. identification of mitigation that may be required to prevent or reduce impacts on sensitive features.
- 4. recommendations for baseline, in-drought and post-drought permit monitoring requirements.

The methodology for this environmental assessment was developed during preparation of the 'shelf copy' environmental assessment⁴ in consultation with the Environment Agency, and is documented separately in 'YWSL's Drought Plan 2022 Environmental Assessment Methodology'⁵. A summary of the assessment approach is provided in Section 3.

The assessments undertaken in this EAR confirm the features requiring consideration of mitigation and appropriate monitoring triggering mitigation. Appropriate mitigation actions identified are both available and practicable and reflect previous agreement with the Environment Agency (see Section 1.3). The methodologies and details for monitoring and mitigation requirements are documented in the standalone document 'YWSL's Drought Plan 2022 Environmental Monitoring Plan (EMP)' which accompanies the drought permit/order application. A summary of the monitoring and mitigation requirements are also included in Section 6 of this EAR.

This EAR should be read alongside the Methodology and EMP documents.



² Yorkshire Water (2022) Yorkshire water Final Drought Plan 2022. April 2022, Available at: https://www.yorkshirewater.com/about-us/resources/drought-plan/

³ Environment Agency (2020) Water Company Drought Plan Guideline, April 2020.

⁴ Ricardo Energy & Environment (2021). Drought Plan: Environmental Assessment Report – River Derwent. Report for Yorkshire Water Services Ltd. February 2021.

⁵ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

1.2 Background to study

Water companies in England and Wales are required to prepare and maintain Statutory Drought Plans under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003 (and subsequently the Water Act 2014), which set out the short operational steps a company will take before, during and after a drought. The Water Industry Act 1991 defines a Drought Plan as 'a plan for how the water undertaker will continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits'.

The Drought Plan (England) Direction 2016 states that Drought Plans should be submitted within 4 years and 3 months after the date on which its Drought Plan, or its last revised Drought Plan, is published. Yorkshire Water Services Limited (YWSL) published their current statutory Drought Plan in April 2022 The Drought Plan provides a comprehensive statement of the actions YWSL will consider implementing during drought conditions to safeguard essential water supplies to customers and minimise environmental impact.

Drought Plans encompass a number of drought options that will only be implemented if and when required. Each drought is different in terms of its severity, season, location and duration and each combination of these factors may require a bespoke reaction in terms of measures. In the context of drought planning, individual drought options are taken to constitute alternatives. YWSL's Final Drought Plan 2022 comprises a total of 63 drought options (49 ordinary supply-side options, 9 long term supply-side options and 5 demand options).

This EAR has been prepared in support of a drought permit application in autumn 2022. It provides an update to the 'shelf copy' report which was produced in support of YWSL's Drought Plan 2022.

Following agreement with the Environment Agency⁶, the physical environment and environmental features assessments presented in the 'shelf copy' report have been retained for this application EAR. The assessments are considered suitable to support the current application as no significant dry weather events have been experienced in the Yorkshire region subsequent to the completion of the 'shelf copy' assessments in 2021. However, in order to provide sufficient evidence that no changes have occurred to the sensitivity of protected/notable species or the macroinvertebrate or fish communities within the impacted reaches, a full review and analysis of additional baseline monitoring data has been undertaken. This review had included incorporation of the available 2020-21 data from the YWSL and Environment Agency baseline monitoring programmes as well as review of updated Water Framework Directive (WFD) status of designated waterbodies which contain the impacted reaches. The results of this analysis are presented as accompanying spreadsheets in support of the drought permit application. In addition, a review of water quality pressures has been undertaken following progression of the YWSL Storm Overflow Assessment Framework (SOAF) programme since the 'shelf copy' assessments were undertaken. Where applicable, changes have been made to the outcomes of the physical environment assessment to reflect this review.

1.3 Consultation

Throughout the preparation and submission of the Final Drought Plan 2019 YWSL proactively engaged with key stakeholders and regulators regarding the scope and outcomes of the environmental assessment, including with the Environment Agency and Natural England. Discussions were also held between YWSL and the Environment Agency on the scope of monitoring/mitigation in Autumn 2018 following a period of prolonged dry weather. These discussions identified certain issues around the appropriateness and practicality of YWSL's monitoring-led mitigation plan as set out in its Draft Drought Plan 2019 EMP. The outcome of these discussions and resulting agreements have informed the basis



⁶ Email exchange between Yasmina Gallaher (Yorkshire Water), and Ineke Jackson (Environment Agency) on 20 July 2022.

of the approach for the update of the environmental assessments and EMP for the Draft Drought Plan 2021, including on the outcomes of the environmental assessment process.

