Yorkshire Water Drought Permit Application

River Wharfe at Lobwood Supporting Information

YorkshireWater

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1.0 Introduction

This document provides supporting information to Yorkshire Water's drought permit applications to reduce the regulated flow release to the River Wharfe, via the River Dibb, from Grimwith Reservoir when we abstract at low flows. It will not alter the compensation release from Grimwith which provides a seasonal minimum flow on the River Dibb. We have submitted a separate application to reduce compensation flows in the North West reservoirs of the Yorkshire System.

The changes, if the application is granted, will be in place for 6 months. We have submitted a drought permit application form (WR80) to the Environment Agency and this document provides supporting information. A draft permit (form WR82) with details of the temporary licence changes has been prepared and a copy provided in support of this application.

This permit application for the reduction in abstraction support from Grimwith Reservoir at low flows is included as a drought option in the Yorkshire Water Drought Plan 2022 available to view on the Yorkshire Water website (**https://www.yorkshirewater.com/about-us/resources/drought-plan/**. In accordance with regulatory requirements Yorkshire Water has a Drought Plan that sets out the actions it can implement in a drought. The Drought Plan is revised every five years and submitted to Defra.

The potential environmental impacts of implementing the drought permit have been considered and an environmental assessment report is provided in support of the application (section 5).

1.1 The Yorkshire Water Supply area

Yorkshire Water supplies water to over five million customers. Under normal weather conditions, approximately 45% of this water is from impounding reservoirs, 30% from rivers and 25% from boreholes (groundwater). This varies from year to year depending on weather conditions. In dry years rivers are used more, with about 40% of supply coming from reservoirs, 40% from rivers and 20% from groundwater. By increasing river abstraction, we make use of supplies that would otherwise be lost and retain reservoir and groundwater supplies for longer. In normal weather conditions reservoir and groundwater stocks are replenished through rainfall and we do not need to rely on rivers as much.

For planning purposes, the Yorkshire supply region is divided into two water resource zones, shown in Figure 1.1. The majority of our region is within our Grid Surface Water Zone (Grid SWZ), with 1% of customers in our East Surface Water Zone (East SWZ). The Grid SWZ has an integrated supply network dominated by the operation of lowland rivers and Pennine reservoirs. The East SWZ, is a much smaller zone covering Whitby and the surrounding area. It is supplied by a river abstraction and moorland springs in the Whitby area. We are not applying for any drought permits in our East SWZ.

Figure 1.1: Water resource zones

Our Grid SWZ includes five interconnected operating areas, which we refer to as North, North West, South, South West and East areas. The Wharfe abstraction at Lobwood is in the North West Area of our Grid SWZ. As well as applying for this drought permit we are submitting separate applications to reduce compensation releases from reservoirs in the North West, North, South and South West areas of our Grid SWZ, and to increase river abstractions. We are not applying for any permits or orders in the East Area of the Grid SWZ or in the East SWZ.

Our Drought Plan 2022 includes 49 drought options that are designed to conserve reservoir supplies or provide additional river or groundwater supplies when droughts occur in our Grid SWZ. The majority (43) of our drought options are related to reservoir compensation releases and we have a high number of these as there are over 100 reservoirs in our region. We have six drought options in our Drought Plan relating to existing river abstractions that can be used to provide additional resources to our Grid SWZ without the need for any new infrastructure. This drought permit application relates to one of these six options, and if granted would allow us to reduce the regulating release from Grimwith reservoir to the River Dibb by 22.7 Ml/d in the lowest flow band. This current application does not include the Drought Plan option to increase the annual abstraction licence at Lobwood, although we will be applying for this in a separate application.

We are applying for drought permits that will enable us to implement several of the drought options in our Drought Plan (a list of these options is provided in Section 6). The permit applications have been selected through modelling and analysis of our drought plan options. We are prioritising our permit applications to those that will offer the maximum benefits to protecting public water supply in the current situation.

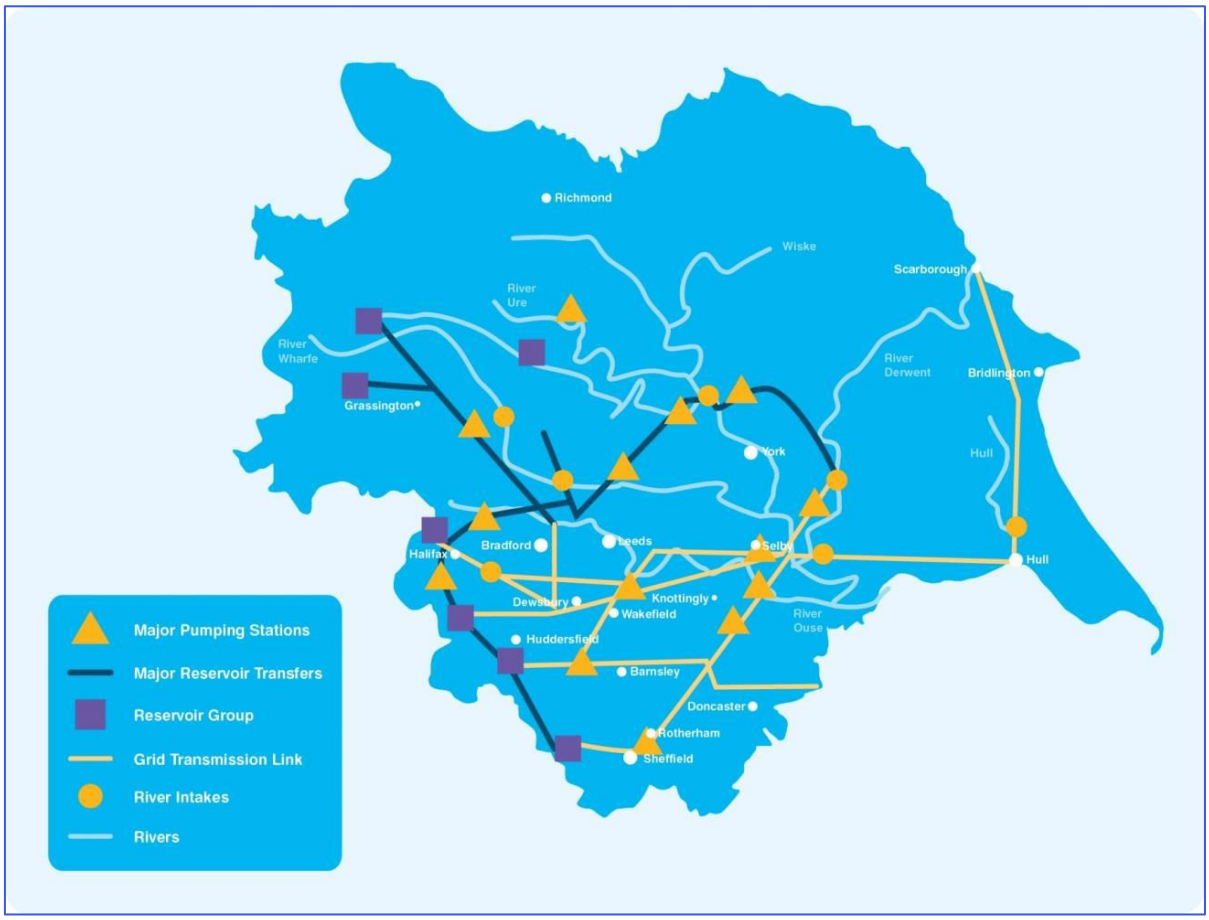

Figure 1.2: Grid SWZ integrated network

Figure 1.2 is an outline of our grid network, which connects most of the water resources in our Grid SWZ. The grid network enables highly effective conjunctive use of different water resources using raw and treated water pipelines. Water abstracted from the river intakes is used to support the five operating areas either directly or indirectly, so they are not solely dependent on local resources.

During dry weather we aim to maximise use of river sources to conserve reservoir stocks for longer. However, this year we have experienced exceptionally high demand and low rainfall. At times we have had to maximise use of rivers and reservoirs simultaneously and during periods of low river flow we have had to rely on reservoir supplies. We balance the drawdown of reservoirs across the zone through use of our grid system. This makes our region more resilient to supply risks but following exceptional weather conditions during 2022, stocks in the reservoirs across our region are lower than average. Our use of the licences in this application is described in Section 4.8.

As a result of the low rainfall our reservoirs are below average for the time of year and there is a risk to security of supply if we do not take action to conserve reservoir stocks as much as possible. We are applying for drought permits to conserve supplies in reservoirs in case the dry weather continues. These drought permits, if granted, will reduce the amount of water we release from reservoirs to rivers allowing us to maintain these compensation flows for longer, and aiding the recovery of these reservoirs. Reducing support from Grimwith Reservoir will conserve water in the reservoir.

2.0 Drought permit description

Yorkshire Water is currently operating within the terms and conditions of the licence agreement held with the Environment Agency under licence number 2/27/19/129/R01 ("the Lobwood Licence"). We release compensation flow from Grimwith Reservoir to support the downstream environment under the terms of the impoundment licence NE/027/0019/011. The impoundment licence is unaffected by this drought permit application, although we have made a separate application to reduce the compensation flows in this impoundment licence.

The abstraction from the River Wharfe at Lobwood drought permit application concerns the level of abstraction from the River Wharfe, detailed in Section 2.2. It proposes a change to the support provided from Grimwith Reservoir as part of the normal abstraction regime, which is included as a drought option in the Yorkshire Water Drought Plan 2022.

We are applying for drought permits to remove the requirement to release an additional 22.7Ml/d from Grimwith reservoir to support our abstractions on the River Wharfe in the lowest flow band (see Table 2.2. Instead of releasing the total abstraction plus 22.7, we the permit will allow us to release a volume equal to the total abstraction.

Yorkshire Water is also permitted to abstract water from the River Wharfe at Arthington (SE 26 45), West Yorkshire under abstraction licence number 2/27/20/196/R01 ("the Arthington Licence"). A copy of the licence is provided. The licence conditions for the abstraction at Arthington also impose an obligation for Yorkshire Water to support abstractions from Lobwood and/or Arthington with releases from Grimwith Reservoir. This clause will also be amended in the Arthington Licence for the duration of the drought permits, if granted, although it is our generating operating policy to only use the Lobwood abstraction in the lowest flow band where a regulating release is required for both the Lobwood and Arthington abstractions.

2.1. Location

The Yorkshire Water abstraction point relating to this application is on the River Wharfe at Lobwood (grid reference SE 07 51), north of Addingham in West Yorkshire. The abstraction is supported from Grimwith Reservoir (grid reference SE 06 64) in North Yorkshire, upstream of the Lobwood intake. Grimwith Reservoir releases are discharged to the River Dibb, which flows to the River Wharfe. The confluence of the two rivers is between the villages of Burnsall and Appletreewick. A location map of Grimwith Reservoir and the abstraction points at Lobwood and Arthington is provided in Figure 2.1.

2.2. Water resource management arrangements relating to the application

Yorkshire Water is authorised to abstract water from the River Wharfe at Lobwood for supply to customers under the terms stated in the abstraction licence. We are permitted to abstract a maximum of 5,060 cubic metres per hour, 93,200 cubic metres per day and 23,742,000 cubic metres per year, at an instantaneous rate not exceeding 1,406 litres per second.

The daily abstraction limit varies depending on flow conditions ('bands') in the River Wharfe, as measured at Addingham gauging station, and upstream releases from Grimwith Reservoir. Under the conditions of the Lobwood Licence, during periods of low flow in the River Wharfe, we are required to support abstraction at Lobwood by releasing water from Grimwith Reservoir. When river flows are above 389 megalitres per day (Ml/d) (Bands A and B in the licence), we do not have to provide any support. When river flows are between 252 and 389 Ml/d (Band C in the licence), we are permitted to abstract the volume of water being released from Grimwith Reservoir plus an additional 6.8 Ml/d. When river flows are below 252 Ml/d as measured at Addingham gauging station (Band D in the licence), we have to support the abstractions on the River Wharfe at Lobwood and Arthington. We are allowed to abstract up to a maximum of 88.6 Ml/d at Lobwood and 28Ml/d at Arthington, and have to release the sum of the combined abstractions at Lobwood and Arthington plus 22.7 Ml/d from Grimwith Reservoir.

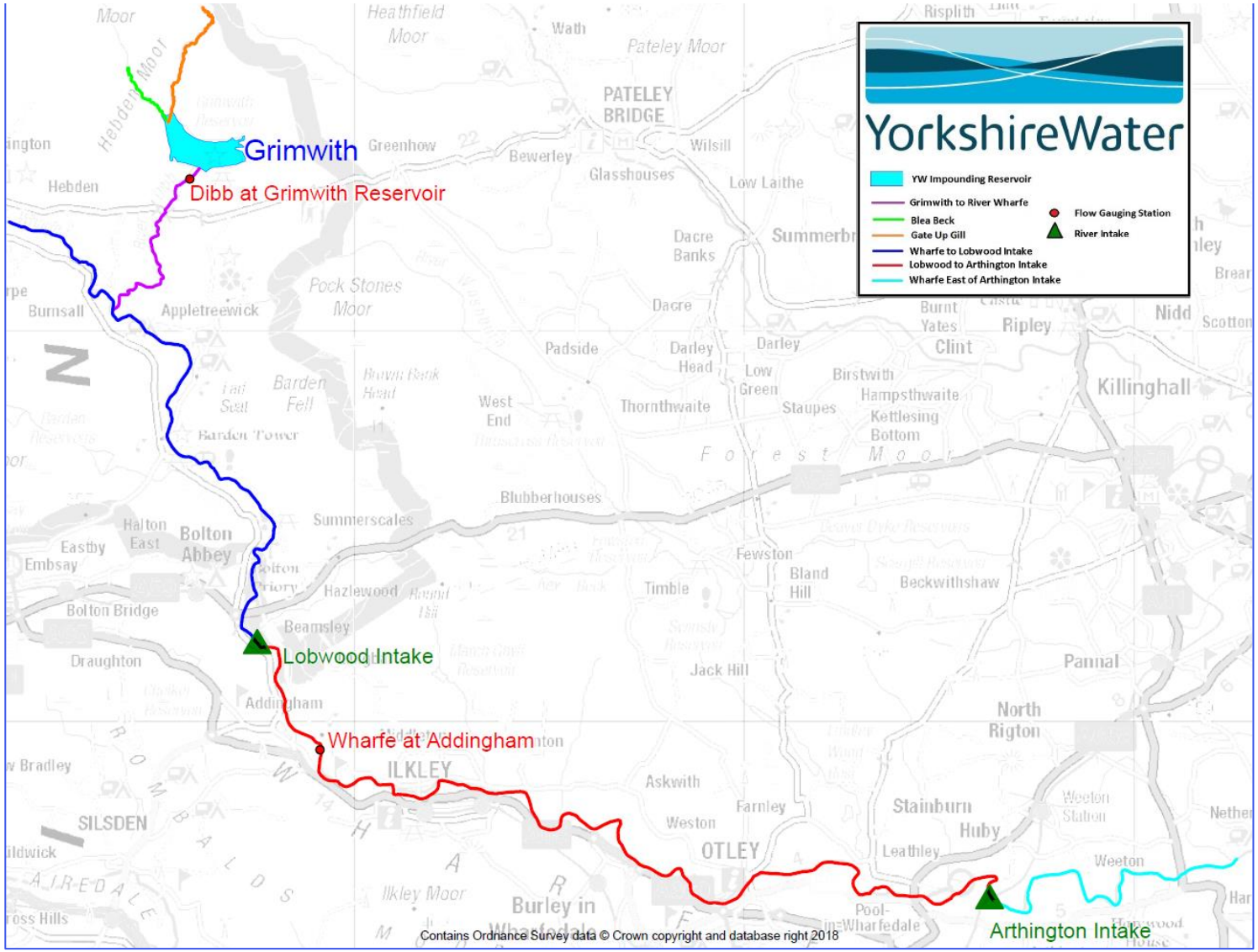

Figure 2.1 Location map

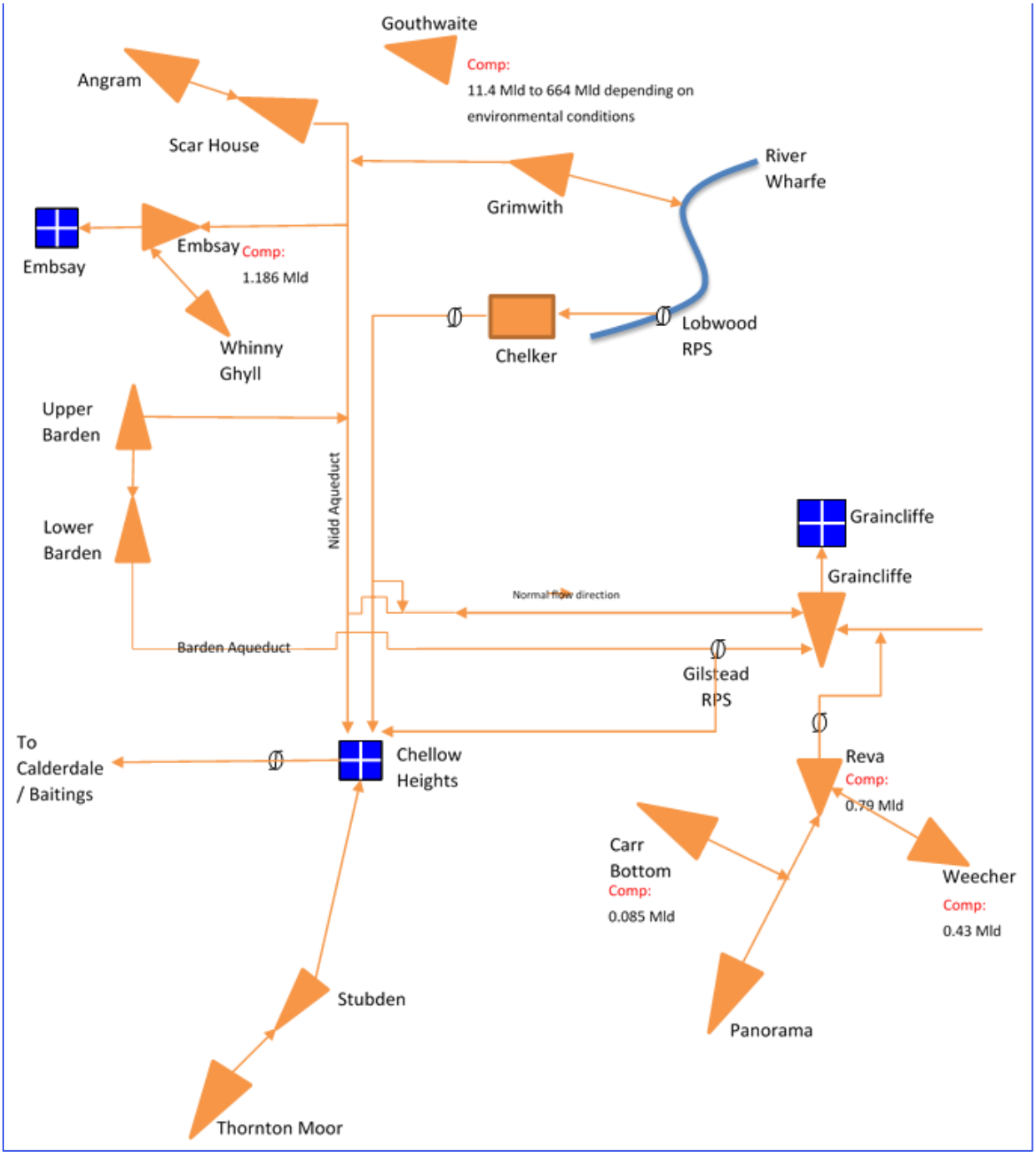

Figure 2.2 Schematic showing the Lobwood abstraction and grid connections

The water abstracted at Lobwood is pumped to Chelker reservoir, which in turn feeds Chellow Heights water treatment works (WTW) and supplies Bradford and surrounding areas in West Yorkshire. Chellow Heights WTW is also supplied by Scar House and Angram reservoirs in the Nidd Valley and the Barden Upper and Lower reservoirs in the Wharfe Valley. In general, the use of reservoirs is maximised when stocks are above the Normal Control Line (NCL). Control lines are discussed in Section 3.3. When reservoir stocks are below the NCL the abstraction is reduced to the reservoir yield where possible, and the use of rivers is increased. A schematic showing the grid system connection to the Lobwood abstraction is provided in Figure 2.2.

