Yorkshire Water
Drought Permit
Application

River Wharfe at Lobwood supporting information

November 2018

It’s part of our Blueprint for Yorkshire
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1.0 Introduction

This document provides supporting information to Yorkshire Water’s drought permit application to increase the annual licence volume from the Lobwood Abstraction point on the River Wharfe and 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 releases from Grimwith Reservoir agreed with the Environment Agency and currently being operated as a “flow trial”.

The changes, if the application is granted, will be in place until 31 March 2019 inclusive. 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. The application form and River Wharfe at Lobwood Draft Drought Permit are provided in the document named ‘River Wharfe at Lobwood Drought Permit application and licence information’.

The part of the permit application that relates to the reduction in abstraction support from Grimwith Reservoir at low flows is included as a drought option in the (draft) Yorkshire Water Drought Plan 2018. In accordance with regulatory requirements our Drought Plan is revised every five years and is currently in draft status. A consultation period was held from January to March 2018 and a revised draft submitted to Defra in June 2018.

The part of the permit application referring to the increase to the annual licence volume for 2018/19 is not in our current drought plan. It has been identified as an option following the dry summer of 2018 as it would help reduce the risk of drought permit applications in the summer of 2019 if we do not receive sufficient rainfall to allow reservoirs to refill. By increasing river abstractions during winter 2018/19 we reduce the volume we put into supply from reservoirs. This helps reservoirs refill and therefore reduces the likelihood of Yorkshire Water needing to apply for drought permits to increase available supplies in the summer, which could be more detrimental for the environment.

We use experience of previous droughts to help form our plans for future droughts and following the summer 2018 we have identified the increase in the Wharfe licence as a drought measure that would offer a significant benefit under the current conditions. Once the situation returns to normal, we will review our Drought Plan in consultation with our regulators and include additional drought options such as the increase in the Wharfe at Lobwood abstraction. Our Drought Plan will be revised and republished with additional options included.

The potential environmental impacts of implementing the drought permit have been considered and an environmental assessment report and a mitigation and monitoring plan are provided as part of this supporting information.

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.

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 intending to submit separate applications to reduce compensation releases from two reservoirs in the North West Area (Doe Park and Eldwick) and to reduce a maintained flow requirement (Springhead Weir). We are also applying for drought permits to reduce compensation releases in the North, South and South West areas of our Grid SWZ and to vary our annual abstraction limits on the River Derwent. 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 2018 includes 58 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 (44) 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 operate our Grid SWZ to balance resources through our five operating areas rather than drawing down individual reservoir groups in each area. Our Drought Plan is designed to implement drought actions, when needed, across our Grid SWZ to provide benefits regionally rather than at a local level.

During November and December 2018, we will be applying for drought permits that will enable us to implement 23 of the drought options in our Drought Plan (a list of these options is provided in Section 6.0). We are also applying for the additional benefit of increasing the Lobwood annual abstraction limit and for an option to vary our permitted abstraction on the River Derwent, both of which are not in our Drought Plan. The permit applications have been selected through modelling and analysis of our drought plan options and newly identified options. We are applying for the options we have calculated may offer the maximum benefits with minimum environmental impacts in the current situation and give us the best chance of starting the spring of 2019 with healthy reservoir stocks.
Most of the water resources in our Grid SWZ are connected by a grid network (grid system), outline in Figure 1.2. This enables highly effective conjunctive use of different water resources through the use of raw and treated water pipelines. 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 2018 stocks in the reservoirs across our region are lower than average.

Our use of the licences in this application is described in Section 3.3.

As a result of the low rainfall there is a risk our reservoirs will not refill before summer 2019. We are applying for drought permits to conserve supplies and aid winter refill. This permit, if granted, will increase our annual abstracted volume from the River Wharfe at Lobwood, increasing our ability to use river water instead of 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"), a copy of which is provided in the document 'River Wharfe at Lobwood Drought Permit application and licence information'. This document also includes a description of the Grimwith Reservoir flow trial agreement we hold with the Environment Agency. Under the terms of the agreement we are releasing compensation flow from Grimwith Reservoir to support the downstream environment.

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 2018. In addition to this we are applying for an increase in the annual abstraction licensed volume for the 2018/19 licence year, to allow increased abstraction over the winter months when river flows are higher, to preserve reservoir stocks for summer 2019.

The drought permit will not impact on the compensation releases from Grimwith Reservoir under the terms of the flow trial agreement between Yorkshire Water and the Environment Agency.