YWSL then held a number of meetings during the early stages of the preparation of the Draft Drought Plan 2021, including several meetings focused on the proposed approach to the environmental assessments which are documented in the Drought Plan 2022 Environmental Assessment Methodology⁷. Proactive consultation continued to be conducted for the Drought Plan 2022 submission.

Further consultation with key stakeholders will be undertaken throughout the overall drought permit application process.

1.4 Content of report

The structure of this EAR is provided below with reference to other relevant documents.

- Section 1: Introduction
- Section 2: Drought management proposals including an overview of YWSL's water supply system, drought planning, the need for the applications, alternative options and proposed drought permit details (to be completed at the time of a drought permit application)
- Section 3: Approach to environmental assessment description of the approach to assessing environmental impacts and identification of mitigation and monitoring requirements, with reference to the details which are provided in YWSL's Drought Plan 2022 Environmental Assessment Methodology⁸.
- Section 4: Drought option overview: River Derwent overview of drought permit conditions.
- Section 5: Physical environment effects: River Derwent baseline assessment of physical environment and assessment of potential changes in the physical environment as a result of the drought option, and from cumulative operation with options described in other EARs. Detailed information is provided in Appendix A and summarised in Section 5.
- Section 6: Features susceptibility and sensitivity assessment: monitoring and mitigation: River Derwent

Appendices

Appendix A Physical Environment



⁷ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

⁸ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

2 Drought management proposals

See YWSL drought permit application supporting documentation.



3 Approach to environmental assessment

3.1 Overview

The environmental assessment of the drought options in this report has been prepared in accordance with Environment Agency's 2020 DPG; specifically the Environment Agency's July 2020 'Environmental Assessment for Water Company Drought Plans - supplementary guidance'. The approach to environmental assessment and the bespoke assessment methodologies used have been developed in consultation with the Environment Agency and are documented separately in YWSL's Drought Plan 2022 Environmental Assessment Methodology⁹ ('the Methodology').

Depending on the particular ongoing water resources drought, different management options may be available and the full range of drought permits may not be used by YWSL at the same time. This EAR considers the impacts of implementation of the River Derwent drought permit.

The Environment Agency's 2020 DPG requires the completion of environmental assessment and production of an environmental monitoring plan for each of supply side actions included in a drought plan. The environmental assessments should also include any mitigation measures that could be implemented. The Methodology provides detailed approaches to the specific requirements of the DPG which are:

- 1. Setting out the likely changes to the hydrology (or hydrogeology) due to a proposed action (see Section 3.4 and Section 3.5 of the Methodology).
- 2. Identifying the key features of the environment which are likely to be affected by these changes and assess their sensitivity (see Section 3.6 of the Methodology).
- 3. Assess the likely impact on these features, allocate a level of confidence in your assessment and set out the actions you will take to reduce uncertainty (see Section 3.7 of the Methodology).
- 4. Mitigating against the potential impacts and where datasets are considered insufficient to undertake an environmental assessment it is the responsibility of the water company to implement environmental monitoring to generate the information required (see Section 3.8 of the Methodology).

The overall approach taken in completing the environmental assessment to demonstrate an understanding of the impact on the environment of implementing the proposed drought options is illustrated in **Figure 3.1**.

Results of the assessment have also informed the Habitats Regulations Assessment (HRA)¹⁰ and Strategic Environmental Assessment (SEA)¹¹ which support YWSL's Drought Plan 2022, and are documented separately.

The Environment Agency's 2020 DPG also requires water companies to 'consider the combined environmental effects of your supply side drought options, and where relevant, the combination effects of your actions with those of neighbouring water companies and other abstractors'. The SEA and HRA for a drought plan as a whole has informed these combined assessments.

3.2 Limitations of assessment

Details on the quality of the data collected and used in the assessment, limitations and any assumptions made, are included in the relevant technical appendices.



⁹ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

¹⁰ Yorkshire Water (2022) Yorkshire Water Drought Plan 2022 Habitats Regulation Screening Report, April 2022. Available at https://www.yorkshirewater.com/media/vzenyqzb/yorkshire-water-drought-plan-2022-hra.pdf.

¹¹ Yorkshire Water (2022) Yorkshire Water Drought Plan 2022 SEA Environmental Report, April 2022. Available at https://www.yorkshirewater.com/media/c2qgvnsf/yorkshire-water-drought-plan-2022-sea-environmental-report.pdf.







4 Drought option overview

4.1 Drought permit description

This EAR assesses the potential impacts on the environmental features of the River Derwent catchment during the period of implementation of associated drought options.

The River Derwent catchment includes the River Derwent drought permit as summarised in Table 4.1:

Further details on the existing arrangements at the site and the proposed drought option are found in **Appendix A**, Section A2. The study area is illustrated in **Figure 4.1**.