The output from Chellow Heights WTW is required to ensure Bradford and surrounding areas are supplied with water. The Lobwood abstraction is a major source of supply for the Chellow system, as the only river source supplying Chellow Heights WTW. The system requires Lobwood to be used for most of the time; supplies could only be maintained for a few days without an abstraction at Lobwood.

On days when not releasing from Grimwith Reservoir to support downstream abstraction, compensation flows are released to the River Dibb as summarised in Table 2.1. Changes to compensation flows have been applied for in a separate drought permit application for the North West Area.

Date	Compensation flow releases (Ml/d)
1 January to 19 April	15.1
20 April to 10 May	7.8
11 May to 11 October	3.8
12 October to 31 October	7.8
1 November to 31 December	15.1

Table 2.1: Summary of compensation flow requirements

2.3. Abstraction from the River Wharfe under permit proposal

The current annual and daily maximum abstraction licence permissions at Lobwood on the River Wharfe and proposed changes for the duration of the drought permit are shown in Table 2.2, (changes highlighted yellow). The daily permitted volumes are dependent on the flow on the River Wharfe as explained in Section 2.2.

	Licence agreement conditions		**Proposed drought permit conditions**	
Gauged flow Ml/d (at Addingham Gauging Station)	**Allowed abstraction Lobwood Ml/d**	**Allowed abstraction Arthington Ml/d**	**Allowed abstraction Lobwood Ml/d**	**Allowed abstraction Arthington Ml/d**
>580	93.20	78	93.20	78
>488 (Band A)	93.20	34.1	93.20	34.1
>389 (Band B)	88.60	25	88.60	25
>252 (Band C)	Grimwith release plus 6.8, up to maximum of 88.6	25	Grimwith release plus 6.8 up to maximum of 88.6	25
<252 (Band D)	Grimwith release less 22.7, up to maximum of 88.6*	Grimwith release less 22.7, up to maximum of 25*	**Grimwith release up to maximum of 88.6****	Grimwith release less 22.7, up to maximum of 25*
* If abstraction is taking place at both Lobwood and Arthington, the total Grimwith release must be at least 22.7Ml/d greater than the combined abstraction * *If abstraction is taking place at both Lobwood and Arthington, the total Grimwith release must be at least the combined abstraction				

Table 2.2: Current Licence and Drought Permit proposals

The drought permit application is to temporarily amend the Licence to abstract the full volume released from Grimwith Reservoir when river flows are in the lowest flow band (Band D). In Bands A, B and C there would be

no change to the permitted abstraction rates. The abstraction rates (hourly, daily and instantaneous maxima) specified in the licence for differing flow bands in the River Wharfe are not affected by the drought permit application. The maximum abstraction rate of 88.6 Ml/d in Band D is also unchanged.

The licence conditions for the Yorkshire Water abstraction at Arthington also impose an obligation to support abstractions from Lobwood and/or Arthington with releases from Grimwith Reservoir that are 22.7 Ml/d greater than the abstracted volume when river flows are in Band D. This clause will be amended in the Arthington Licence for the duration of the drought permit, if granted, to allow the full volume released from Grimwith Reservoir to be abstracted from Lobwood when river flows are in Band D.

We do not anticipate using Arthington in the lowest flow band during dry weather. If we were to abstract from both Lobwood and Arthington during low flows, we would be required to support both abstractions from Grimwith Reservoir and we would be at risk of depleting the reservoir's stocks. However, if we do need to abstract from Arthington whilst this permit is in operation, we will comply with our licensed abstraction and release the additional 22.7Ml/d regulatory support from Grimwith Reservoir. The environmental assessments have been carried out on this basis (as per our Drought Plan 2022). This is reflected in Table 2.2.

In 2022 our reservoirs stocks are low following the high summer demand and below average rainfall. During the winter, demand is generally lower than summer but if temperatures fall below zero degrees Celsius pipes often freeze then break when they thaw as temperatures rise again. This "freeze-thaw" can lead to an increase in bursts on our supply network and in customers' properties and therefore an increase in winter demand. If we were to experience a period of high winter demands, we would need to be able to maximise abstractions at Lobwood to meet demand, and if river flows are low this abstraction would require support from Grimwith reservoir. This permit would reduce the impact this additional abstraction on the winter recovery of Grimwith reservoir.

3.0 Drought permit justification

This drought permit application is necessary due to an exceptional shortage of rain threatening a serious deficiency of supplies of water in the area supplied by Yorkshire Water. Evidence to demonstrate the exceptional shortage of rain in the North West Yorkshire area is provided below and further details are available in the separate document on 'Exceptional shortage of rain 2022', provided in support of this application.

We are applying for a permit to aid the recovery of reservoir stocks during the winter. Because this permit is for winter recovery, we expect it to have less environmental impact than it would during the summer. Furthermore, by maximising our prospects for winter recovery, we will decrease the likelihood of requiring permits in 2023 during the more environmentally sensitive spring and summer periods.

3.1. Why we need a drought permit

Our Grid SWZ has an interconnected network (grid system) that enables highly effective conjunctive use of the available water resources using raw and treated water pipelines. During dry weather we aim to maximise use of river sources to conserve reservoir stocks for longer. However, during 2022 we have experienced exceptionally high demand, which has led to greater draw down of reservoirs, and below average rainfall has meant reservoirs have not refilled.

Rainfall over the winter period of 2021/22 was very variable, it was dry until January with reservoir stocks at 87% full at the start of the year. A very wet February meant that stocks recovered to 95% full by the end of February 2022. Rainfall continued to be significantly below LTA in March and April, with stocks falling to 87% at the end of April.

Reservoir stocks crossed our 'Normal Control Line' in mid-March 2022. This triggered additional activity to manage water resources and in particular to abstract, treat and distribute more water from rivers in order to reduce our draw on reservoir stocks. This activity continued during the summer and will continue into autumn and winter until the water resources position recovers. We have used our grid system to move water up to 70 miles from river sources to areas in the south and west of the region which are usually supplied by local reservoirs. Throughout this period, we have been managing reservoir levels to ensure, as far as possible, that stocks are drawn down evenly across all areas.

In June and July, we experienced high customer demand due to ongoing dry weather coupled with a period of high (and very high) temperatures. The very high temperatures were unprecedented, with the highest temperatures ever being recorded across the UK, and the first Met Office Red weather warning for heat being issued. At times we had to maximise use of rivers and reservoirs simultaneously to meet customer demand, and during periods of low river flow we had to rely on reservoir supplies more than would normally be the case.

This led to our reservoir stocks depleting at a much faster rate and if the dry weather continues there is a risk, we will not be able to maintain supplies in some areas or receive sufficient refill for levels to return to normal in the autumn.

3.2. Benefits of this drought permit

The proposal to temporarily amend the Licence to abstract the full volume released from Grimwith Reservoir when river flows are in the lowest flow band (Band D) would allow us to prolong the amount of time that reservoirs are available for both public water supply and compensation releases to the environment.

We have considered all options and this permit application has been identified as being the best option for the current situation. Very high demands have led to an increase in abstractions from all sources to meet peak demands and from river sources to support reservoir stocks. If we were able to continue the use of the river abstractions at a higher rate over the winter, this would aid recovery of reservoir stocks and put us in a better position for the spring and summer of 2023.

A reduction in the regulatory flow releases from Grimwith Reservoir when abstracting at low flows will give a benefit of 1,362Ml between October and March, if we assume river flows are in the lowest flow band for one third of the time. Lower river flows would give a larger benefit, and higher flows a smaller benefit in terms of stocks in Grimwith Reservoir. The effects of this option will be a direct reduction in the release from the

reservoir, resulting in higher stocks, allowing it to be used for longer for public water supply and to meet compensation requirements for longer.

Reservoir group	Potential Benefit on 1 April 2023
Regional stocks	0.76%
North West Stocks	2.89%
Grimwith stocks	6.26%

Table 3.1: Benefits of Drought Permit proposals

The benefits that could be achieved if this permit is granted are summarised in Table 3.1 and include improved flexibility and an increase in regional reservoir stocks of up to 0.76% on 1 April 2023 The benefit is equivalent to the volume of the reduction of release from Grimwith, and is shown as a proportion of total stocks in the regional and North West, groups and of Grimwith reservoir.

3.3. Deficiency of supplies due to an exceptional shortage of rain

Our drought triggers include data from a number of sources – rainfall, river flows, ground water levels and reservoir levels. Our report 'Exceptional shortage of rainfall 2022 v7' provides a regional overview of conditions across the Yorkshire Water area and details the analyses we have carried out on rainfall and climate data in Yorkshire. This document is presented in support of our application and includes the following analyses:

- Standardised Precipitation Index (SPI) calculations
- Rainfall ranking
- Rainfall probability bands
- Rainfall percentage of long term average
- Soil Moisture Deficit

We have analysed rainfall for the Yorkshire river catchments, the Yorkshire region and a number of reservoir group catchments.

Table 3.2: summarises some of the analyses that have been carried out on rainfall data for the catchments most relevant to this drought permit application. It shows the 1 month, 3 month, and 6 month standardised precipitation index (SPI) for September for Yorkshire regional rainfall, the River Wharfe catchment, and Grimwith reservoir. The analyses show that the 6 month SPI is extremely dry for Wharfe catchment, and severely dry for the Yorkshire region, with the Grimwith catchment being moderately dry. September had close to average rainfall, which has led to a slight reduction in the severity of the longer term SPI values with the 1 month SPI being near normal for all catchments shown. However these catchments have only experienced 68-69% of LTA rainfall in the period April to September. The Yorkshire and Wharfe catchments are ranked 5th and 3rd driest on the Cunnane ranking, which denotes exceptional low rainfall.is classified as exceptionally dry.

For the River Wharfe catchment, the SPI is exceptionally low for the April-September period, based on the monthly rainfall data, but the river flow plots on the Centre for Ecology and Hydrology (CEH) Water resources portal (shown in our Exceptional Shortage of Rainfall report) show periods when the river flows are notably low and exceptionally low during the month.

March-July rainfall as % of LTA for these catchments is between 51% and 72% of the LTA. For the Yorkshire Region, the March-July LTA is 66%- just slightly higher than the same period in 1995 (61%).

Plots of monthly rainfall as percentage of the 1961-1990 LTA are shown in the Exceptional Shortage of Rainfall report. These show that since October for most catchments only October and February have been above average. December was close to average, and February was extremely wet, providing some much needed reservoir refill. Since March all months have been below the LTA until September, which was close to the average.

	1 month SPI	3 month SPI	6 month SPI	%LTA Apr - Sep rainfall	Ranking April - September
Yorkshire regional	0.37	-1.18	-1.78	68%	5
Wharfe	-0.62	-1.78	-2.01	69%	3
Grimwith	0.31	-0.83	-1.14	69%	22

Key

Extremely dry	Severely dry	Moderately dry	Near normal	Moderately wet	Severely wet	Extremely wet
Exceptionally low	Notably low	Below normal	Normal	Above normal	Notably high	Exceptionally high

3.2: Rainfall catchments and summary of analyses September 2022

River flows and reservoir stocks and their use as an indicator for a deficiency of supplies are discussed in the next sections of this document.

3.4. Reservoir Stocks

Our reservoir control lines represent the value of reservoir storage that is required to guarantee a continuous rate of supply (equivalent to yield) such that the reservoir storage never falls below a critical storage line given the minimum historical inflows.

We calculate two sets of control lines:

- Drought Control Line (DCL) - the DCL is designed such that stocks will never fall below marginal storage when the reservoirs supply 85% of their calculated yield.
- Normal Control Line (NCL) - the NCL is designed such that stocks will never fall below the DCL when the reservoirs supply their calculated yield.

Once we have calculated the NCL and DCL, we linearly interpolate between the 100% full level and the NCL, the NCL and DCL, and the DCL and emergency storage level, to obtain the ten control lines (CLs) used in our modelling and reservoir stocks monitoring. The NCL is control line (CL) 3, the DCL is CL7, and we use CL4 as the Environment Agency trigger line. This is the trigger for Yorkshire Water and the Environment Agency to initiate communications around a potential emerging dry weather situation. The control lines are the grey curves shown in Figure 3.2; these provide Yorkshire Water's internal control lines, used to help manage the reservoirs.

The control lines are updated on a regular basis and were last updated in 2022 based on minimum inflows from 1900 to 2020. We have remodelled our historic inflows using GR6J rainfall runoff models and extended our historic record back to 1900.

Control lines have been revised since our most recent drought plan, but the triggers in our drought plan related to control lines are still applicable to the updated control lines. We will carry out a further review of our control lines after the current drought period has ended, and when inflows are updated to include this current period.

In the operation of our reservoirs, we aim to abstract the reservoir yield when stocks fall below the NCL, but at times of high demands or in response to other system constraints we will often use a source above its yield for periods of time, and then reduce to below yield later in the year to compensate.

The figures below show regional and area reservoir stocks for this year compared to the last few years and selected dry years.

Figure 3.1 shows the regional reservoir stocks from our weekly water situation report. It shows that stocks in 2022 have been very low. Only 1995 and the start of 2020 have been drier during parts of the year, in recent times.

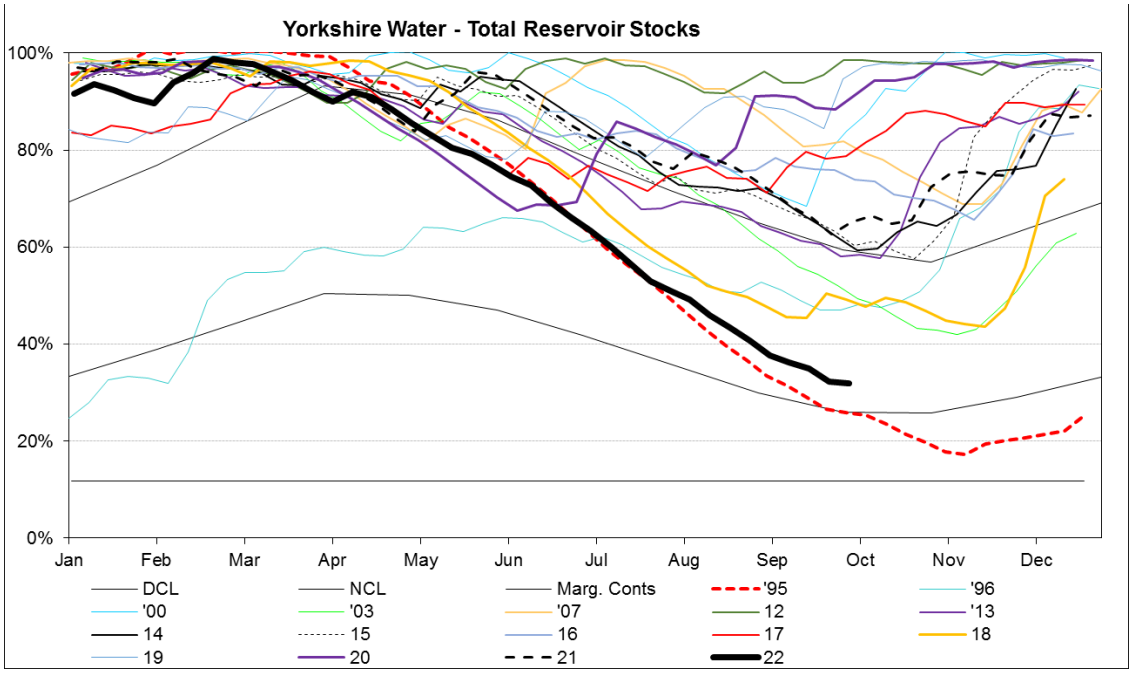

Figure 3.1: Regional Reservoir Group stocks (from Water Situation Report)

Figure 3.2 shows the area stocks for the North Group of reservoirs supplying Harrogate and Leeds. This area can be used to support the north west area using the Eccup to Graincliffe transfer.

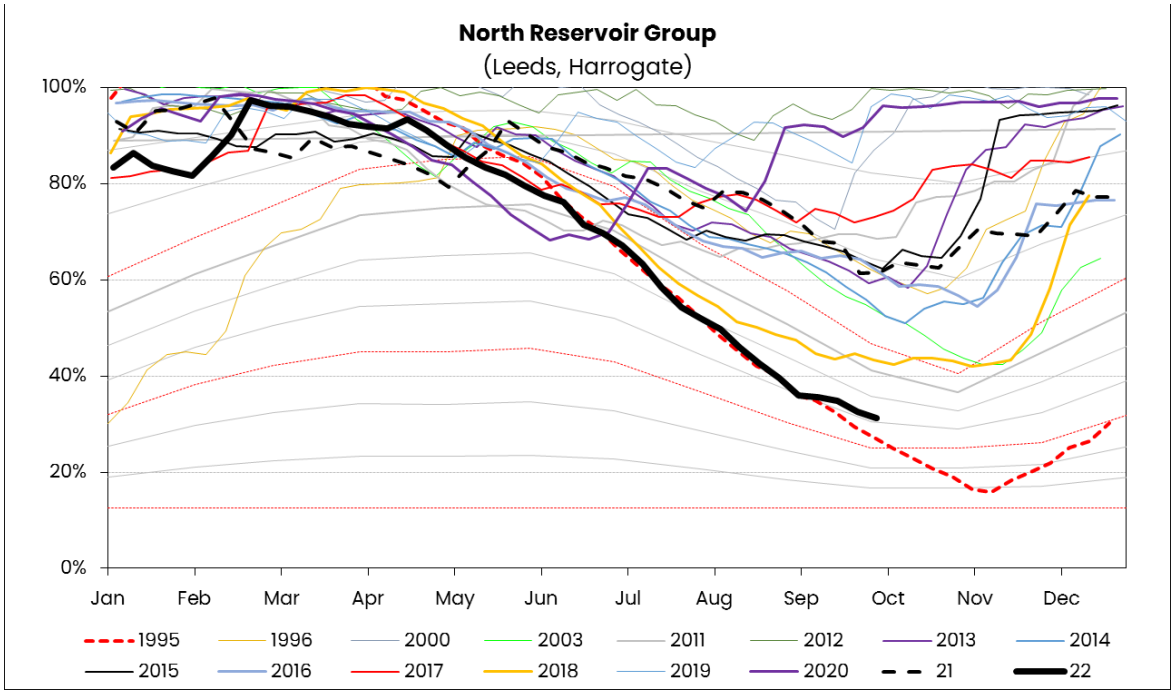

Figure 3.2: North Reservoir Group stocks (from Water Situation Report)

Figure 3.3 shows the area stocks for the North West Group of reservoirs supplying Skipton, Keighley and Bradford. This area is supported by the River Wharfe abstraction and includes Grimwith reservoir, which this application relates to.