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 in 'River Wharfe at Lobwood Drought Permit application and licence information'. 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 be amended in the Arthington Licence for the duration of the drought permit, if granted.

2.1. Location

The Yorkshire Water abstraction point relating to this permit application is on the River Wharfe at Lobwood (grid reference SE 07 51), North of Addingham Village 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 point at Lobwood 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 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 (MI/d) (Bands A and B in the licence), we do not have to provide any support. When river flows are between 252 and 389 MI/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 MI/d. When river flows are below 252 MI/d (Band D in the licence), we are permitted to abstract the volume of water being released from Grimwith Reservoir less 22.7 MI/d, up to a maximum of 88.6 MI/d.
Figure 2.1: Location of Lobwood intake

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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, increasing the annual licence is an opportunity to maintain supplies whilst reducing reservoir abstractions and preserving reservoir stocks. 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.

Yorkshire Water is currently providing compensation flow releases from Grimwith Reservoir as part of a flow trial agreement with the Environment Agency on the days when not releasing to support downstream abstraction. The trial started in 2015 and will run for five years. It aims to protect low flows on the River Dibb, which will improve the in-stream ecology and thereby meet requirements under the Water Framework Directive (WFD).

The releases from Grimwith Reservoir under the terms of the flow trial are summarised in Table 2.1. We are currently operating under the terms of the licence agreement and the flow trial agreement. The drought permit will not affect the compensation flow trial releasing water from Grimwith reservoir to the River Dibb.

### Date | Compensation flow trial 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 trial 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.

<table>
<thead>
<tr>
<th>Licence agreement conditions</th>
<th>Proposed drought permit conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual maximum 23,742 ML</td>
<td>Annual maximum 27,397 ML</td>
</tr>
<tr>
<td>Gauged flow ML/d</td>
<td>Allowed abstraction ML/d</td>
</tr>
<tr>
<td>&gt;488 (Band A)</td>
<td>93.20</td>
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<tr>
<td>&gt;389 (Band B)</td>
<td>88.60</td>
</tr>
<tr>
<td>&gt;252 (Band C)</td>
<td>Grimwith release plus 6.8, up to maximum of 88.6</td>
</tr>
<tr>
<td>&lt;252 (Band D)</td>
<td>Grimwith release less 22.7, up to maximum of 88.6*</td>
</tr>
</tbody>
</table>

*If abstraction is taking place at both Lobwood and Arthington, the total Grimwith release must be at least 22.7 ML/d greater than the combined abstraction.

*Table 2.2: Current Licence and Drought Permit proposals*
The drought permit application is to temporarily amend the Licence to allow an increased annual abstraction limit of 27,397,000 cubic meters (an increase of 3,655,000 cubic meters) for the licensing year 2018/19 and, from the date which the permit is granted until 31 March 2019 inclusive, 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. 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.

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 2018).

In the period 1 April to 8 November (61% through the licence year) we have used 57% of the annual licenced quantity for the River Wharfe at Lobwood. Without an increase in the annual licence, we would be restricted to an average of 71Ml/d until 31 March 2019, which would be adequate for a normal year. During 2018 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 when 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. In order to ensure we have enough licence remaining to meet high winter demands without this drought permit, we have reduced abstractions at Lobwood, and are using already depleted reservoirs. The pattern of abstraction from the Wharfe at Lobwood (and Grimwith releases) is shown in Figure 3.3.
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 2018’, 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 2019 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 2018 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.

At the beginning of the year in February and March we experienced a period of prolonged cold weather (the “Beast from the East”) and pipes froze in our network and in customers' properties. This led to an increase in winter demands when temperatures increased early March, and pipes burst. However, we received sufficient rainfall over winter 2017/18 for reservoir levels to be more than 95% full by April 2018 so this increase in winter demand did not affect supplies in 2018.

Reservoir stocks crossed our ‘Normal Control Line’ in mid-May 2018. 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 throughout the summer and autumn and will continue into winter due to the current ongoing water resources position. 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 a period of dry weather and high temperatures. At times we had to maximise use of rivers and reservoirs simultaneously and during periods of low river flow we had to rely on reservoir supplies.

During August demand reduced closer to normal levels but rainfall was still below normal, and whilst September rainfall was about average regionally, October rainfall has been below average and reservoirs stocks have not recovered.

This has led to our reservoir stocks depleting at a much faster rate and we have not received sufficient refill for levels to return to normal for the time of year. If rainfall from December 2018 to March 2019 continues to be below average and we experience a repeat of high winter demands due to freeze-thaw over the winter of 2018/19 there is a risk our reservoirs will not refill in time for summer 2019.