Abstraction Water Source	NGR	Normal Abstraction MI/d ¹²	Proposed Drought Permit Abstraction MI/d	Benefit MI/d
River Derwent	SE7048 / SE7029	 Daily maximum abstraction at Elvington of 205 MI/d Daily maximum abstraction at Loftsome Bridge of 114 MI/d Daily combined maximum abstraction of 305 MI/d Hands-off flow condition whereby combined abstraction cannot exceed previous day gauged flow at Buttercrambe, when flow at Buttercrambe is less than 305 MI/d Annual combined abstraction total of 94,841 MI 	 Increase the annual (1 April to 31 March) total abstraction at Loftsome Bridge by ~2,300 MI to 32,700 MI (application specific) Reduce the annual (1 April to 31 March) total abstraction at Elvington by ~2,300 MI to 72,700 MI (application specific but noted as to same value as Loftsome Bridge increase) No change to daily maximum or hands-off flow conditions. 	N/A

 Table 4.1
 River Derwent at Elvington and Loftsome Bridge drought permit description



^{12 1}MI/d is 1 million litres per day



4.2 Potentially impacted reaches

The zone of influence associated for a drought option is defined through hydrological effects. Within the overall zone of influence, reaches are then defined on a hydrological basis. Section 3.4 of YWSL's Drought Plan 2022 Environmental Assessment Methodology¹³ sets out this approach in detail. The reach for the River Derwent drought permit has been defined previously during the environmental assessment of YWSL past drought plans. **Table 4.2** provides details of this reaches, which is illustrated in **Figure 4.1**, and in a schematic below in **Figure 4.2**.



Reach name	Watercourse name	Reach start	Reach end	Down- stream reach	Drought option Derwent Dervent
Derwent 1	River Derwent	Elvington WTW	Loftsome Bridge WTW	N/A	~







¹³ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

4.3 WFD waterbodies in study area

The study area and focus of the environmental assessment covers the WFD waterbodies listed in **Table 4.3.** The WFD waterbodies are also illustrated on **Figure 4.1**.

Table 4.3 WFD waterbodies considered in the assessment

Drought Option	Reach	WFD Waterbody
River Derwent	Derwent 1	River Derwent from Kirkham to Elvington Beck (GB104027069312) River Derwent from Elvington Beck to River Ouse (GB104027068311)



5 Physical environment effects: River Derwent

Potential impacts on the physical environment due to the River Derwent drought permit are summarised below in **Table 5.1**. Full details are provided in **Appendix A**.

Table 5.1 Summary of potential changes in the physical environment as a result of the
River Derwent drought option

Reach	River flow impact	Flow depleted reaches and risks [*]	Risk to river habitats	Risk to water quality
Derwent 1	Increases of 7.6% and 9.9% in the estimated summer Q95 and Q99 flow statistics respectively, and of up to 6.8% and 1.9% in the year round Q95 and Q50 flow statistics throughout the reach at any time of year that drought options implemented.	None None		None
	As there is no reduction in flow, and the increased flow values are well within the range of normal flow variability, this is assessed as a negligible hydrological impact at any time of year			



6 Environmental features screening: River Derwent

6.1 Sensitivity and susceptibility assessment

Details regarding the approaches/methodologies used for assessing susceptibility and sensitivity to drought management actions and the assessment of the impacts associated with drought management actions are presented in Sections 3.6 and 3.7 of YWSL's Drought Plan 2022 Environmental Assessment Methodology¹⁴.

The environmental preferences within which a species can successfully exist and the relationship between populations in stressed river conditions remains subject to debate. The prediction of impacts of hydrological and water quality changes on aquatic ecology remains subject to significant uncertainty and this may be exacerbated where data are limited. This assessment has, therefore, adopted a precautionary approach, with potential impacts highlighted where doubt exists.

The assessment of environmental features is informed by the assessment of the physical environment (which includes hydrology and hydrodynamics; geomorphology; and water quality), this is summarised in Section 5 presented in full in **Appendix A**.

Potentially sensitive receptors due to the River Derwent drought permit are summarised below in **Table 6.1**.