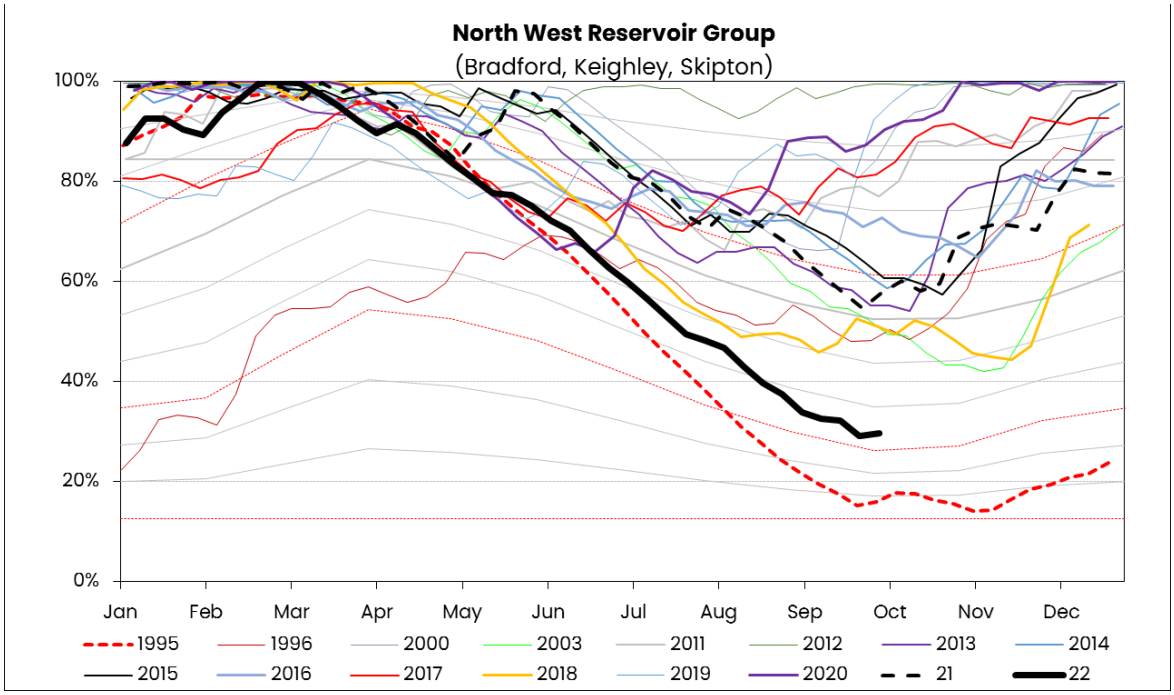

Figure 3.3: North West Area Reservoir stocks (from Water Situation Report)

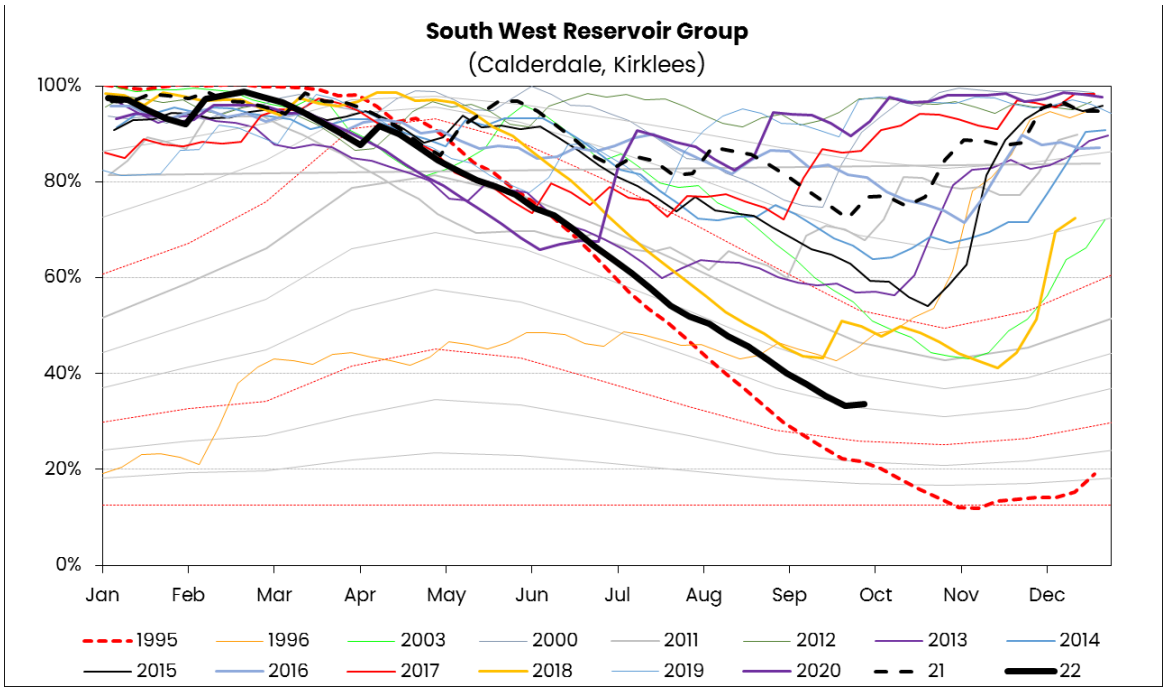

Figure 3.4: South West Area Reservoir stocks (from Water Situation Report)

Figure 3.4**Error! Reference source not found.** shows the stocks for the South West Reservoir group. A reduction of support for the north west area from grid abstractions could be transferred to this area via Brayton and Womersley pumping stations (after treatment at Elvington WTW).

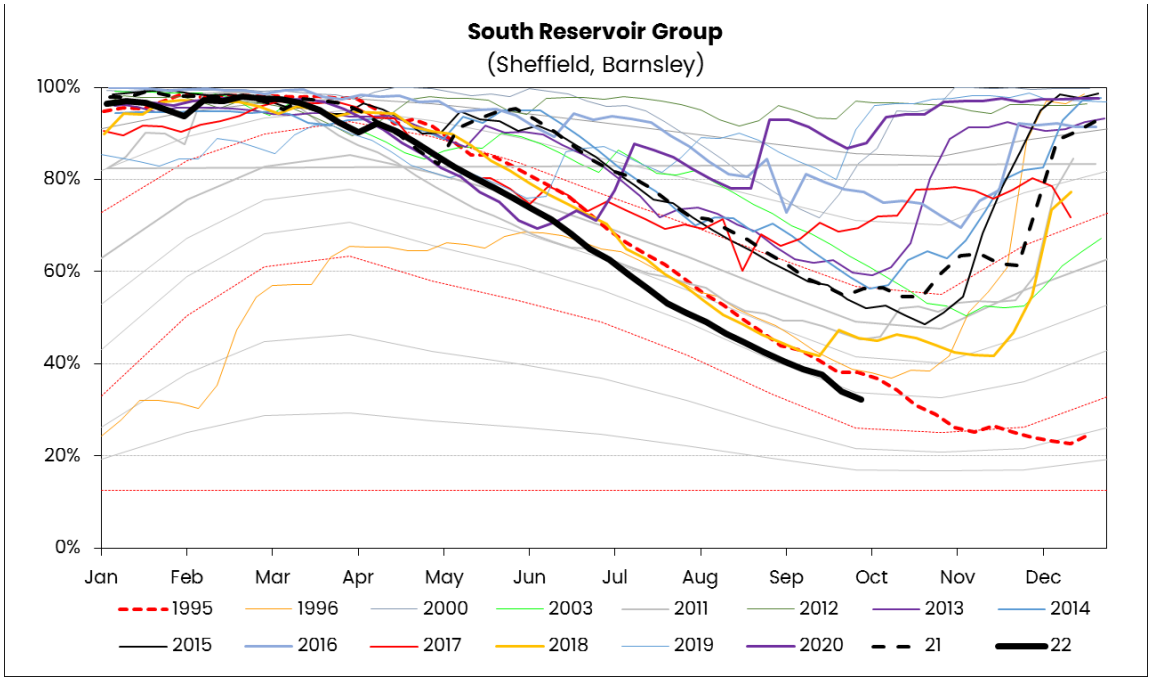

Figure 3.5: South Area Reservoir stocks (from Water Situation Report)

Reservoir stocks in the South Group are shown in Figure 3.5 . A reduction of support for the north west area from grid abstractions could be transferred to this area via Elvington WTW and Grid pumping stations.

Figure 3.6**Error! Reference source not found.** shows the Grimwith Reservoir stocks. Figure 3.7 shows the stocks for the Washburn Valley reservoir group (Thruscross, Fewston, Swinsty and Eccup reservoirs), which supply Leeds. Figure 3.8 shows the stocks for the Nidd reservoir group (Scar House and Angram Reservoirs). These plots all show the reservoirs well below the Normal Control Lines. Any reduction in the regulating release we need to make from Grimwith reservoir will aid recovery of Grimwith, and stocks in the north west area. All graphs show that stocks in 2022 are lower than they have been for many years. Only 1995/1996 and the start of 2020 have been drier in recent times.

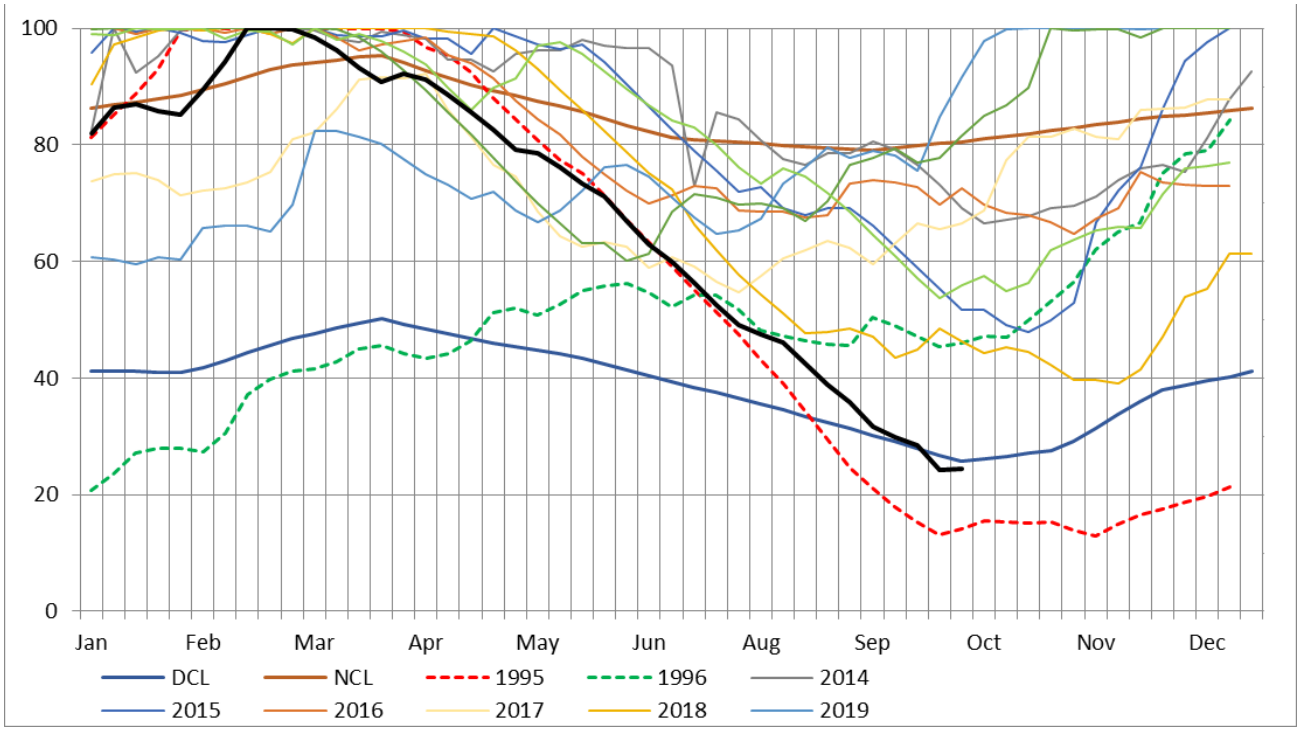

Figure 3.6 – Grimwith Reservoir stocks

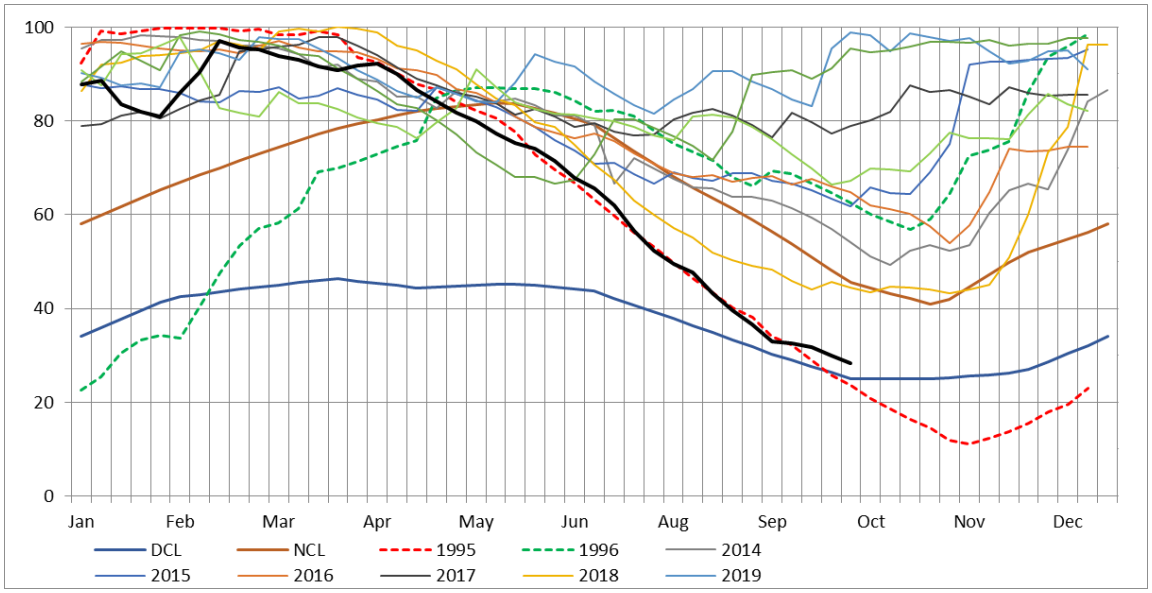

Figure 3.7 – Washburn Valley (including Eccup) Reservoir stocks

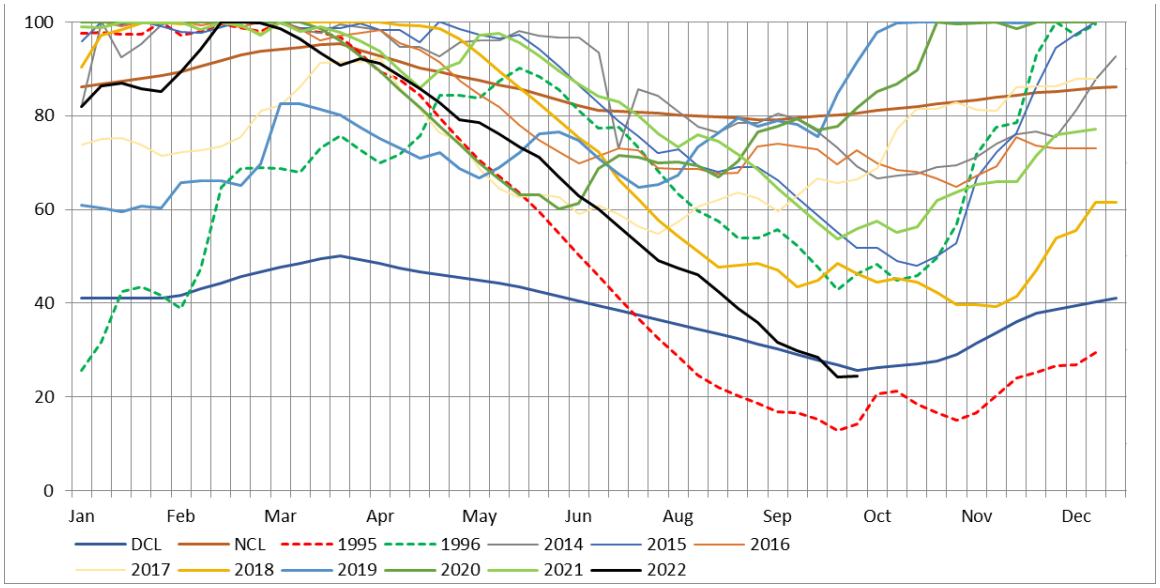

Figure 3.8 – Nidd Group Reservoir stocks

The serious deficiency of supplies that is threatened is demonstrated by the attached reservoir stocks graphs for the region, for the North West Area, and for Grimwith Reservoir and the Washburn Valley reservoirs.

Grimwith Reservoir in the North West area is part of this drought permit proposal, as it supplies the regulating release to the Lobwood abstraction at low river flows. Lobwood abstraction supports Bradford and the surrounding area. The Washburn Valley reservoirs will benefit from the permit as they supply the Leeds area but can supply the Bradford area if water availability form the Wharfe is low. If we are able reduce the regulating release from Grimwith reservoir, this will allow reservoir stocks in the north west to recover more quickly, reducing the amount of support required to Bradford from the Leeds area.

The reservoir plots show that reservoir and group stocks are far lower than they have been in recent years, with regional stocks only lower in 1995 and 1996 for most of the summer months.

3.5. River Flows

Figure 3.9 shows the gauged flows recorded on the River Wharfe at Addingham for 1995 and 2022, as well as releases from Grimwith Reservoir and abstractions at Lobwood and Arthington.