To increase reservoir refill over winter 2018/19 we plan to apply for several Drought Permits to reduce reservoir compensation releases across our region and to increase our permitted abstraction form rivers. This includes:

- Two drought permits relating to existing river abstraction licences
We are applying for a drought permit on the River Wharfe at Lobwood to help aid the recovery of reservoir stocks in the North West Area of our Grid SWZ during the winter months. By implementing the permit during winter, we expect it to have less environmental impact than it would if we had to implement in the summer if reservoir stocks did not receive sufficient refill through rainfall alone. Furthermore, by maximising our prospects for winter recovery, we will decrease the likelihood of requiring permits in 2019 during the more environmentally sensitive spring and summer periods.

### 3.2. Benefits of this drought permit

The proposed increase in the annual licensed quantity at Lobwood would allow us to maximise the abstraction up to the daily limits. In the winter of 1995/96 (our only two season drought), river flows were in the higher flow bands more than 50% of the time, we therefore believe that the variation in the annual licence this will have minimal environmental impacts. Aside from the increase in annual licensed quantity, and the above changes in Grimwith Reservoir support, the abstraction regime will be the same as that usually in operation.

In 2018/19, we have abstracted more than we usually would have by this time of year due to the high summer demands experienced, particular through June and July 2018 (see Section 3.8). During most winters we would use the Lobwood abstraction at lower rates, with reservoirs providing a larger proportion of supply. With reservoirs low, we need to abstract more from the River Wharfe, but we are constrained by the annual permitted licence volume at Lobwood.

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 2019. The increase in the total volume we are permitted to abstract in 2018/19 from Lobwood is in an addition to the option proposed in our drought plan to reduce the regulated support form Grimwith Reservoir to support the Lobwood abstraction. We believe that by implementing the increased annual licence limit we can increase abstractions when river flows are likely to be higher, resulting in lesser environmental impacts.

We have calculated the benefits that could be achieved if this permit is granted. We considered three options for inclusion in this permit application and, based on the benefits of each option, decided to apply for only two of the three. Table 3.1 shows the benefit of the two options (options 1 and 2) we are applying for, and the third option that was considered.

We are applying for Option 1 - an increase in the annual licence at the Lobwood intake. If fully utilised this will give a benefit of up to 3,650Ml, equivalent of up to 2% of regional reservoir stocks. The effects of the increase in annual licence will be a reduction in the amount of water required to be abstracted from reservoirs throughout the North and North West of the region. This option will be most beneficial if river flows are in bands A and B where a regulating release from Grimwith is not required, but will still be of some benefit if a regulating release is required.

We are also applying for Option 2 – a reduction in the regulatory flow releases from Grimwith Reservoir when abstracting at low flows. This will give a benefit of 1,044Ml between December and March if we assume a repeat of 1995/96 river flows. 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 under the flow trial agreement.
The maximum potential benefit of options 1 and 2 combined is 4,694ML, which is the sum of both options, although the actual benefit will depend on river flows.

The third option we considered was reducing the compensation flows released from Grimwith Reservoir into the River Dibb, when there is no regulating release required. In the period December 1995 to March 1996 there would have been a benefit of only 170ML (sum of benefits of halving the required compensation flow days when no regulating release was required). We have therefore decided not to reduce the compensation flows due to the small benefit and the effect this would have on our ability to assess the WFD compensation flow trial.

<table>
<thead>
<tr>
<th>Drought Option</th>
<th>Benefit ML</th>
<th>Additional stocks available in Grimwith reservoir</th>
<th>Benefit % stocks Additional stocks available in North West reservoir group</th>
<th>Additional stocks available in regional reservoir group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Increase annual licence at Lobwood (maintain daily maximum)</td>
<td>3650</td>
<td>16.8% (equivalent)</td>
<td>7.7%</td>
<td>2.0%</td>
</tr>
<tr>
<td>2) Reduce regulating release in lowest flow band</td>
<td>1044</td>
<td>4.8%</td>
<td>2.2%</td>
<td>0.6%</td>
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<tr>
<td>3) Half compensation trial flows</td>
<td>170</td>
<td>0.8%</td>
<td>0.4%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Table 3.1: Benefits of Drought Permit proposals

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

In this section we provide evidence of drought caused by 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 2018’ 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. Conditions affecting Grimwith and the Wharfe catchment are considered in more detail in the following paragraphs.