¹⁴ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

Table 6.1 Environmental features screening in the zone of influence of the River Derwent drought option

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity to Dec- Mar DP (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Yes/No)
River Derwent SAC/SSSI	Negligible	The site is designated for water dependant features including river and sea lamprey, bullhead, and watercourses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation. These features will be sensitive to flow and level changes, however as the implementation of the drought permit is assessed as having negligible impacts on flow and level no significant impacts are anticipated.	Not sensitive	No
Lower Derwent Valley SAC/SPA/Ramsar/NNR	Negligible	The site is designated for a range of features including high-quality lowland hay meadows, areas of damp alder woodland, otters and over wintering birds. These features may be sensitive to flow and level changes, however as the implementation of the drought permit is assessed as having negligible impacts on flow and level no significant impacts are anticipated.	Not sensitive	No
Breighton Meadows SSSI	Negligible	The site is designated for notified for its nationally and internationally important alluvial flood meadow plant community and its outstanding assemblage of breeding birds associated with lowland damp grasslands. These features may be sensitive to flow and level changes, however as the implementation of the drought permit is assessed as having negligible impacts on flow and level no significant impacts are anticipated.	Not sensitive	No
Derwent Ings SSSI	Negligible	The site is designated for neutral alluvial flood meadows, fen and swamp communities and freshwater habitats. These features may be sensitive to flow and level changes, however as the implementation of the drought permit is assessed as having negligible impacts on flow and level no significant impacts are anticipated.	Not sensitive	No
Humber Estuary (SAC/SPA/SSSI/Ramsar)	n/a (downstream of tidal limit)	Reduction in freshwater flows could potentially affect qualifying interests for which Humber Estuary is designated, specifically river and sea lamprey (entrainment, attractant flows, dissolved oxygen etc). However the site is situated downstream of the zone of impact, in which impacts are assessed as negligible, and therefore no impact on designated features is anticipated. Additionally, extensive work undertaken by YWSL has shown that cumulative impacts of all drought options would have no adverse effect on SAC/SPA integrity ¹⁵ .	Not sensitive	No
NERC Act Species – Fish	Negligible	Potentially susceptible as December to March permit coincides with upstream	Not sensitive	No

¹⁵ Scott Wilson (2011). Yorkshire Water Drought Plan: Assessment of Possible Impact on Humber Estuary SPA/SAC. Final Report Revision 2 February 2011. Report for Yorkshire Water.



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Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity to Dec- Mar DP (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Yes/No)
 Brown Trout (Salmo trutta) Salmon (Salmo salar) Sea lamprey (Petromyzon marinus) River Lamprey (Lampetra fluviatilis) European eel (Anguilla anguilla) 		migration and spawning life stages (salmon). The hydrological impacts (flow and level changes) associated with the drought permit are assessed as negligible and will not detract from the quality of the supporting environment at the time.		
<u>Notable Species – Fish</u> - Grayling (<i>Thymallus</i> <i>thymallus</i>) - Barbel (<i>Barbus barbus</i>) - Bullhead (<i>Cottus gobio</i>)	Negligible	The drought permit period December to March avoids late spring and summer in which potential impacts are more likely and therefore susceptibility of this species during this time is much lower. The hydrological impacts (flow and level changes) associated with the drought permit are assessed as negligible and will not detract from the quality of the supporting environment at the time.	Not sensitive	No
Other Fish Ruffe (Gymnocephalus. cernua) - Bleak (Alburnus alburnus) - Minnow (Phoxinus. phoxinus) - Stone loach (Barbatula barbatula) - Flounder (Platichthys flesus)	Negligible	The hydrological impacts (flow and level changes) associated with the drought permit are assessed as negligible and will not detract from the quality of the supporting environment at the time.	Not sensitive	No
<u>NERC Act Species – Birds</u> - Bewick's swan (<i>Cygnus</i> <i>columbianus bewickii</i>) - Bittern (<i>Botaurus stellaris</i>)- Lapwing (<i>Vanellus vanellus</i>)	Negligible	A number of bird species to varying extents rely on water dependent habitats. However, they are not expected to be impacted significantly from implementation of the drought permit because the flow and level changes are anticipated to be negligible.	Not sensitive	No
<u>Notable / Other Birds</u> There are a number of species present across the region. - Ruff (<i>Philomachus pugnax</i>)	Negligible	A number of bird species to varying extents rely on water dependent habitats. However, they are not expected to be impacted significantly from implementation of the drought permit because the flow and level changes are anticipated to be negligible.	Not sensitive	No



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Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Susceptibility to flow and level impacts	Sensitivity to Dec- Mar DP (Uncertain, High, Medium, Low, Not sensitive)	Further Consideration Required (Yes/No)
- Golden plover (<i>Pluvialis</i> <i>apricaria</i>)				
- Pochard (Aythya ferina)				
- Shoveler (Anas clypeata)				
- Mallard (Anas platyrhynchos)				
- Wigeon (Anas penelope)				
- Teal (Anas crecca)				
NERC Act Species Mammals		Populations may be vulnerable to flow level change and impacts on wetted		
Otter (Lutra Lutra)	Negligible	width and habitat. However, they are not expected to be impacted significantly	Not sensitive	No
Water Vole <u>(</u> Arvicola amphibius)	rightio	from implementation of the drought permit because the flow and level changes are anticipated to be negligible.		
Invasive non-native species – Terrestrial plants				
Himalayan balsam (<i>Impatiens glandulifera</i>)		The implementation of this drought permit is not anticipated to increase the		NI-
Giant Hogweed (<i>Heracleum mantegazzianum</i>)	Negligible	from drought permit implementation are anticipated to be negligible.	Not sensitive	INO
Japanese Knotweed (<i>Fallopian japonica</i>)				