For the early part of 2022, flows in the River Wharfe were low, with support required from Grimwith in January (quite unusual) before an extremely wet February, when there was widespread flooding. With only one above average rainfall month in the winter, by the end of March, Lobwood abstractions were again in the lower flow bands, requiring support from Grimwith reservoir, and were lower at times than in 1995. Occasional rainfall has increased river flows above the threshold requiring support for short periods, but most of the time river flows have required support to allow abstraction at Lobwood, so reservoir stocks have been depleted. The rainfall at the end of July allowed a few days where no support was needed. Arthington pumping station was flooded in February and was consequently out of operation until the start of August. Had it been operational, it would have been used when river levels were in the higher bands, and since it has returned to use, it has been used to support Lindley Wood compensation reservoir when river flows allow it to be used without support from Grimwith.

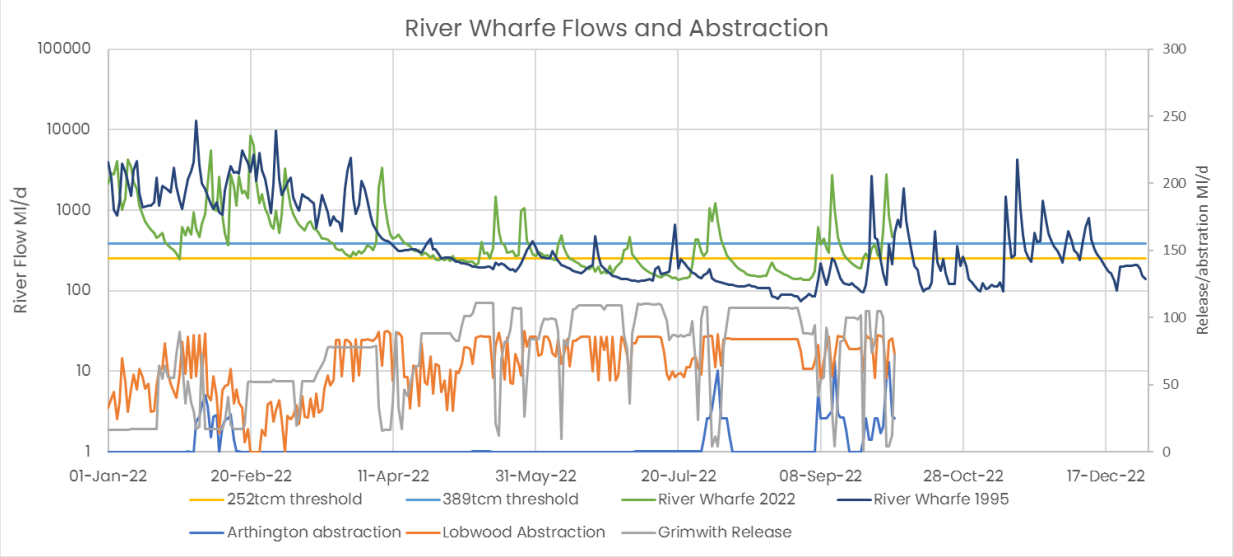

Figure 3.9 : Flows and abstractions for the River Wharfe

Figure 3.9 shows that Lobwood was used at a lower rate (30-50 Ml/d) during the early part of the year, with its use gradually increasing from early May when the Nidd reservoir group stocks (Figure 3.8) fell below their normal control line, in accordance with our operating strategy of decreasing reservoir use and increasing river abstractions as reservoirs fall below their normal control lines.

3.6. The effects of the current water shortage

The current water supply situation is a result of the exceptional shortage of rainfall described in our report. As well as the exceptional shortage of rain, the situation has been exacerbated by exceptionally high temperatures, which resulted in very high demand for water during summer 2022 (demonstrated in Sections 3.8 and 3.10). Reservoir stocks are depleted and to reduce the risk to supplies and the environment, we are preparing for the possibility of continued dry weather by taking actions in line with our drought plan. There are specific hot-spots (e.g. Worth valley, in the North West group), where stock levels are declining more rapidly than the average regional level and this is resulting in higher levels of risk which are a cause for increased concern.

Throughout the summer we have continually modelled and monitored our water resources situation, including estimates of the likely dates that temporary use bans (TUBs) and drought permit triggers could have been crossed. Since early June our modelling has consistently shown that if we had a repeat of 1995/96 inflows, we would expect to cross TUBS triggers in late August or early September 2022, and drought permit triggers (our drought control line) regionally in the winter. Although our modelling shows that in most scenarios these permits will not be required, the fact that the rainfall patterns for 2022 are similar to those in 1995 and the rainfall quantities for the January to July period were similar, means that we need to plan for this worst-case scenario.

We have operated according to the high-level strategy outlined in our drought plan, increasing the use of river sources as reservoir stocks fell through control lines. The continued low reservoir stocks have led us to plan for this permit to reduce the regulating release from Grimwith reservoir at low flows.

The potential threat to water supplies is a direct result of the weather conditions during this spring and summer. The threat will only occur if the conditions continue to be dry, or if we experience a prolonged period of high demands. We have acted in line with our drought plan triggers, preparing for TUBs in the summer when models suggested they would be required, and implementing TUBs from 26th August 2022.

We have modelled many scenarios for both inflows and demands and selected the permits which we think will give the most benefit and put us in the best position we can be for winter 2022 and for 2023 if the dry weather continues.

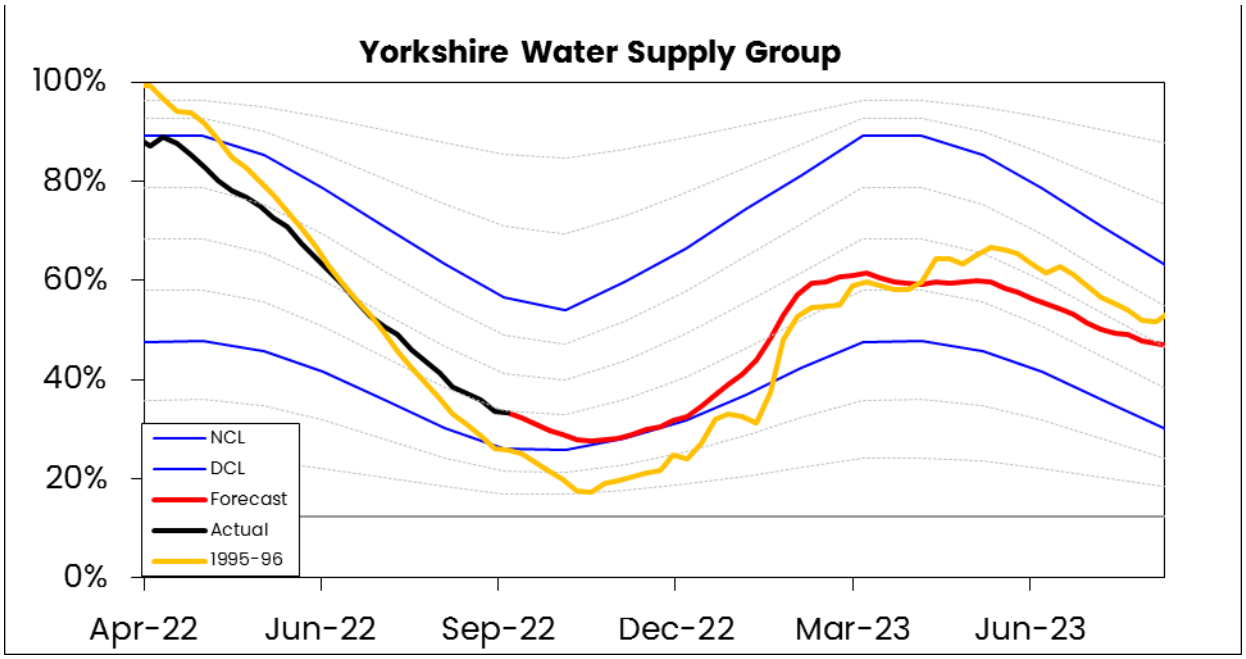

Figure 3.10: Actual and forecast Reservoir stocks

Figure 3.10 shows regional reservoir stocks as part of the output of our Water Resources Planning Report (WRPR) which we generally produce monthly during the summer and have been producing weekly this year as drought conditions have continued. We use it to forecast expected reservoir stocks based on current and future asset availability. This shows the results for a repeat of 1995/96 inflows, at an annual average demand of 1295Ml/d. As well as the regional picture, we also produce graphs of area stocks, and predict WTW outputs which we use to inform our weekly production planning process. This forecast does not show regional stocks crossing the drought control line, but stocks do fall below the DCL in some areas, and some of our previous model runs showed regional stocks falling below the DCL.

3.7. Population affected by the drought permit

The drought permit, if granted, will alter how we operate our River Wharfe abstraction which supplies water to our Grid SWZ. As this abstraction is part of our conjunctive use grid system and can be used to support (directly or indirectly) all of our five areas, the population affected by the water shortage is that of our Grid SWZ (5,316,740 for 2021/22 as estimated population from our final WRMP 2019).

The Wharfe at Lobwood abstraction is primarily used to supply Skipton and Bradford forecasting zones (which includes Ilkley and Keighley). The Skipton forecasting zone (FCZ) population is approximately 15,000 and the Bradford FCZ population 535,000 based on most recent census data, therefore approximately 550,000 in total.

3.8. Summer 2022 demand

Customer water use tends to increase in summer as a result of increased garden watering, jet washing, showering and use of paddling pools. In the summer of 2022 we have seen a much greater uplift in water use than in recent years.

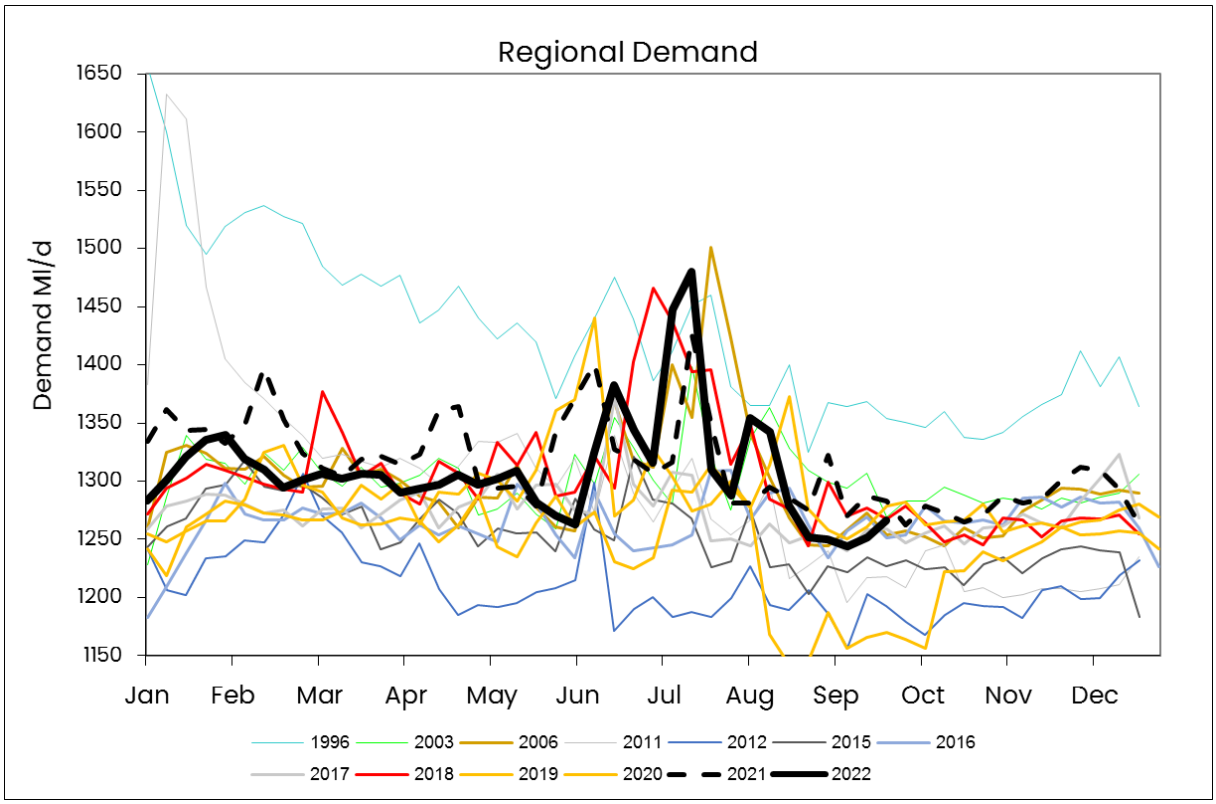

Figure 3.11: Regional Weekly Demand (from Weekly Water Situation Report)

Figure 3.11 shows the high demands experienced in 2022 compared to the preceding five years and other years selected to represent previous high demand years. This shows the that in 2022 we had one of the highest weekly summer peak demands we have ever seen, except for 1996, although it should be noted that a higher proportion of the 1996 demand was due to leakage. Demand was close to levels seen in 2018, but high demand did not occur for as long. We had a weekly peak demand of 1480 Ml/d in the week of 20th July, and peak day demand of 1573 Ml/d on 19th July. This high demand has been driven by exceptionally high temperatures and dry weather, with the first ever Met Office Extreme Heat red weather warning issued on the 15th July 2022 for the 18th–19th July 2022. Further demand peaks occurred in August with an amber weather warning for extreme heat from 11th–14th August.

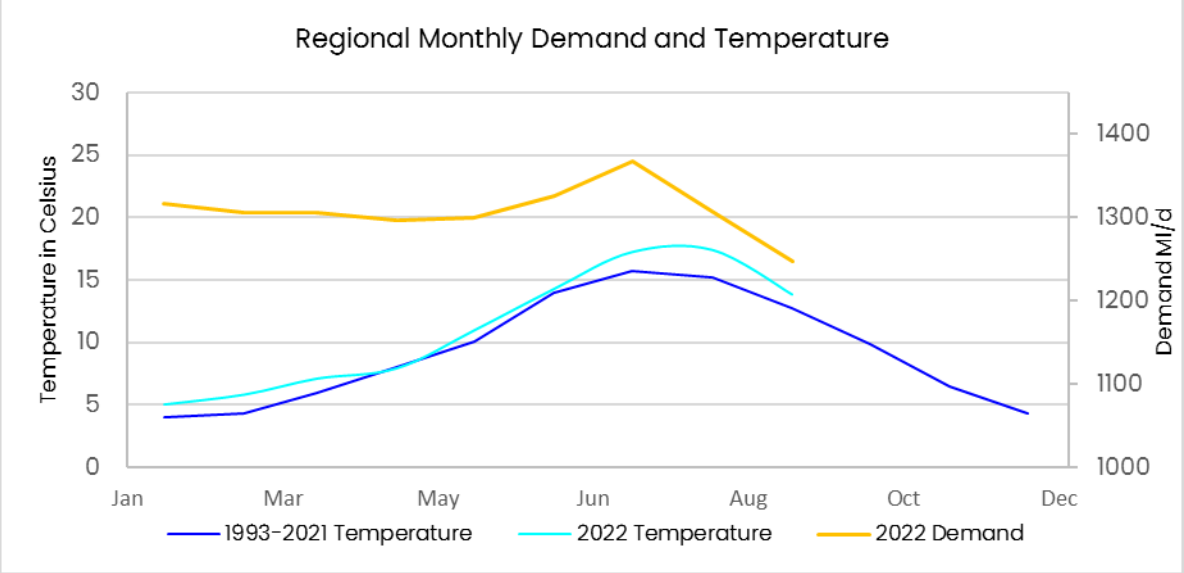

Figure 3.12: Regional Monthly 2018 Demand and Temperature

Figure 3.12 shows monthly 2022 regional demand plotted alongside monthly average temperatures (calculated from weekly MORECS data), for the 1993-2021 average and for 2022. The peak demand in July corresponds to the far higher than average temperatures.

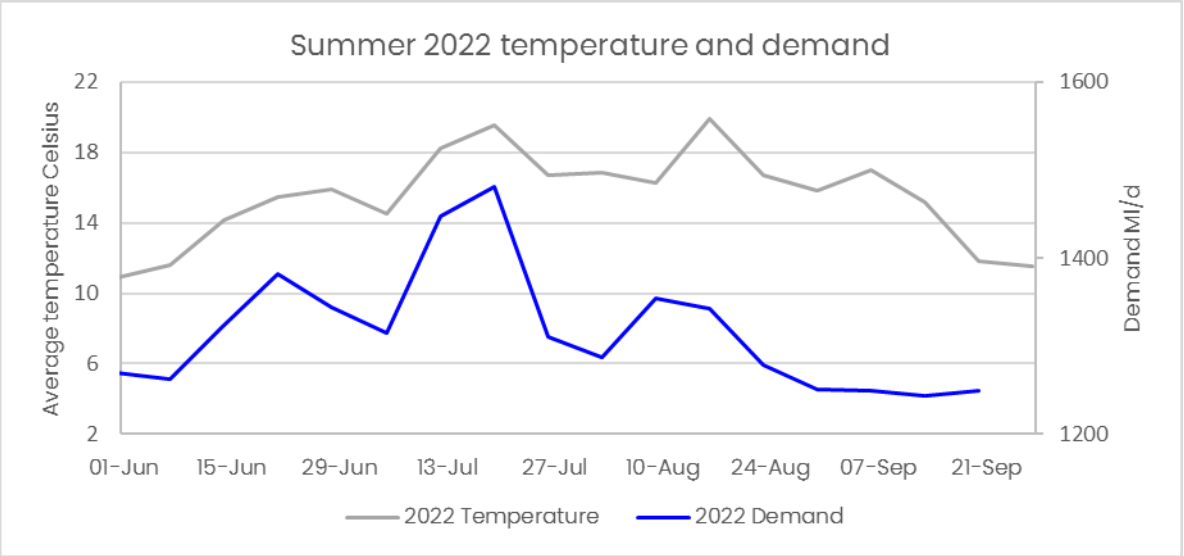

Figure 3.13 Relationship between average temperature and demand

Figure 3.13 shows weekly regional demand plotted alongside average weekly temperature, and Figure 3.14 shows weekly 2022 regional demand plotted alongside average weekly sunshine hours. Both show that demand increases in relation to high temperatures and longer sunshine hours.

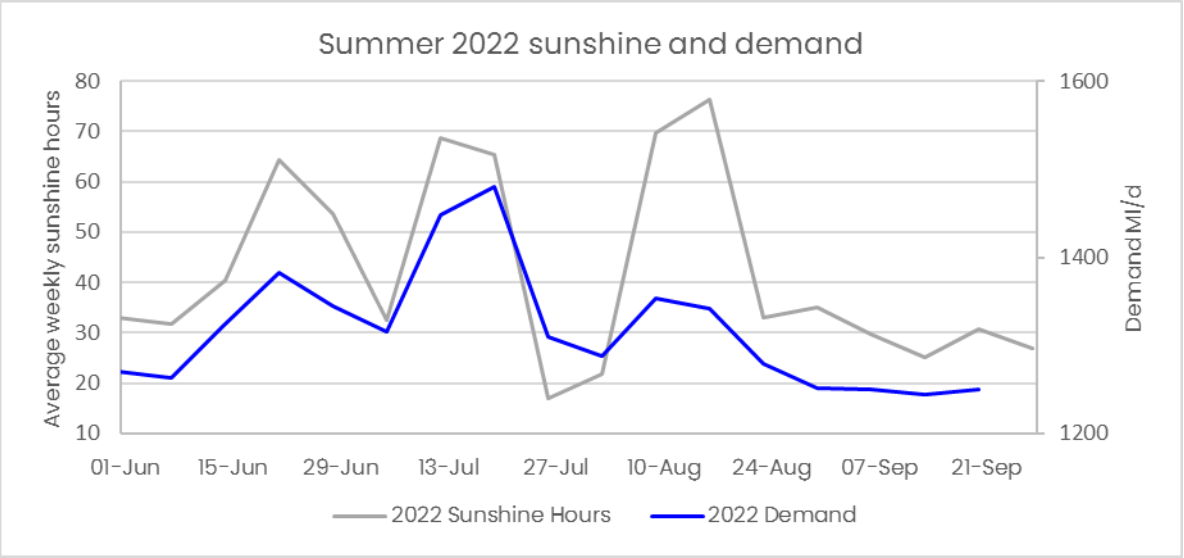

Figure 3.14 Relationship between average hours of sunshine and demand

3.9. Leakage control

In the reporting year 2021-22 leakage was 283.08 Ml/d which overachieved the Ofwat in year target of 286.3 Ml/d this was a reduction of 7.9% in the AMP against the target of 7.4% after year 2. In years such as 1995-6 and 2017-18 when demand levels were higher leakage levels were also significantly higher at 535 Ml/d in 1995-6 and 323 Ml/d (when using modern leakage reporting methodology). The introduction of mandatory leakage targets, and significant investment in monitoring infrastructure to facilitate detection and repair, has resulted in a 47% reduction in reported leakage.

Each year we find and repair leaks on our distribution network to drive down our average daily leakage. These reductions in leakage are achieved through additional find and fix resources and new and innovative leakage detection techniques. Our regional leakage target for 2022-23 is 285.21 Ml/d to hit the three-year rolling average and keep on track for a target reduction of 15% by 2025.

During hot, dry weather customer demand increases significantly, and the pattern of customer demand changes, making it much harder to determine where leakage is occurring and where increasing flows are due to leaks or increased customer demand. This summer we have experienced increased breakout of leaks as during hot, dry weather, ground movement increases causing our pipes to burst. In a normal year ground movement causes about half of our leaks, but the change in soil moisture this year is unprecedented, and the number of burst mains has increased by 33%.

We started this financial year ahead of this year's target having overachieved during the mild winter of 2021-22. Our additional leakage activity reduced leakage to planned low levels after the normal winter peak by the middle of June. However, we saw an increase of 25Ml/d at the beginning of July due to the extremely hot and dry weather spell which put pressure on the Water Network due to high demand and low soil moisture. Our current leakage figure (which relies on some in-year projections) is 286.34 Ml/d, which is above our business plan due to the extreme weather but reducing and still within parameters to hit the year end regulatory target.

3.10. Demand on the affected water source

Table 3.3 shows demand volume in the Yorkshire Water region divided into forecasting zones. The zones directly affected by this Drought Permit are shown in bold text.

Yorkshire Water Forecasting Zones	Area	Demand in Zone (29th September 2022) Ml/d
Leeds & Harrogate	North/Central	238
Sheffield	South	268
Bradford & Skipton	**North West**	**170**
Calderdale & Wakefield	South West	219
Hull	East	155
Malton, York, Doncaster, Selby	Grid and groundwater	216
Regional	Regional	1266

Table 3.3: Weekly Water Demand

The Yorkshire region is divided into forecasting zones (FCZ) for assessing demand. FCZs group parts of Yorkshire by the water treatment works which are most commonly used to meet their demand. The FCZs are not discrete areas and connections within the grid system allow water to be imported and exported between FCZs. Current and historical regional demand is shown in Figure 3.10. It shows the high demands experienced in 2022 compared to previous years including years selected to represent previous high demand years. This shows the peak demands have been high, and we have had some of the highest daily peaks we have seen. These high demands have been driven by exceptionally high temperatures and dry weather in a series of heatwaves, including record breaking temperatures in July.

The Grid water network in the Grid SWZ utilises Elvington and Loftsome Bridge WTWs in the East and Chellow Heights WTW in Bradford to support the local supply sources in the Yorkshire region. Elvington and Loftsome Bridge WTW take water from the Rivers Derwent and Ouse, which is then transferred via the Grid network of pipelines across Yorkshire. Grid sources are currently being maximised to conserve reservoir stocks where possible across the region. Table 3.4 shows the water treatment works outputs supplying the Yorkshire Grid.

WTW	Current Output to Grid Ml/d (29th Sep 2022)	Main Sources
Elvington	190	**River Derwent at Elvington and River Ouse at Moor Monkton**
Loftsome Bridge	55	**River Derwent at Loftsome Bridge**
Chellow Heights	**127**	**Nidd Barden and Grimwith Group and Thornton Group and River Wharfe at Lobwood**

Table 3.4: Grid Water Treatment Works

3.11. Drought permit alternatives considered

We have so far managed the situation by promotion of water saving to customers, maximising leakage reduction activity and maximising our river abstractions where possible to conserve reservoir stocks. We have increased abstractions on the River Ouse, the River Derwent, and the River Ure, as well as at Arthington and Lobwood on the River Wharfe when river flows have allowed. River flows have been low for the time of year for much of the time, so our allowed abstractions have been limited.

All reservoir fed water treatment works have been minimised and the Grid has operated at higher flow rates for long periods.

Additional staffing and standby provision have been employed across all areas of Yorkshire to ensure that any interruptions due to mechanical failures are resolved as soon as possible.

We are also applying for drought permits to reduce compensation flows at our reservoirs, and to increase the abstraction from the River Ouse at Moor Monkton when flows are below 1000 Ml/d.

We have followed the steps in our Drought Plan 2022 and are applying for these permits in order to preserve stocks as much as possible in anticipation of an event worse than one we have experienced before. We believe applying for this permit, and the others listed in Section 6.0 is the best course of action at this point in time. It will allow us to decrease the amount of water released from Grimwith Reservoir at the lowest flow band in the River Wharfe , thereby conserving reservoir stocks and increasing the amount of time that reservoirs can provide water for compensation flows to rivers and public water supply.

3.12. Consequences if the drought permit is not granted

We have considered not applying for this permit, and our modelling of past events shows that we could maintain supplies through our historic droughts without permits. However, in that scenario our reservoir stocks would be reduced, and there would be real risks to supply if we did not obtain this drought permit.

The granting of this permit will provide additional support to our grid, conserving reservoir stocks and providing additional resources to areas that are currently stressed.

If we had a repeat of 1995 inflows, with this permit in place, reservoir stocks in our supply reservoirs could be increased by 0.76% regionally, if river flows are in the lowest flow bands for 33% of the time, and far more if river flows are in the lowest band for more of the time. The actual benefit of the drought permit would depend on river flows and reservoir inflows during the period, and how much and where reservoir stocks had recovered.

If this permit is granted, we will be able to manage our system in a more resilient way, allowing increased river abstractions and reduced reservoir abstractions if conditions require it. If this permit is not granted (or the decision to grant it occurs too late for us to manage supplies as if it were granted), we will have to operate according to the current licence conditions, and this may result in the overdrawing of reservoirs.

4.0 Actions taken to reduce demand and conserve supplies

Promoting water efficiency to our customers is part of our day-to-day operations during all weather conditions. In line with our Drought Plan we implemented additional demand management actions in response to crossing drought triggers in 2022. Demand reduction helps us conserve supplies for later in the year if the situation does not return to normal. At the same time, we constantly review our raw water resources to make best use of the water available to us. Wherever possible, we operate to conserve supplies that can be stored for use later in the year by reducing the use of reservoirs and increasing the use of river abstractions.

Customer-use demand reduction actions are implemented in response to crossing drought control lines using a phased approach. This starts with appeals for voluntary reductions in use, escalating to imposing temporary use bans then applying for a drought order to restrict non-essential use. In 2022 lower than normal reservoir stocks triggered the need for appeals for voluntary reductions, and we are planning to impose Temporary Use Restrictions on the 26th of August.

In February 2022, our regional reservoir stocks were above 95% and we started the spring in a good position, with many reservoirs full. At this time, we were implementing our normal water efficiency measures and preparing for our annual summer campaign. We have had below average rainfall since March, and reservoir stocks have decreased steadily, with only 1 week at the start of April showing an increase.

High temperatures in June led to peaks in demand of 1413 and 1434 ML/d on the 17th and 22nd July, respectively. Further high temperatures in July led to demands of 1505Ml/d and 1573 on the 11th and 19th of July. These July peaks occurred at a time of a heatwave and the first ever Met Office Extreme Heat red weather warning.

As a result of the peak demand and lower than average rainfall, reservoir stocks reduced to lower than average levels, and we crossed our normal control line and early warning Environment Agency control line. In line with our Drought Plan we implemented demand management actions to reduce demand and conserve available water resources in response to crossing these triggers.

The following sections list the actions we carried in response to crossing control lines. A timeline of the customer communications appealing for reductions in water use during 2022 is provided in Appendix 1. This provides a breakdown of the measures we used to raise awareness of the heightened need to use water wisely in our region and the number of customers exposed to the messages (the reach).

4.1. Demand management during normal operating conditions

During normal operating conditions, the Yorkshire Water website provides water saving information and a link for customers to order free water saving packs. It includes a page dedicated to water resource management where our current Drought Plan and Water Resource Management Plan (WRMP) are available to download.

We have education centres at several of our sites (Headingley WTW, Ewden WTW, Tophill Low Nature Reserve) and a Living with Water Learning Lab hosted by Wilberforce College (Hull), which schools and other groups can arrange to visit. We cover a range of topics including the water cycle and water conservation during the sessions, alongside other themes such as flooding, wastewater education and water safety. We also offer an outreach programme and virtual live assemblies. Our website offers our green classroom pack for teachers to download. These lesson packs provide educational material on the water cycle and the importance of water conservation.

Each summer the Yorkshire Water Brand and Communications Team delivers a water efficiency campaign, which educates customers on ways to save water in their homes and gardens and encourages customers to find out more information about water conservation via the Yorkshire Water website. This typically involves a media plan of activity such as 'paid for' social media advertising, digital display ads, a detailed content plan for organic social activity and customer emails, along with a mixture of other paid for advertising such as: radio (traditional and digital), press, digital out of home adverts and TV advertising. The Communications team also ensure there is a presence at large events in the region, this year sponsoring The Great Yorkshire Show and having a stand dedicated to Water conservation messages to engage and educate customers of all ages about water conservation.

We also teamed up with local radio stations to deliver 'on the street' events in four busy town centres during the summer holidays (Leeds, Hull, Sheffield, and York) this gave us the opportunity to talk to customers face to

face about ways to save water and answer any questions or concerns they have about water conservation, droughts, hosepipe bans etc. There is also a media plan of pro-active press office activity, including: joint press releases with other partners, paid for editorials in local newspapers and a PR campaign that works with social media influencers to recommend water saving tips and advice. Included in the Communications plan is a content plan for colleagues within the business as well as promotional material for the retail team to share with non-household customers to encourage them to improve water efficiency.

This year's campaign was developed from the insight and learning we gained following 2018, after carrying out research on customer's views on water efficiency and TUBs. The research that we conducted, told us that customers were more likely to get on board with messaging and change their behaviours when the advice feels achievable, and they can understand why there is a need for change. The research also showed for some segments of customers, a financial benefit is more likely to make them change too. We also had to take into consideration the current external climate and other financial or personal challenges that many of our customers might be facing. Having this in mind helped us develop the 'Use Less. Save more' campaign, in which we crafted messaging and creative that speaks to customers in the right tone of voice, feels relatable and includes enough of the 'why' (explaining why we need to save water) as well as practical, achievable tips that most people can apply in their everyday lives. Some of the more dynamic channels in our media plan, such as social and digital advertising allow the flexibility to be able to switch the messaging on ads depending on the weather, for instance: we have referred to 'There's not been much rain lately' or 'No need to water the lawn, there's been a bit of rain.' This was to help customers understand the link between rainfall, the impact on our reservoir levels and how they can help.

Our communications to customers during the hot, dry weather this year has been at a regional level aimed at targeting all Yorkshire Water customers. The Lobwood abstraction supplies our North West Area, which is part of our Grid SWZ and in line with our Drought Plan we implement water saving messages at a zonal level.

4.2. Metering

The number of domestic customers in the Yorkshire Water supply area receiving water via a metered supply is currently 58%. Most commercial properties are metered, with the exception being some small water users where metering is not practical. All new build properties receive a metered supply and unmetered households can opt to have a meter installed free of charge. The Yorkshire Water region is not classified by the Environment Agency as a severely water stressed area, therefore we are not able to compulsory install meters in domestic customers' properties.

We promote metering to our customers as a means of saving water and money. We are transparent on all unmeasured bills, showing the comparative metered costs to all customers. This allows customers to make informed decisions as to whether a meter is right for them. Demand for meters was impacted through COVID and is yet to return to expected volumes, although we have seen an increase. We believe this slow return to be due to the current financial crisis meaning customers prefer guaranteed bills. We anticipate an additional 25,000 customers to opt-in to a meter this year through our promotion in bills.

We have an extensive partnership network to help increase our reach to customers experiencing affordability challenges. We plan to continue to utilise this network in understanding where a meter could reduce charges for customers and continue with other forms of support to vulnerable customers.

4.3. Leakage reduction activity

Enhanced leakage reduction is included as a drought option in our Drought Plan for implementation when reservoir stocks are predicted to be 10 weeks from crossing the drought control line. We retained an increased number of leakage inspectors since the escalation of 2018 to meet our 2025 leakage target. This year we have employed additional resources to fix leaks and bursts in our region. This additional activity includes a new 'Smart Leakage Team' to support leakage reduction through the integration of 'smart technology' in our networks. Enhanced leakage activities include:

- Overtime, including 7-day working, for leakage inspectors, support staff and field technicians.
- Additional personnel fixing leaks - We had 56 contractor teams (112 people) on primary leakage work in July 2022. This is a 25% increase on the 45 teams (90 people) we had in July 2021, despite the workbasket being 25% lower this year.

- We have found and fixed 10,968 leaks in the first 4 months of this financial year.
- 295 Pressure Reducing Valves (PRVs) maintained and or optimised in the last 4 weeks to reduce bursts and leakage.
- We have repaired or renewed 2,000 customers' leaking supply pipes to help our customers tackle their leakage.
- We have dedicated teams to find leaks on trunk mains - using satellites in rural areas where leaks are more difficult to identify.
- We have optimised our fleet of 38,000 acoustic loggers to more quickly and efficiently find and fix breakout leakage.
- We are utilising a live hydraulic model across several of our most challenging leakage areas to understand underlying causes of network performance. The hydraulic model solution aims to reduce leakage in these areas to their lowest ever level.

Leakage activity in the North West Area

Leakage in the North West of Yorkshire is lower than the regional average due in part to its rural nature. Leakage hotspots are focused around the urbanised areas of Keighley and Skipton. As part of our ongoing work to reduce leakage in our region and achieve a 15% reduction by 2025 we are including a number of new approaches and these have been deployed in the North West area.

- We have permanently installed 4,600 acoustic loggers listening for leaks in some of our most leaky areas, this includes several DMAs in Keighley and Skipton.
- We installed an additional 500 lift and shift acoustic loggers to locate leaks in higher leakage rural areas where network coverage is limited.
- We invested in a number of new permanent and temporary meters to narrow down leaks into smaller discrete areas for ease of locating leaks.
- We have installed a network of high density pressure loggers to identify and locate leakage.
- We developed hydraulic models for the most difficult areas to support leakage reduction.
- We have used satellite imaging to find leaks in rural areas where leaks are more difficult to identify.
- We tested the raw water mains for leakage.
- We have shifted resources from other parts of the region to support this activity.
- In the Keighley water supply system (WSS) we have reduced leakage by 30% since July and we are repairing any leaks in the Keighley WSS twice as fast as the regional average.

4.4. Trigger: Reservoirs crossed our normal control line

We meet customer demand through use of our licensed water resources, which include reservoir, river and groundwater supplies. In most years, we have sufficient rainfall to balance our resources to ensure regional reservoir stocks remain above the normal control line. If the normal control line is crossed it is a trigger for us to review our operations and identify where the use of river supplies can be increased in preference to reservoir supplies. This conserves reservoir stocks during periods of low rainfall.

In 2022 regional reservoir stocks crossed the normal control line on 28th March 2022. In response to this we reduced our use of reservoir supplies in our Grid SWZ and increased our use of river and groundwater abstractions to meet demand. This included increased abstraction from the River Derwent at Loftsome Bridge to reduce abstraction from reservoirs across our region. Although regional stocks crossed the NCL on 28th March, the NCL for individual reservoirs and groups was crossed at different times. Our operating strategy is to try to balance the rate of fall of reservoirs as much as possible to ensure a balanced risk across the region.

All year, free water saving packs are available for customers to order through the Yorkshire Water website. Our Communications Team started to talk to our customers about water saving in April, followed by adverting using social medial channels and our website in May.

4.5. Trigger: Reservoirs crossed Environment Agency early warning trigger line

Regional reservoir stocks reached the Environment Agency early warning trigger on 23rd May 2022, and we started implementation of our drought communications plan. At this stage, our region was not considered to be in drought and this trigger ensures we start implementing actions early to lessen the impacts if the situation worsens.

In reaction to the dry weather and high temperatures we launched our "Using Water Wisely" campaign to raise awareness of the increased demand we were experiencing and to notify customers of the heightened importance for reducing water use. As a follow up, we launched our 'Thanks for' water saving campaign which focused on thanking customers for "using water wisely and helping to keep Yorkshire flowing".

By changing the artwork and messages in media promotions we were aiming to keep customers' attention and reiterate the water saving message.

The actions included:

- Raising awareness of the developing situation, such as increased demand due to high temperatures and declining water stocks due to low rainfall.
- Promoting the importance of reducing demand for water in our region and requesting customers to make voluntary reductions in water use.
- Promoting our free retrofit devices and tips on how to save water.
- Requesting customers to report any leaks or bursts in our region.
- As part of our advertising for our priority services we asked any customer who needed extra care, support or are vulnerable during the hot weather to contact us.
- Our Wholesale Service Desk opened discussions with retailers and in collaboration with Water UK and other water companies provided advice to commercial users on saving water. This was made available through our website and proactively highlighted to Retailers by email and the 'Retailer Portal.'
- Liaised with retailers and commercial water users on any changes to water services such as re-routing supplies, which can impact on the products or processes of commercial users.
- Free flushsaver devices offered to commercial water users on our website.