6.2 Screening conclusions

In line with the DPG and YWSL's Drought Plan 2022 Environmental Assessment Methodology¹⁶, only features identified as either: 1) uncertain; 2) high or medium sensitivity; or 3) low sensitivity in a designated site form the scope of monitoring, environmental assessment and consideration of mitigation actions. On this basis no further environmental assessment is required (see also **Figure 3.1**).

6.3 Monitoring and mitigation

As outlined in Section 6.2, no features have been screened in for further assessment as it has been concluded that there would be negligible impacts resulting from implementation of the drought option. On this basis, no monitoring or mitigation is proposed to support implementation of the option.



¹⁶ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

Appendices

Appendix A Physical Environment



Appendix A – Physical Environment



A1 Introduction

This appendix assesses the potential impacts on the physical environment of the catchment surrounding the River Derwent during the period of implementation of the associated drought option.

Details regarding the approaches/methodologies used for assessing susceptibility and sensitivity to drought options and the assessment of the impacts associated with drought options are presented in YWSL's Drought Plan 2022 Environmental Assessment Methodology¹.

This EAR has been prepared in support of a drought permit application in autumn 2022. It provides an update to the 'shelf copy' report which was produced in support of YWSL's Drought Plan 2022. Following agreement with the Environment Agency, the physical environment and environmental features assessments presented in the 'shelf copy' report have been retained for this application EAR (see main EAR Section 1.2).

This appendix is set out in the following sections:

Section A.2 Drought option

Section A.3 Study area

Section A.4 Physical environment effects – this includes:

- 1. Introduction
- 2. Setting
- 3. River flow regime
- 4. River habitat
- 5. River water quality
- 6. Summary of potential changes in the physical environment as a result of the drought option.

Annex 1 provides a list of all regulated abstractions in the reach. Annex 2 provides a list of all wastewater treatment works (WwTW) and combined sewer overflows (CSOs) considered in the assessment.



¹ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

A2 Drought options

A2.1 River Derwent drought permit

YWSL is authorised to abstract water from the River Derwent at Loftsome Bridge under licence serial number 2/27/28/083. YWSL's abstraction at Loftsome Bridge is limited to 114 Ml/d and 30,400 Ml/ year. YWSL is authorised to abstract water from the River Derwent at Elvington under licence serial number 2/27/28/017. YWSL's abstraction at Elvington is limited to 205 Ml/d and 75,000 Ml/ year. In addition to the above stated daily and annual abstraction limits at Loftsome Bridge and Elvington, the licences state aggregate daily and annual limits for abstraction. These are 305 Ml/d and 94,841 Ml/year. The licences also state that the abstraction on any day at Loftsome Bridge and Elvington shall not exceed the previous day's flow in the River Derwent as measured by the Environment Agency's gauge at Buttercrambe.

The drought permit applications for the River Derwent are to increase the annual abstraction limit at Loftsome Bridge and to correspondingly decrease the annual abstraction limit at Elvington. The daily limits at each site, and all aggregate volumes are unchanged. The specific abstraction rates within the antecedent period would determine the timing and annual abstraction limit changes of the drought permit. YWS consider that an application could be made in November or December to be in place in January, noting that the licensed annual total would be unlikely to be reached until February or more likely March. The annual abstraction limit re-sets on 1 April each year and the drought permit conditions would expire on 1 April.

At the time application for a drought permit is made, the remaining volume on the annual abstraction limits and the number of remaining days will be known, and this will describe the drought permit conditions to be applied for and the abstraction reference conditions without a drought permit. For indicative purposes in this desk-study assessment, a daily average abstraction rate at Loftsome Bridge of 75MI/d is used as the without drought permit reference condition, and abstracting within the annual combined total, 183.9MI/d at Elvington. This is in the context of the annual licensed total abstraction if abstracted evenly throughout the year which would allow 83.3MI/d abstraction each and every day at Loftsome Bridge, and abstracting within the annual combined total, 175.6MI/d each and every day at Elvington – in operational circumstances where abstraction at Loftsome Bridge is to be maximised.

Comparison can be made with the sustainable daily average maximum abstraction rate at Loftsome Bridge of 95MI/d²,, and abstracting within the annual combined total, 163.9MI/d at Elvington, for the drought permit. This is on the assumption that abstraction could be to these rates for the remainder of the annual licensed period from January when a drought permit would be in place. This change in river flows (up to 20MI/d in this indicative assessment that would be confirmed at time of application) would only be apparent in the River Derwent reach between Elvington and Loftsome Bridge.