Information was communicated to customers through a variety of media channels. A programme of the media promotions during summer 2022 and the number of customers reached is provided in Appendix 1. Social media and digital advertising offer the ability to reach a large number of customers, although only a proportion will click on the links for further detail. Radio and newspaper advertising were used to reiterate the messages and reach those customers not exposed to digital advertising.

The media channels are outlined below:

- The Yorkshire Water homepage banner was focused on water saving and the Yorkshire Water intranet front page included an article on the dry weather situation to inform colleagues.
- Repeated messaging on Yorkshire Water's social media channels (Facebook, Twitter) promoted water saving messages and requests for voluntary demand reduction.
- At the start of July, we launched paid for adverts on social media reaching up to one million customers a week. At the end of July, we switched to programmatic display advertising, allowing us to focus messages to cohorts of customers. For example, water saving tips for the kitchen and bathroom were aimed at young families whereas using a watering can instead of a hose was the focus in areas with large gardens. This reached up to 7.5 million customers a week.
- Google display advertising during July and August was directed to up to 21 million customers a week.
- Adverts promoting the need to save water were also delivered by local radio stations including, Yorkshire Coast Radio, Hallam FM, Heart FM, Stray FM, and Capital radio. This was aimed at a combined audience of up to 3 million customers a week.

- We partnered with Sunrise FM, Radio Sangram and Coast & Country to deliver radio advertising to our customers in a range of languages including; Urdu, Punjabi, Pathwari, Bengali, Pushto and Polish.
- From July to September adverts for water saving were placed in regional newspapers including the Sheffield Star, Sheffield Telegraph, Harrogate Advertiser Series, Scarborough Evening News, Yorkshire Post, Yorkshire Evening News, and The York Metro. The combined estimated readership is over 180,000.
- Outdoor digital advertising reached an estimated 145,000 customers.
- Bill inserts with water saving tips were included in water bills sent to 87,500 households each week.
- Yorkshire Water representatives delivered television and radio interviews on local news channels.

In addition to heightened water saving messages, we continued to optimise operations across our Grid SWZ to preserve regional reservoir stocks:

- We maximised river abstractions where possible, but due to low river flows and asset availability this was limited at times.
- We maximised groundwater abstractions within licence constraints.
- We experienced extremely high demands most notably in late June and into July, and at times we had to maximise use of reservoirs as well as river abstractions where available. River sources and our grid system were used strategically to support each area of our Grid SWZ as much as possible and balance the drawdown of reservoirs across the region to ensure no area was unnecessarily exposed to a greater reduction in available resources.
- Normally we release approximately 10% above our required compensation flow releases, to ensure that we are meeting our statutory obligations for compensation and to take into account any inaccuracies in, for example, meter or weir readings. This summer, to help preserve reservoir stocks, we reduced this tolerance on compensation releases from 10% to 5%. This is in line with our operating strategy when the Environment Agency trigger line is crossed.

Where possible we have taken action to reduce the output of water treatment works supplied by the reservoirs and meet demand through increased use of our grid system in order to reduce the rate of draw down from the reservoirs. The actions to reduce the use of reservoir sources are explained below:

- We have maximised all river abstractions where river flows and asset availability allow.
- We have maximised abstractions on the River Ouse at Moor Monkton to Eccup and Wetherby when assets and river levels allowed.
- We have supported Leeds with treated grid water from the River Derwent abstractions, allowing Harrogate to be supported with treated water from Leeds.
- Reduction in Compensation flows to allow lower margin of tolerance above required.

4.6. Trigger: Reservoir stocks predicted to be 10 weeks from crossing the drought control line

The next trigger for implementing drought actions is when regional stocks are predicted to be 10 weeks from the drought control line. During dry periods we model reservoir stocks against forecasts of a repeat of previous droughts in our region. On the 6th of June 2022, our modelling predicted a risk of reservoir stocks reaching the 10 weeks from crossing our drought control line (4 weeks before implementing TUBs) on 1st August if we had a repeat of the 1995/96 rainfall. The modelling was repeated weekly to represent the actual demand and rainfall experienced each week. By re-modelling declining stocks each week, we were able to monitor the situation and the likelihood of meeting the 10-week trigger line. The modelled data of crossing the 10-week trigger stayed relatively constant throughout the summer, and we crossed this tigger (4 weeks before TUBs implemented) on 25th July.

We took the decision to start implementing some of the actions triggered by stocks being 10 weeks from crossing the drought control line, rather than wait until we reached this trigger. These actions were to ensure we were prepared for restrictions on use and drought permits if required later in the year, and included:

- Preparation of notices, adverts and website content for temporary use bans in case needed.
- Preparation of supply side drought permit application templates with details on the 2022 dry period.

- Environmental assessments, including walkover surveys of potentially affected river reaches, and updating of our Environmental Assessment Reports to reflect the drought situation (see Section 6).

4.7. Trigger: Reservoir stocks predicted to be 8 weeks from crossing the drought control line

This trigger was predicted to be crossed on the 15th August in our 1st August runs. We ramped up our drought permit application work and our TUBs preparation, and, in line with our Drought Plan process, on 12th August we advertised that TUBs would be implemented on 26th August.

4.8. Trigger: Reservoir stocks predicted to be 6 weeks from crossing the drought control line

Following the implementation of TUBs on 26th August 2022 we have seen an estimated 2% reduction in Distribution Input (DI) resulting in a demand reduction of 88Ml/d on our network.

In the following analysis, we have compared our current DI and PCC data from June 2022 to September 2022 with the equivalent data in 2018. We have chosen 2018 as the comparative year as we experienced similar conditions to 2022, due to the hot dry summer where we issued drought permits but didn't need to enact a TUB.

Figure 4.1 shows our DI since 1st June 2022 and the reflective data in 2018, summer demand in 2018 was on average 1351Ml/d which reduced to 1286Ml/d in the 2 weeks following the August bank holiday resulting in a demand reduction of 65Ml/d. Historic data shows that over the same period leakage reduced by 5Ml/d therefore, overall demand reduction was 60Ml/d in 2018.

In 2022, summer demand was on average 1343Ml/d which reduced to 1248Ml/d resulting in a demand reduction of 95Ml/d. Over the same period in 2022 leakage reduced by 7Ml/d therefore, overall demand reduction was 88Ml/d.

Compared to 2018 demand in 2022 is 28Ml/d lower than expected. We consider that TUBs will be a major factor in this reduction, although the slightly wetter weather, compared to the same period in 2018, will also have an impact. We have estimated a 25Ml/d impact of TUBs, allowing a small drop due to weather, which is around 2% of average September/October demands.

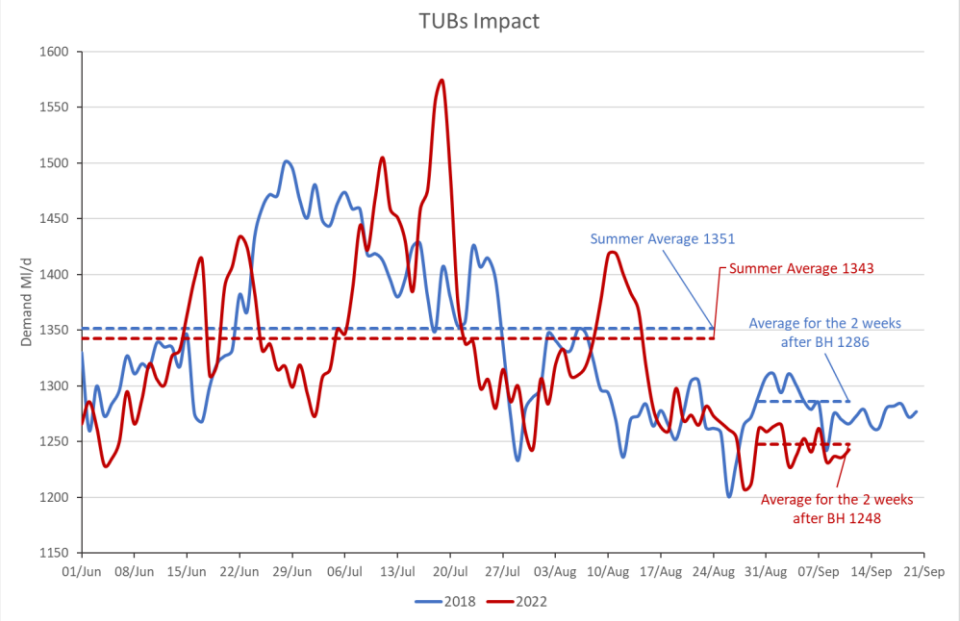

Figure 4.1 Distribution Input (DI) since 1st June 2022 to present with 2018's DI included as a comparable year

We have also seen an associated reduction in consumption based on data from our various consumption samples and monitors. For the purpose of this application, we have used PCC from our Domestic Customer

Monitor (DCM) sample as this data is available daily, so we are able to see the impact that a TUB has had on this sample. Our measured household data is only obtained monthly via volumetric reads which means we don't have the granularity required to see the impact of a TUB on these households.

Figure 4.2 shows our PCC taken from a sample of circa 1000 households on our DCM sample across Yorkshire. We can see from the data that consumption in summer 2018 was on average 141 l/h/d which reduced to 126 l/h/d in the 2 weeks following the bank holiday - a reduction in consumption of 15 l/h/d. In 2022, that consumption in summer was on average 133 l/h/d which reduced to 109 l/h/d resulting in a consumption reduction of 24 l/h/d.

Compared to 2018 consumption in 2022 is 9 l/h/d lower than expected which equates to an estimated 45Ml/d. TUBs are likely to be a contributing factor in this reduction. However, when analysing both DI and PCC reductions since TUBs were implemented, we also need to take into consideration other factors that can impact demand including weather conditions, customer holidays, water conservation activity and non-household consumption. These factors can all influence changes to demand and any decreases that we may see in the data.

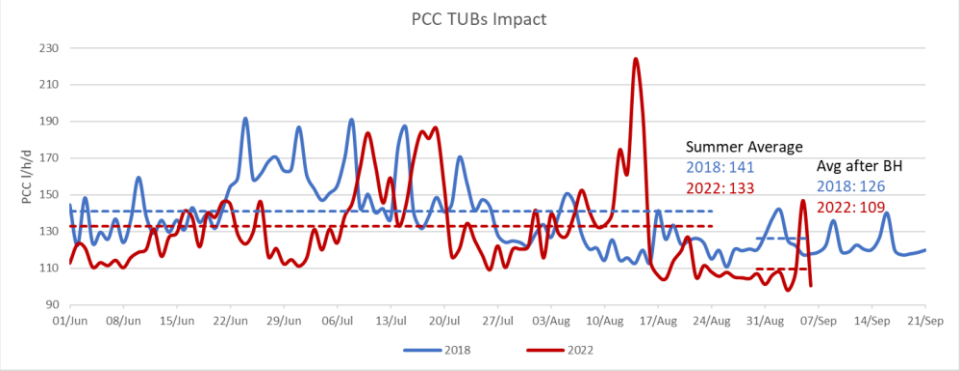

Figure 4.2: Per Capita Consumption (PCC) from our DCM sample since 1st June 2022 to present with 2018's PCC included as a comparable year

4.9. The use of sources in 2022

Due to the high demands in the summer of 2022, we have produced more treated water than in most years. This section describes source outputs this year in comparison to recent years and explains our operation of our sources this year.

Figure 4.3 shows total abstractions for the Yorkshire Water supply area, and also shows the proportion of those abstractions supplied by the different source types for the licencing years April to March. The figures for 2022/23 are based only for the period until July 2022, so do not include any additional winter demand or the usual increase in the use of reservoir sources when reservoir levels tend to be high in the winter but do include the higher summer demands to date.

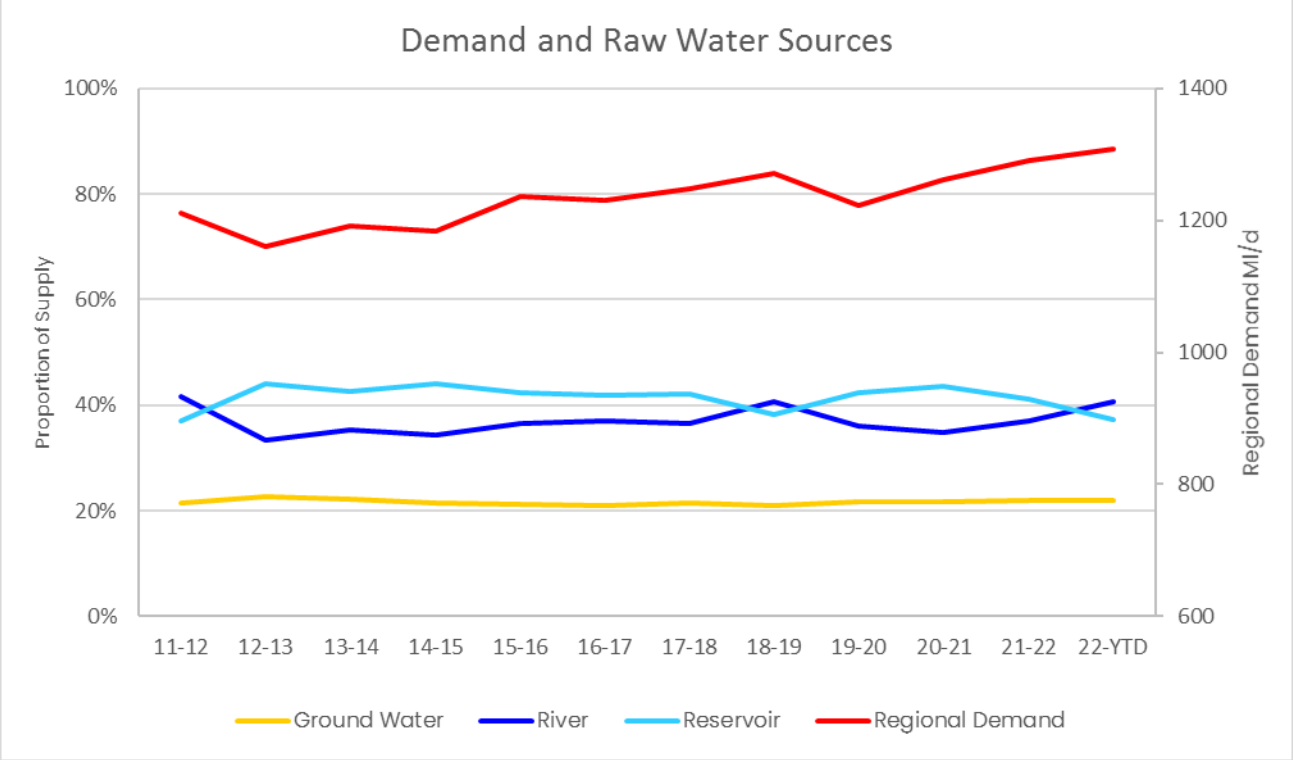

Figure 4.3: Total abstractions and proportion supplied by different source types

The figure shows that for most years the proportion of use of reservoirs is greater than that of rivers, apart from 2011/12 and 2018/19. In 2011/12 there was high water production and river use in the winters due to cold conditions and associated freeze thaw events causing increased bursts. The 2022 data shows a higher proportion of river abstractions compared to the previous wetter years, and this is likely to continue to increase as river flows increase in the autumn and winter and we maximise these sources to allow reservoirs to recover. The increased abstractions in 2020 and 2021 reflect the uplift due to the high Covid-19 demands.

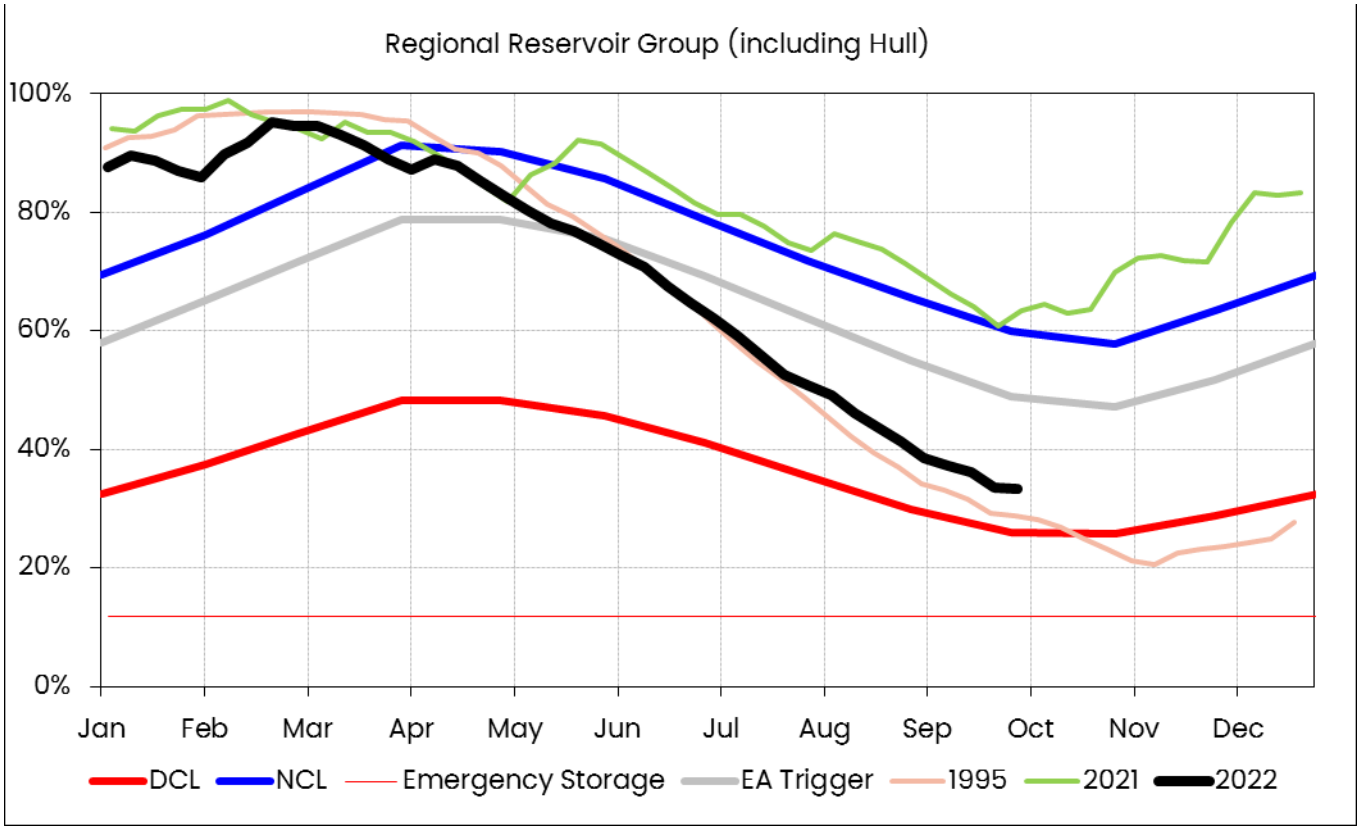

Figure 4.4: Regional Reservoir Stocks

Figure 4.4 shows regional supply reservoir stocks for 2021 and 2022. In 2021 stocks crossed the Normal Control Line in April, but significant rainfall meant that the EA Trigger was not crossed, whereas this year, the NCL was crossed two weeks earlier, but no significant refill has been experienced. When reservoir stocks fall below the Normal Control Lines, we increase the use of river sources. The use of two key rivers that supply our 'grid' system are shown in the below figures. Figure 4.5 and Figure 4.6 show daily and cumulative abstraction from the River Derwent at Loftsome Bridge and Elvington.

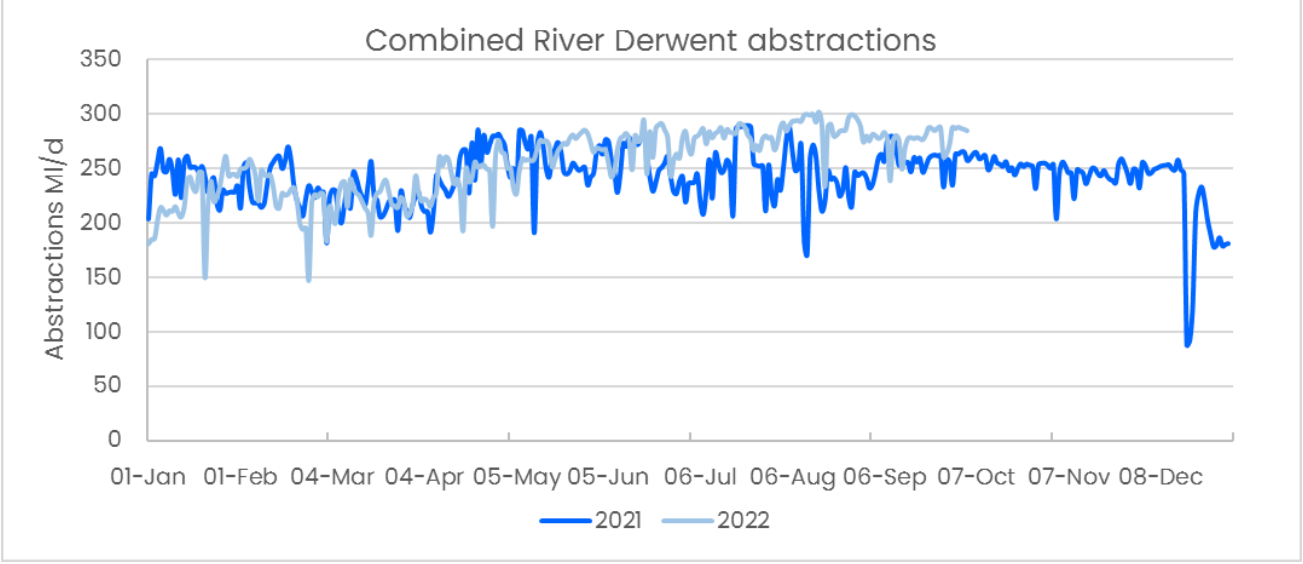

Figure 4.5: Abstractions from the River Derwent 2021 and 2022

The graph in Figure 4.5 shows the use of the abstractions on the river Derwent at Elvington and Loftsome Bridge in 2021 and 2022. They show a similar pattern of use until summer, when this year we increased our use of river sources in response to high demands and decreasing reservoir stocks. Figure 4.6 shows the

cumulative abstractions in relation to the average licence and shows that this year we have used the River Derwent abstractions more than last year since early July.

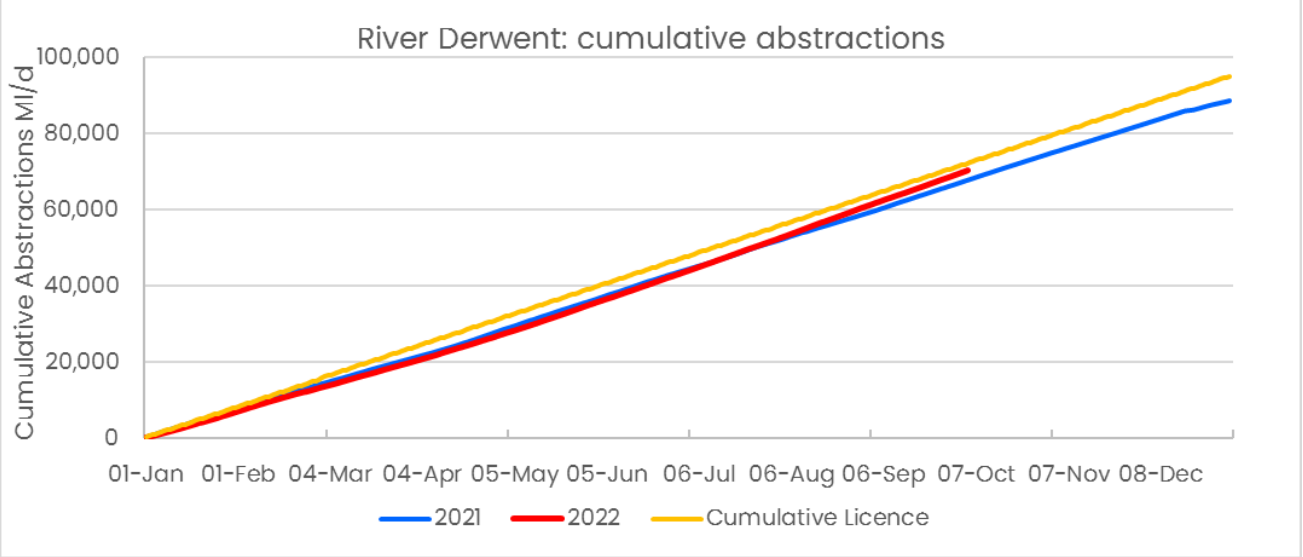

Figure 4.6: Cumulative abstractions from the River Derwent 2021 and 2022

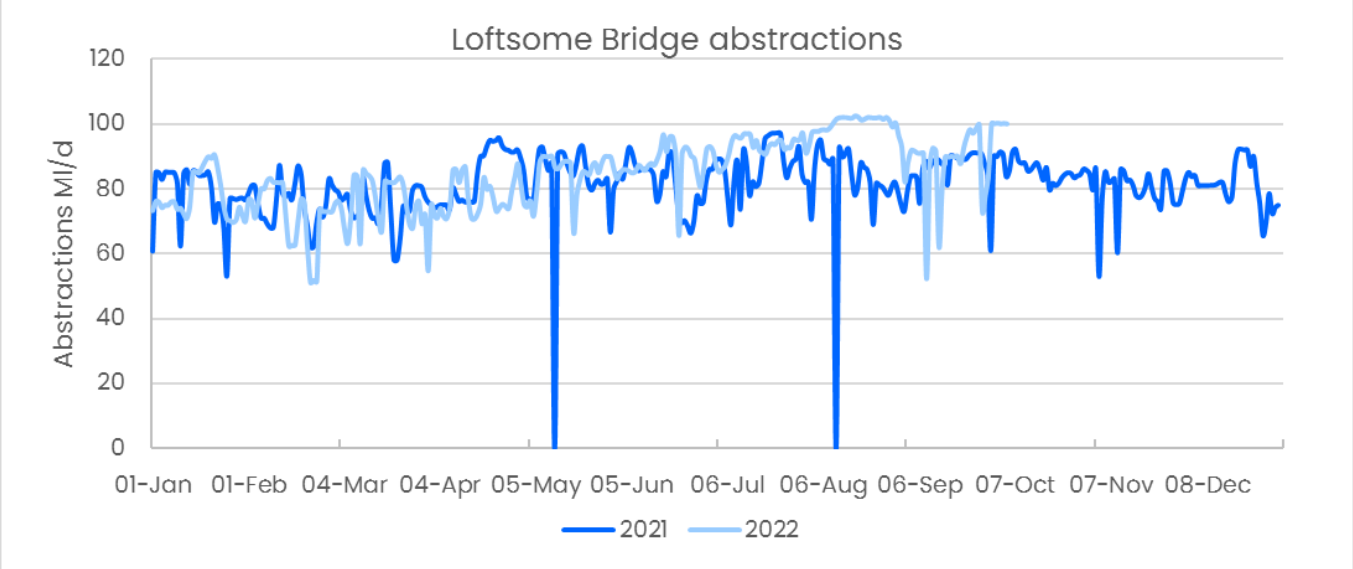

Figure 4.7: Loftsome Bridge abstractions from the River Derwent 2021 and 2022

Figure 4.7 shows abstractions for just Loftsome Bridge on the River Derwent, and Figure 4.8 shows abstractions for just Elvington on the same river.

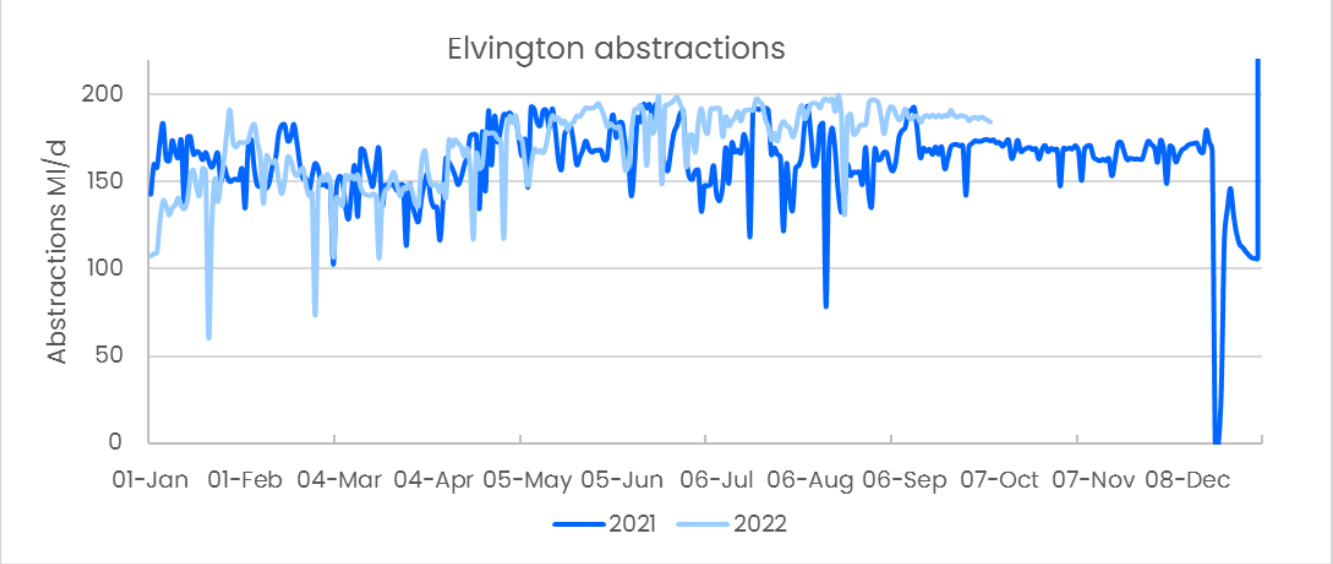

Figure 4.8: Abstractions from the River Derwent at Elvington 2021 and 2022

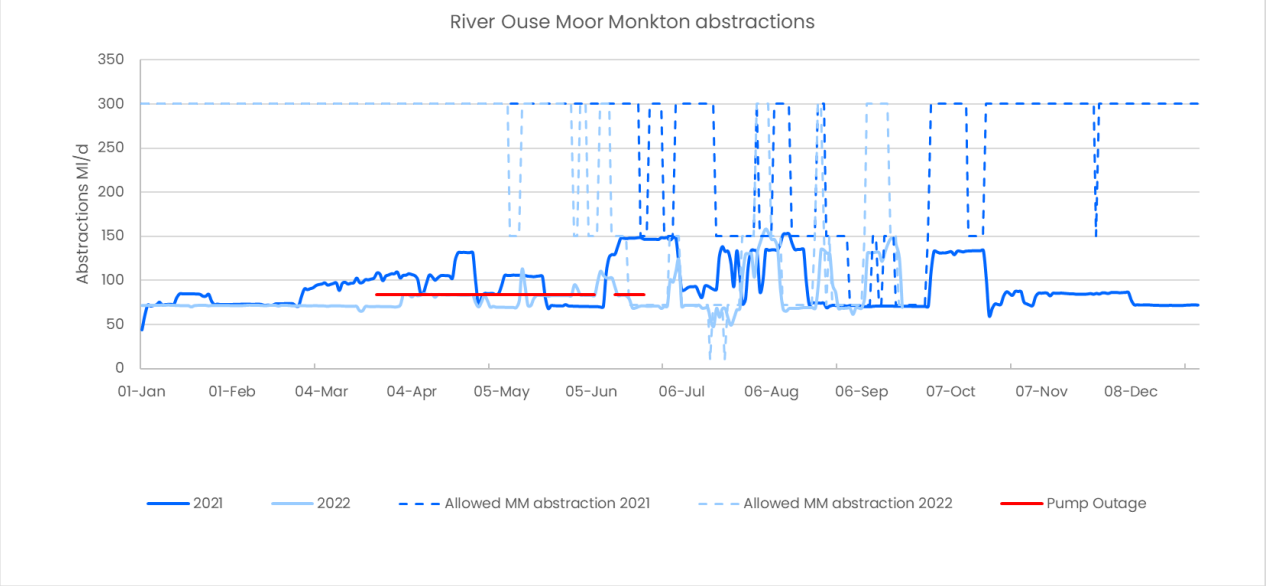

Figure 4.9: Abstractions from the River Ouse at Moor Monkton 2021 and 2022

Figure 4.9 shows the licenced and abstracted amounts for the River Ouse at Moor Monkton. We have not shown the cumulative abstraction for Moor Monkton as the allowed abstraction is dependent on the river flow, so comparisons between years is not appropriate. It shows that we have maximised the abstraction within operating constraints and requirements. In the highest flow band (at river flows above 1000Ml/d) we are licensed to abstract 300Ml/d, although the infrastructure required to abstract that volume is currently not in place. The red line shows the period when our abstraction was limited by asset availability. Before this reservoir stocks were below the normal control line, so in line with our operating policy we had not maximised the abstraction. During the period of pump unavailability we were limited to about 84Ml/d, with a few periods of higher abstractions when repairs and tests on these repairs were attempted. The pumps returned to service in late June, and were used at higher rates in early July when river flows increased, allowing higher flows to be abstracted. They have been used at about 130Ml/d whenever the river has been available. It should be noted that this graph shows the 24 hour average flow and abstraction at midnight, and that compliance is monitored on a 15 minute basis using the rolling 24 hour average flow, so on days where a flow threshold is crossed, the allowed abstraction may be different to that shown using the 24 hours at midnight.

The two pumping stations at Moor Monkton contain multiple pumps that allow us to pump water to treatment sites at Eccup No 2 WTW, Headingley WTW, Huby WTW and Elvington WTW. Pump availability at Moor Monkton

was reduced in spring and early summer due to a pump failure, which initially constrained the volume of water abstracted from the river. The repair was completed in June 2022, and the pumps returned to full operation in early July when river levels recovered sufficiently to allow their use.

The licenced and abstracted amounts for the River Wharfe at Lobwood and Arthington, as well as the Grimwith Reservoir Release are shown in Figure 3.9. We have not shown the cumulative abstraction for the River Wharfe as the allowed abstraction is dependent on the river flow, so comparisons between years is not appropriate. It shows that we have maximised the abstraction within operating constraints and requirements.

5.0 Environmental impacts of drought permit

During the preparation of our Drought Plan 2022, a 'shelf copy' Environmental Assessment Report (EAR) was produced for each supply side drought option or group of options. The EAR provides an independent and robust assessment of the potential environmental effects of the implementation of our drought options.

The environmental assessment was 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', and comprised 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 order 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. Cumulative impacts with other drought options are also considered.

The assessments undertaken confirm the features requiring consideration of monitoring and mitigation; which are provided in full in the Environmental Monitoring Plan (EMP). Throughout the environmental assessment process, Yorkshire Water have proactively engaged key stakeholders, including the Environment Agency and Natural England.

During the prolonged dry weather dialogue was initiated with the Environment Agency and consultants were instructed prepare 'application-ready' EARs, and undertake the onset of drought walkovers. The application ready EAR, and EMP, are provided alongside this drought permit application.

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

6.0 Water Supply Strategy for continuation of drought

Our grid system allows us to move water around the region and we aim to balance resources so that our customers receive the same levels of service. This makes us resilient to drought conditions and in recent dry years (2003, 2006 and 2011) we have not been required to apply for drought permits. However, following an exceptionally dry year and unprecedented summer demand in 2018 we applied for winter drought permits to aid reservoir stock recovery, but did not need to implement them when reservoir stocks recovered after heavy rainfall.

Our Grid SWZ has an interconnected network (grid system) that enables highly effective conjunctive use of the available water resources using raw and treated water pipelines. During dry weather we aim to maximise use of river sources to conserve reservoir stocks for longer. However, during 2022 we have experienced exceptionally low rainfall as well as periods of very high demand; this has led to greater draw down of reservoirs, and the below average rainfall has meant reservoirs have not refilled.

Reservoir stocks crossed our 'Normal Control Line' in mid-March 2022. This triggered additional activity to manage water resources and to abstract, treat and distribute more water from rivers to reduce our draw on reservoir stocks. This activity continued during the summer and will continue into autumn and winter until the water resources position recovers. We have used our grid system to move water up to 70 miles from river sources to areas in the south and west of the region which are usually supplied by local reservoirs. Throughout this period, we have been managing reservoir levels to ensure, as far as possible, that stocks are drawn down evenly across all areas.

We will continue to closely monitor the water resources position and alter our operational activities to preserve stocks across the region. We have taken mitigating actions in line with our drought plan, with actions undertaken to date listed in section 4. We will continue to operate in accordance with our drought plan and expect to apply for additional drought permits and orders as listed in Table 6.1.

Table 6.1. lists all the permit applications we have discussed with the Environment Agency and plan to submit in 2022.

Permit application	Drought Action
North West Area (submitted 15th September 2022)	Reduce compensation releases
River Ouse at Moor Monkton (submitted 29th September 2022)	Increase abstraction in lower flow bands
River Ure at Kilgram (paused)	*Allow abstraction below HOF*
River Wharfe at Lobwood (this application)	Reduce regulating release from Grimwith in the lowest flow band
South Area	Reduce compensation releases
North Area	Reduce compensation releases
River Derwent at Loftsome Bridge	Transfer abstraction licence permissions from Elvington abstraction point on the River Derwent to Loftsome Bridge abstraction point downstream.
South West	Reduce compensation releases

River Wharfe	Increase annual licence (if licence increase application not received)
River Hull	Alter hands off flow requirements

Table 6.1: Drought permit applications

We have advertised Temporary use bans (TUBS) to start on 26th August, and we will still deliver a summer water saving campaign as we routinely do each year regardless of reservoir levels.