^{2 95} MI/d is the sustainable maximum daily abstraction rate at Loftsome Bridge albeit there would be daily variations up to around 105MI/d, noting that operational constraints mean the daily licence maximum of 114 MI/d is not possible.

Abstraction Water Source	NGR	Normal Abstraction MI/d ³ Proposed Drought Permit Abstraction MI/d		Benefit MI/d
River Derwent	SE7048 / SE7029	 Daily maximum abstraction at Elvington of 205 Ml/d Daily maximum abstraction at Loftsome Bridge of 114 Ml/d Daily combined maximum abstraction of 305 Ml/d Hands-off flow condition whereby combined abstraction cannot exceed previous day gauged flow at Buttercrambe, when flow at Buttercrambe is less than 305 Ml/d Annual combined abstraction total of 94,841 Ml 	 Increase the annual (1 April to 31 March) total abstraction at Loftsome Bridge by ~2,300 Ml to 32,700 Ml (application specific) Reduce the annual (1 April to 31 March) total abstraction at Elvington by ~2,300 Ml to 72,700 Ml (application specific but noted as to same value as Loftsome Bridge increase) No change to daily maximum or hands-off flow conditions. 	N/A

Table 4.1 Derwent at Elvington and Loftsome Bridge Licence Data

Any future drought permit application would be accompanied by a supporting statement demonstrating the need for this drought permit.



³ 1MI/d is 1 million litres per day

A3 Study area

The zone of influence associated with the drought option is defined through hydrological effects. Within the overall zone of influence, the reach is defined on a hydrological basis. YWSL's Drought Plan 2022 Environmental Assessment Methodology⁴ sets out this approach in detail in Section 3.4. The zone of influence for assessment of impacts is set out in **Section A3.1** below. Information on the likely timing of the drought option is set out in **Section A3.2** below.

A3.1 Zone of influence of the drought options

A review of hydrological information related to the abstraction for the Elvington intake and Loftsome Bridge intake has informed the study area for this hydrological impact assessment. **Table A3.1** provides details of this reach, and the reach is illustrated in main EAR **Figure 4.1** and in a schematic below in **Figure A3.1**.

The transfer of up to 20 MI/d of daily abstraction from Elvington to Loftsome Bridge will have no impact on the River Derwent upstream of the Elvington abstraction intake, or downstream of the Loftsome Bridge, as the overall combined abstraction at both intakes is assumed to be unchanged. The only hydrological impact will be an increase in daily flow of up to 20 MI/d from the Elvington intake downstream to the Loftsome Bridge intake.







⁴ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

Table A3.1	River	Derwent	reach	details
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Reach name	Watercourse name	Reach start	Reach end	Down-stream reach	Drought option Jerwent Siver Derwent
Derwent 1	River Derwent	Elvington WTW	Loftsome Bridge WTW	N/A	✓

The end of each study area has been defined previously from review of hydrological information – either flow gauge data that corroborates that drought option hydrological impacts have reduced to negligible, or by simple review of contributing catchment area where there is an order of magnitude step change in this from confluence with a significantly larger river or joining tributary.

A3.2 Timing of drought measure effects

The drought permit application is anticipated to be submitted by YWSL in autumn 2022 and the implementation period would therefore be to cover autumn/winter 2022.



A4 Physical environment effects

A4.1 Introduction

This section provides a characterisation of the physical environment within the zone of influence (as defined above in **Section A3**) and includes the following information for each reach:

- 1. Reach setting
- 2. River flow regime (reference conditions and sensitivity)
- 3. River habitat (reference conditions and likely sensitivity)
- 4. River water quality, including water quality pressure (reference conditions and sensitivity).

An assessment of likely changes from drought option implementation for the zone of influence is then provided.

YWSL's Drought Plan 2022 Environmental Assessment Methodology⁵ provides details of the approach in Section 3.5. The approach has been developed to ensure compliance with the Environment Agency's 2020 Drought Plan Guideline (DPG)⁶ and Section 3 of the Environment Agency's July 2020 "Environmental Assessment for Water Company Drought Plans- supplementary guidance".

A4.2 Derwent 1

A4.2.1 Reach introduction

A summary of physical environment information for Derwent 1 is provided in **Figure A4.1**. The reach includes part of the following river waterbodies:

- River Derwent from Kirkham to Elvington Beck (GB104027068312)
- River Derwent from Elvington Beck to River Ouse (GB104027068311)

A4.2.2 Reach setting

The reach, located on main EAR **Figure 4.1**, comprises a 23.9km stretch of River Derwent from Elvington Water Treatment Works to Loftsome Water Treatment Works (**Table A2.1**). The reach has an additional catchment area of 330.4km² along its length.