If the Environment Agency grant the drought orders and permits, we are applying for in 2022, they will be valid for up to six months. We may not implement the drought permits if we receive sufficient rainfall.

If we do not receive sufficient reservoir refill for our region to be no longer in drought by 1st April 2023 further drought actions may need to be implemented. We would consider the situation to have returned to "normal" if regional reservoir stocks are above the normal control line and none of our area reservoir groups are below control line 4 (the Environment Agency Early Warning Trigger line). We will continue to maximise use of river resources until the situation recovers and our communications to customers will continue to target water conservation.

To mitigate the impact of the drought, we will continue to promote the need for water saving to our customers throughout the Yorkshire region. This will be delivered through press releases, public engagement and collaborations with third parties. By collaborating with others, we will be able to provide a stronger message that reaches a wider audience.

We will seek to work with other water companies, the Environment Agency, Natural England, Consumer Council for Water (CCW), local authorities, health authorities, emergency services, other organisations such as NFU, CBI and trades unions. We recently began publishing our water situation report monthly as part of our 'open data' initiative.

If the water resources situation continues during the winter, we will deliver a "winter campaign". Customer water use is generally lower during winter months compared to summer. However, we can still experience peaks in demand due to leaking pipes, which freeze in the cold weather then burst when temperatures increase again. Our winter campaign will look to provide advice to customers on how to protect their home when temperatures drop, which will reduce the risk of pipes leaking or bursting.

The winter campaign will focus on raising awareness of the key messages across Yorkshire through media relations, stakeholder relations and bought on and offline media, including digital advertising, radio and potentially print and we will have the ability to upscale activity should the weather take a turn for the worse. As part of the campaign, we will offer a limited number of free items to customers, such as outdoor tap covers, which will be available to order via our website.

Alongside our campaign, we will be promoting our Priority Services Register to ensure we know about customers who need an extra bit of help. Media activity and campaign messaging will be targeted on the relevant channels to have maximum impact.

We will continually monitor the situation, making decisions about applying for winter drought permits or whether we need further spring/summer permits in line with our Drought Plan.

Should a severe shortage of rainfall continue this year, it is possible that permit applications beyond those listed in Table 6.1 will be required. The decision to apply for additional permits will depend on reservoir stocks and forecasts, which we will be monitoring closely.

6.1. Operational changes we will make to avoid future drought-related problems

Our Drought Plan includes long term options that we will consider if the drought continues into 2023. These options will provide additional resources for public supply and will only be implemented if there is a risk that our current available resources will not be able to meet demand if the drought continues.

The decision to implement long term options will be dependent on the severity of the situation and scenario modelling to assess the potential risk. The trigger in our drought plan is to review the need for long term options if we are six weeks away from our regional drought control line in the second year of a drought. We are currently reviewing the scope of the long-term options and the timescales for delivery. If we were approaching the trigger for implementing long term options, this information will help determine which long-term options we should implement if required.

In line with our drought planning process, once the situation recovers, we will carry out a full review of our drought triggers and actions and their impacts. We will produce a "lessons learnt report" within six months of the situation returning to normal. This will include a review of operations and any opportunities to operate differently to improve our resilience to future droughts. For example, we will review drought triggers and reservoir control lines incorporating 2022 data. If this review leads to material changes to our current Drought Plan, it will be revised and resubmitted to Defra.

7.0 Notices and advertisements relating to application

Written notice of the drought permit application for the River Wharfe at Lobwood abstraction [will be sent] sent to organisations and individuals with potential to be impacted, which include:

- Bradford Council, the local authority which includes the Lobwood abstraction point.
- Craven District Council, the local authority which includes Grimwith Reservoir.
- Other abstractors operating in the areas affected by the permit.
- Members of the Wharfe Anglers Associations.
- Internal Drainage Board.
- Natural England.

The notices provide information on where the full application can be inspected free of charge and states objections can be made by 5pm on Thursday, 20th October 2022. A copy of the notice is provided in Appendix 2.

The notice will be advertised on Thursday, 13th October 2022, in the Ilkley Gazette and Wharfedale Observer, which are circulated in the area potentially affected if the permit is granted, and on Thursday, 13th October 2022 in the London Gazette, in accordance with Environment Agency guidance. If the application is successful, we will provide notice the permit has been granted in the same newspapers.

A Yorkshire Water webpage has been created to provide information on drought permit applications. A copy of the notice for the River Wharfe at Lobwood application is available and any further permit application notices will be added on the dates we apply. The webpage includes information to explain why we are making the applications and a list of frequently asked questions.

7.1. Public inspection arrangements

Documents relating to the River Wharfe at Lobwood drought permit application will be made available, free of charge, for inspection by any interested parties from the date it is advertised.

The documents include a copy of the drought permit application and supporting information including environmental reports and will be made available at the following locations and on the Yorkshire Water website:

- Yorkshire Water, Western House, Halifax Road, Bradford, BD6 2SZ.
- Addingham Post Office, 100 Main Street, Addingham, Ilkley, LS29 0NS.
- Grassington Post Office, 15 Main Street, Grassington, Skipton, BD23 5AD.
- Ilkley Post Office, Unit 9, Station Plaza, Station Road, Ilkley, LS29 8HF
- Environment Agency, Lateral, 8 City Walk, Leeds, LS11 9AT.

The supporting documents are available at the Yorkshire Water Head Office in Bradford. The Environment Agency guidelines state drought permits must be advertised at the water company's head office and the office most local to the relevant area. We have water treatment works nearby the permit application sites however, they are not suitable for public access, and we are therefore only able to provide the information at our head office in Bradford, which can be accessed by the public.

7.2. Environment Agency

We met with our local Environment Agency in May following reservoirs stocks crossing the Environment Agency early warning trigger line. We have continued to consult the Environment Agency on the drought situation as it has escalated. We will continue to meet regularly until the situation recovers.

7.3. Natural England

Natural England were consulted throughout the process of writing our Drought Plan 2022 and we have notified them of our intention to submit drought permit applications for the late summer of 2022. If there is potential

for a proposed drought permit to impact on a designated site we are required to consult Natural England prior to submitting the application. The environmental assessment of this drought option confirmed there would be no impacts on any designated sites. The details of the assessment can be found in the accompanying EAR.

7.4. Navigation Authority

We consulted with the Canal and Rivers Trust in October 2018, and they have confirmed that we do not need consent for this Drought Permit application as it will not impact on an inland navigation.

7.5. Internal Drainage Board

We have notified the Internal Drainage Board (IDB) of our intention to submit drought permit applications and have not received any comments relating to this application. There is one IDB in the non-tidal Wharfe catchment – Ainsty – whose area includes small watercourses between Thorp Arch and Tadcaster that drain into the Wharfe. Most of Ainsty IDB's area either drains to the River Nidd or is in the tidal reach of the River Wharfe and / or River Ouse, beyond the impacted area for the River Wharfe at Lobwood Drought Permit.

7.6. Retailers

Since retail separation in April 2017 commercial water users are now customers of retail companies. The Yorkshire Water Non-household Management Team will ensure retailers operating in the Yorkshire Water supply area are notified of the permit applications in advance of public notices being published in newspapers. Notification will be provided by email and will include a copy of the frequently asked questions. We will highlight to the retailers that the drought permits we are applying for will not impact on customers' supplies and we are providing the information in case they get any calls or queries from their non-household customers. We will also provide retailers with contact details for raising questions relating to the permits.

8.0 Appendices

8.1. Appendix 1: Summary of water saving communications

The table below summarises the communication activity we have carried out to raise awareness of the dry weather situation and to encourage demand reduction.

Water Saving **Customer Communications**		**W/C 20th June**	**W/C 27th June**	**W/C 4th July**	**W/C 11th July**	**W/C 18th July**	**W/C 25th July**	**W/C 1st August**	**W/C 8th August**	**W/C 15th August**
MEDIUM	***PLATFORM***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***
ONLINE	Facebook	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions**	**Impressions:**	**Impressions**	Impressions	Impressions
	'paid for' Adverts	**1,406,328**	**895,032**	**1,144,058**	**1,021,400**	**1,261,645**	**1,354,586**	**1,552,557**	1,552,557	1,675,002
	Programmatic/ Digital Display Advertising	**Impressions:** **271,828**	**Impressions:** **252,118**	**Impressions:** **503,115**	**Impressions:** **1,212,554**	**Impressions:** **714,940**	**Impressions:** **478,719**	**Impressions:** **505,055**	Impressions: 521,527	Impressions: 582,369
RADIO ADS	Traditional	**Impressions:** **3,234,500**	**Impressions:** **3,234,500**	**Impressions:** **4,737,500**	**Impressions:** **4,737,500**	**Impressions:** **4,737,500**	**Impressions:** **4,737,500**	**Impressions:** **3,182,395**	**Impressions:** **3,931,375**	**Impressions:** **3,931,375**
	Radio									
	Digital Audio	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**
	'Instream'	**130,000**	**130,000**	**312,500**	**312,500**	**312,500**	**312,500**	**312,500**	**312,500**	**312,500**
LOCAL NEWSP-APERS	Metro Yorkshire	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**98,889**	
	Yorkshire Post/Doncaster Free Press/Hull Daily Mail/ Malton and Pickering Mercury/York Press/Harrogate Advertiser/Sheffield Star/Bradford T&A/ Ilkley	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**49,229**	**49,229**
OUT-DOOR	Digital	**Impressions:**	**Impressions:**	**Impressions:** **120,064**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**
	6 Sheet	**9,260**	**41,372**		**116,284**	**44,839**	**67,877**	**92,370**	**83,597**	**74,800**
	Bus	N/A	N/A	N/A	N/A	N/A	**Impressions:** **1,083,333**	**Impressions:** **1,083,333**	**Impressions:** **1,083,333**	**Impressions:** **1,083,333**
TV / YouTube	All 4	N/A	N/A	N/A	N/A	N/A	**Impressions:** **52,102**	**Impressions:** **52,102**	**Impressions:** **122,237**	Impressions 93,595
	Sky Go	N/A	N/A	N/A	N/A	N/A	**Impressions:** **55,719**	**Impressions:** **43,215**	**Impressions:** **47,907**	Impressions 18,408
	YouTube		N/A	N/A	N/A	N/A	**Impressions:** **55,127**	**Impressions:** **55,096**	**Impressions:** **80,865**	Impressions 65,987
	Terrestrial ITV Yorkshire	n/a	N/A	N/A	N/A	N/A	**Impressions** **3,620,870**	**impressions** **3,546,137**	**Impressions** **3,731,744**	**Impressions** **1,260,205**
	ITV HUB	n/a	N/A	N/A	N/A	N/A	**Impressions** **55,250**	**Iimpressions** **71,000**	**Impressions** **71,000**	Impressions 71,000
MEDIA	Media reach	**Reach:** **407,112**	**Reach:** **8,169**	**Reach:** **20,650,458**	**Reach:** **370,117,387**	**Reach:** **80,600,000**	**Reach:** **19,300,000**	**Reach:** **104,000,000**	**Reach:** **1.100.000.000**	**Reach** 700,000,000

IN HOUSE	Customer Emails	N/A	N/A	N/A	N/A	**Impressions: 29,755**	N/A	N/A	N/A	**Impressions: 51,000**
	YW Website:	**Hits:**	**Hits:**	**Hits:**	**Hits:**	**Hits:**	**Hits:**	**Hits:**	**Hits:**	Hits:
	Save water page	**815**	**678**	**794**	**1,802**	**2,612**	**1,515**	**2,465**	**4,103**	1,531
	YW Website:	**Hits:**	**Hits:**	**Hits:**	**Hits:**	**Hits:**	**Hits:**	**Hits:**	**Hits:**	Hits:
	Hosepipe page	**25**	**11**	**70**	**657**	**761**	**422**	**2,858**	**38,431**	19,737
	Organic Social Channels: Facebook, Instagram & Twitte	**Reach: 19,982**	**Reach: 16,628**	**Reach: 33,758**	**Reach: 45,070**	**Reach: 75,688**	**Reach: 42,000**	**Reach: 41,846**	**Reach: 47,452**	Reach: 50,483

Water Saving / **Customer Communications**		**W/C 22nd August**	**W/C 29th August**	**W/C 5th September**	**W/C 12th September**
MEDIUM	***PLATFORM***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***	***REACH / IMPRESSIONS***
ONLINE	Facebook	Impressions	Impressions	Impressions	Impressions
	'paid for' Adverts	1,766,389	2,374,199	783,833	944,757
	Programmatic/ Digital Display Advertising	Impressions: 499,222	Impressions: 631,586	Impressions: 491,587	Impressions: 331,281
RADIO ADS		**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**
	Traditional	**2,183,755**	**2,183,755**	**2,107,088**	**2,107,088**
	Radio				
	Digital Audio	**Impressions:**	**Impressions:**	**Impressions:**	**Impressions:**
	'Instream'	**TBC**	**TBC**	**TBC**	**TBC**
LOCAL NEWSP-APERS	Metro Yorkshire	**N/A**	**N/A**	**N/A**	**n/a**
	Yorkshire Post/Doncaster Free Press/Hull Daily Mail/ Malton and Pickering Mercury/York Press/Harrogate Advertiser/Sheffield Star/Bradford T&A/ Ilkley	**N/A**	**N/A**	**186,464**	**241,521**

Samples of creative used during the campaign are provided below


OCEAN
Water.
Showering
uses less
than a bath.
Use less.
Save more.
YorkshireWater

8.2. Appendix 2: Notice relating to Abstraction from the River Wharfe at Lobwood drought permit application

YORKSHIRE WATER SERVICES LIMITED

NOTICE OF APPLICATION FOR DROUGHT PERMITS

River Wharfe Catchment

TAKE NOTICE that due to the threat of a serious water shortage in the Yorkshire area caused by an exceptional shortage of rain, YORKSHIRE WATER SERVICES LIMITED (company number 02366682) whose registered office is at Western House, Halifax Road, Bradford, BD6 2SZ is applying to the Environment Agency for drought permits under section 79A of the Water Resources Act 1991 in the River Wharfe catchment.

The drought permits are intended to apply until 31 March 2023 inclusive and propose amendments to the Grimwith Reservoir releases during low flows.

Yorkshire Water is authorised to abstract water from the River Wharfe at Lobwood, North Yorkshire for supply to customers under abstraction licence number 2/27/19/129/R01 ("the Lobwood Licence"). Yorkshire Water is also entitled to abstract water from the River Wharfe at Arthington, West Yorkshire under abstraction licence number 2/27/20/196/R01 ("the Arthington Licence"). The permits being applied for will, if granted, vary both of these licences.

Lobwood Licence

Abstraction licence number 2/27/19/129/R01 entitles Yorkshire Water to abstract a maximum of 5,060 cubic metres per hour, 93,200 cubic metres per day and 23,742,000 cubic metres per year, at an instantaneous rate not exceeding 1,406 litres per second, from the River Wharfe at Lobwood.

The daily abstraction limit varies depending on flow conditions ('bands') in the River Wharfe and upstream releases from Grimwith Reservoir. Under the conditions of the Lobwood Licence, during periods of low flow in the River Wharfe, Yorkshire Water is required to support its abstraction at Lobwood by releasing water from Grimwith Reservoir. When river flows are above 389 megalitres per day (Ml/d) (Bands A and B in the licence), Yorkshire Water does not have to provide any support. When river flows are between 252 and 389 Ml/d (Band C in the licence), Yorkshire Water is permitted to abstract the volume of water being released from Grimwith Reservoir plus an additional 6.8 Ml/d. When river flows are below 252 Ml/d (Band D in the licence), Yorkshire Water is permitted to abstract the volume of water being released from Grimwith Reservoir less 22.7 Ml/d, up to a maximum of 88.6 Ml/d.

The drought permit would amend the Lobwood Licence to allow Yorkshire Water to abstract the full volume released from Grimwith Reservoir when river flows are in Band D. In Bands A, B and C there is no change to the permitted abstraction rates. The abstraction rates (hourly, daily and instantaneous maxima) specified in the licence for differing flow bands in the River Wharfe are not affected by the drought permit application. The maximum abstraction rate of 88.6 Ml/d in Band D is also unchanged.

Arthington Licence

The licence conditions for abstraction licence number 2/27/20/196/R01 also impose an obligation for Yorkshire Water to support abstractions from Lobwood and/or Arthington with releases from Grimwith Reservoir that are 22.7 Ml/d greater than the abstracted volume when river flows are in Band D. This clause will be amended in the Arthington Licence for the duration of the drought permit, if granted, to allow the full volume released from Grimwith Reservoir to be abstracted from Lobwood when river flows are in Band D. However, any abstractions

from Arthington during the period of the permit will continue to be supported as normal from Grimwith Reservoir under the terms of the Arthington Licence.

The anticipated effect of the drought permits, if granted, will be to reduce the rate of draw down on Grimwith Reservoir and increase the volume of river water Yorkshire Water can supply to customers. This will allow Yorkshire Water to reduce its use of other reservoirs in the region and allow stocks to recharge over the winter period, to help maintain supply to customers. Yorkshire Water, in consultation with the Environment Agency, has carried out an assessment of the potential environmental impacts resulting from the changes to the current operations under the terms of the permit. This includes an environmental monitoring plan and mitigation measures to reduce the impacts on the downstream ecology.

Anyone may inspect the proposals at the following locations, free of charge, during normal working hours for a period of eight days from the publication of this notice;

- Yorkshire Water, Western House, Halifax Road, Bradford, BD6 2SZ.
- Addingham Post Office, 100 Main Street, Addingham, Ilkley, LS29 0NS.
- Grassington Post Office, 15 Main Street, Grassington, Skipton, BD23 5AD.
- Ilkley Post Office, Unit 9, Station Plaza, Station Road, Ilkley, LS29 8HF.
- Environment Agency, Lateral, 8 City Walk, Leeds, LS11 9AT.

Copies of the proposals are also available to view on our website **https://www.yorkshirewater.com/drought-permits**

Objections may be made in writing to the Environment Agency at:

Water Resources Permitting Support Centre, Environment Agency, Quadrant 2, 99 Parkway Avenue, Parkway Business Park, Sheffield, S9 4WF or **psc-waterresources@environment-agency.gov.uk.**

Objections should be made immediately and in any event by 5pm on Thursday 20th October 2022.

Objectors may also send a copy of their objection to:

Western House, Halifax Road, Bradford, BD6 2SZ or **publicaffairs@yorkshirewater.co.uk**.

Dated: 13th October 2022

Signed:	Neil Dewis	Perminder Kaur
	Director of Water	Head of Legal Services

Thank you