A4.2.3 River flow regime

Daily mean flows at the upper end of the reach, immediately downstream of the Elvington abstraction intakes, have been estimated by the Gustard flow transposition method based on catchment parameter ratios and daily mean flow data from an available gauge situated 14.5km upstream of the Elvington abstraction, at Buttercrambe.

After applying the flow transposition, the daily public water supply abstractions from the Elvington intake were then subtracted from the transposed flow record to provide an estimated daily flow record for the Elvington location, covering the period 1990-2019. Daily mean abstractions were available for the period 23 June 1997 to 31 December 2019.

The catchment area at the Elvington intake is approximately 5% higher than it is at the Buttercrambe gauge, so the flow statistics at the two locations would be of a similar magnitude prior to subtracting the daily abstractions. However, the daily abstractions have a significant impact particularly at lower flows, therefore the flow statistics downstream of the Elvington intake are based only on the period for which observed abstraction data is available, June 1997 to December 2019.



⁵ Ricardo Energy & Environment (2020). Yorkshire Water Drought Plan 2022. Environmental Assessment Methodology. Report for Yorkshire Water Services Ltd. June 2020.

⁶ Environment Agency (2020) Water Company Drought Plan Guideline, April 2020.

Under the drought permit, an increase in the annual licensed volume for Loftsome Bridge, and a corresponding decrease in the Elvington annual licensed volume, would be applied for. There would be no change in the daily maximum rate at either location, or in the combined daily maximum and annual maximum licensed volumes for both sites. The exact details of the volume to be transferred from Elvington to Loftsome Bridge would depend on the antecedent abstraction rates at the time of any future application (from 1 April to the date of application). For the purposes of this indicative assessment, however, it is assumed that the drought permit would be applied for in November or December, and would be in place during the period from 1 January to 31 March of the following year (as the annual licence volumes are reset on 1 April in each year), and would be for a volume of 1,092 MI to be transferred as outlined below.

It is assumed that in the baseline drought conditions, abstraction at Loftsome Bridge would be taking place at 75 Ml/d, whilst abstraction at Elvington would be taking place at 184 Ml/d to fully utilise the remainder of the combined annual licence volume (subject to any reductions necessary when the preceding day's flow measured at Buttercrambe is below 305 Ml/d). With the drought permit in place, during the period from 1 January to 31 March it is assumed that YWSL may potentially wish to increase abstraction from Loftsome Bridge up to a daily rate of 95 Ml/d, an increase of 20 Ml/d compared to the baseline abstraction (and an increase of 12 Ml/d compared to the existing annual licence). This would necessitate a transfer of 1,092 Ml of the annual licensed volume from Elvington to Loftsome Bridge.

A flow increase of up to 20 Ml/d downstream of the Elvington abstraction intake represents increases of up to 7.6% and 9.9% in the estimated summer Q95 and Q99 flow statistics respectively, and of up to 6.8% and 1.9% in the year round Q95 and Q50 flow statistics. As there is no reduction in flow, and the increased flow values are well within the range of normal flow variability, this is assessed as a **negligible** hydrological impact at any time of year.

Furthermore, the tidal barrage at Barmby is known to exert a significant effect on sub-daily patterns in river flow (through amending level and velocity) when water is either backed up by the closed tidal barrage at higher states of the tide, or free-flowing into the estuarine River Ouse at lower states of the tide. This effect is clearly observed in 15 minute flow data provided by the Environment Agency for a period in 2018 at Loftsome Bridge (see **Figure A4.2**), where a daily average flow of ~700MI/d can include minimum (15 minute) flows of close to zero and maxima of ~2,000MI/d within the same day. The Environment Agency note this very large variation in flow and velocity at Loftsome Bridge with each tidal cycle will dwarf the drought permit difference of 20 MI/d overall⁷. This is also borne out by review of gauged river level data⁸ at Loftsome Bridge and Bubwith Bridge, although the effect will diminish upstream as the tidal influence diminishes.

There is one significant flow pressure influencing flow in Derwent 1, discharge licence at Elvington WTW. See Annex 1 and 2 for a full list of flow pressures considered in the assessment.



⁷ David Lindsay (Environment Agency) by email 23/11/2018

⁸ Water level data are available for the River Derwent between the Elvington and Loftsome Bridge intakes at Elvington sluices and at Bubwith Bridge.









A4.2.4 River habitats

The physical environment has not been reviewed for the purposes of this assessment as based on the DPG requirements set out in **Figure 3.1** of the main EAR no further assessment is required.

A4.2.5 River water quality

The physical environment has not been reviewed for the purposes of this assessment (see Section A4.2.4) however for completeness a review of the water quality baseline has been presented in **Figure A4.1**.

The first water quality monitoring point present in Derwent 1: River Derwent at Sutton Lock (NE-49600137) has been used. The average pH between 2010-2020 was 7.9 with a maximum temperature of 20.8°C for the same period. The ammonia concentrations were consistent with 'Good' WFD status (0.6 mg/l) throughout the monitoring period, dissolved oxygen saturation (%) values were consistent with 'Good' WFD status (60%) throughout the monitoring period and Orthophosphate concentrations were consistent with 'Good' WFD status (0.083 mg/l) throughout the monitoring period.

A4.2.6 Summary of potential changes in the physical environment as a result of drought option

An overall summary of potential changes in the physical environment of Derwent 1 as a result of drought option is presented in **Table A4.2**.

Table A4.2	Summary of potential changes in the physical environment of Derwent 1 as a result of drought option

Physical environment aspect reviewed	Assessment of risk from implementation of drought options			
River flows Negligible impacts	 Increases of 7.6% and 9.9% in the estimated summer Q95 and Q99 flow statistics respectively, and of up to 6.8% and 1.9% in the year round Q95 and Q50 flow statistics throughout the reach at any time of year that drought options implemented. As there is no reduction in flow, and the increased flow values are well within the range of normal flow variability, this is assessed as a negligible hydrological impact at any time of year 			
Flow depleted reaches	• N/A			
River habitats	• N/A			
Water quality	• N/A			



Annex 1 – Regulated abstractions in the Derwent 1 reach

DP reach	Licence No.	Use Description	NGR 1	Max Annual Quantity	Max Daily Quantity
Derwent 1	2/27/28/017	Public Water Supply	SE705486	7500000	205000
Derwent 1	2/27/28/040	General Agriculture	SE69854628	13636	455
Derwent 1	2/27/28/043	General Agriculture	SE695450	14547	272.73
Derwent 1	2/27/28/098	General Agriculture	SE709477	23000	410
Derwent 1	2/27/28/102	General Agriculture	SE69394084	12500	155
Derwent 1	2/27/28/140	General Agriculture	SE7033132711	9091	2736
Derwent 1	2/27/28/140	General Agriculture	SE7067431188	9091	2736
Derwent 1	NE/027/0028/032	General Agriculture	SE6938839305	13490	820
Derwent 1	NE/027/0028/032	General Agriculture	SE7030932572	13490	820
Derwent 1	NE/027/0028/046	General Agriculture	SE70734768	8000	748
Derwent 1	NE/027/0028/048	General Agriculture	SE7033132711	40000	1440
Derwent 1	NE/027/0028/048	General Agriculture	SE7055134785	40000	1440
Derwent 1	NE/027/0028/048	General Agriculture	SE7045830029	40000	1440
Derwent 1	NE/027/0028/048	General Agriculture	SE7067431188	40000	1440
Derwent 1	NE/027/0028/055	General Agriculture	SE7012243164	13636	455



Annex 2 – Water quality pressures considered in the assessment

Name	Permit Reference	Outfall NGR	Significant Water Quality Pressure	Intermittent/ Continuous
Bubwith Wpc Works Final Effluent	1247	SE7120035900	No	Continuous
Elvington Water Treatment Works	27/28/0063	SE7060048440	No	Continuous
Elvington Beck SPS	27/28/0121	SE7017947474	No	Continuous
The Granary (Plot 1)	27/28/0128	SE7070034000	No	Continuous
The Coach House (Plot 3)	27/28/0129	SE7070034001	No	Continuous
The Hayloft (Plot 2)	27/28/0130	SE7070034002	No	Continuous
Four Dwellings	27/28/0148	SE7070934000	No	Continuous
Wheldrake Sewage Treatment Works	27/28/0193	SE6925044590	No	Continuous
Plots 1 & 2	27/28/0203	SE7066134120	No	Continuous
Plots 3 &4 And The Dovecote	27/28/0204	SE7066034120	No	Continuous
Orchard Plot	27/28/0208	SE7070834000	No	Continuous
The Lock House	27/28/0209	SE7050047400	No	Continuous
Anchor House	27/28/0233	SE7113036150	No	Continuous
Breighton Launch Public House	3443	SE7030034400	No	Continuous
Northumberland House	C5343	SE7040047600	No	Continuous
Premises At 16 Staite St	NPSWQD002535	SE7110036166	No	Continuous
The Paddock	QC.27/28/0029	SE7070031250	No	Continuous
Bowthorpe Hall	S/P/1045	SE7070034100	No	Continuous
Building Plot Tithe Farm	WA6242	SE7080031000	No	Continuous
Barmby	WADC485	SE7025029750	No	Continuous





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