Figure 3.1 below is taken from Appendix 1 of the ‘Exceptional shortage of rainfall 2018’ report and shows the rainfall in 2018 for raingauges in the North West part of the Yorkshire region and for Fewston reservoir (in the next catchment to Grimwith). These all show that rainfall has been below long term average (LTA) since April 2018, with June being particularly dry (15 to 29% of LTA).

Soil Moisture Deficits (SMD) for the Yorkshire region are also shown in our ‘Exceptional shortage of rainfall 2018’ report, and the maps of SMD show very high values from July to September, with only the western edge of the region returning to normal conditions at the start of October. Analyses of SMD described in the report show that the June to August period is significantly drier in 2018 than in the period 1993 to 2017.

Appendix 2 of our ‘Exceptional shortage of rainfall 2018’ report shows that rainfall measured at Grimwith Reservoir was the driest in the 34 year period of record for the periods May to June, May to July, June, and for the periods November to July, November to August and November to September. These periods are all classified as having “exceptionally low” rainfall using the Cunnane plotting position.
Appendix 3 in the report includes analyses of rainfall data at the Fewston raingauge in our North Area, but only 15km away from Grimwith Reservoir. Tabony Tables (Tabony, 1977) allow return periods to be estimated for rainfall accumulations for a given end month and duration. We have Tabony Tables for Fewston raingauge, and analysis of the rainfall data there show that the May to June period had greater than a 1 in 50 year return period, and the 3 and 4 month periods ending in August and the 6 months ending in October had a greater than 1 in 20 year return period. Analyses for the Scar house raingauge shows that the 2,3,4, 5 and 6 month periods from May have a return period of greater than 1 in 20 years.

Other analyses of rainfall data are described in our report on "Exceptional Shortage of Rainfall".

Table 3.2 shows the ranking of rainfall data at the Grimwith raingauge for 2018 (up to September), and assuming a repeat of 1995 rainfall for October to December. In this table numbers are shown in bold red text if they are in the driest 5 events in the 34 year long record. The Cunnane plotting position has been calculated for this period of record, and events which are 'notably low' are shaded pink in this table. This shows that for many durations, the months ending in September are the driest or second driest in the period of record, and if there is a repeat of conditions in 1995, 2018 will be the driest year on record. The 10 months from December 2017 to September 2018 are the driest on record (of 10 months ending in September) for the Grimwith gauge in the 34 year period of record, although it is the period from May when reservoirs began to drawdown which is most relevant to this application.

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Table 3.2: Ranking of Grimwith rainfall data (2018 Jan-Sept, 1995 Oct-Dec)

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</table>

The Grimwith raingauge is the most relevant to this drought permit application, as it is in the Wharfe catchment. Fewston is nearby, and Tabony Tables are available for this location, but the record at Fewston is relatively short. There are Tabony Tables available for Scar House to the north, and this gauge also has a long record, but it has been quite a bit wetter in this area, and rainfall as a percentage of long term average, has generally be greater at Scar House and Fewston than it has been at Grimwith.

Figure 3.2 Standardised Precipitation Index Map: 3 months ending in July
The map in Figure 3.2 shows the Standardised Precipitation Index (SPI) from the Centre For Ecology and Hydrology drought portal\textsuperscript{2} for July for the three month duration. The Wharfe catchment is outlined in and is shown as severely dry during July. Other durations (1 month and 6 months) and other periods (June-September) are shown in our report ‘Exceptional shortage of rainfall 2018’. The map for September shows the SPI for most of Yorkshire recovering to the “Mildly dry” range. October rainfall has been just over half of the LTA, so the SPI is likely be become drier.

Figure 3.3 shows the gauged flows recorded on the River Wharfe at Addingham for 1995 and 2018, as well as releases from Grimwith Reservoir and abstractions at Lobwood and Arthington.

For the early part of 2018, flows in the River Wharfe were similar to those in 1995, with some flows in February and March lower than in 1995. Occasional rainfall from the end of July has meant that river flows have been above the 252ML/d threshold for much of the time since August (below this threshold the highest level of regulating release from Grimwith Reservoir is required to support abstraction at Lobwood). River flows will fluctuate depending on the rainfall we receive during the winter months. With no rain forecast during the remainder of November, flows are more likely to be in the flow bands where support is required until there is further rainfall.

The fact that flows have mainly been in the higher bands where support is not required has meant that we have been able to maximise abstractions in 2018 without depleting stocks in Grimwith Reservoir as much as they would if river flows had been lower.

\textsuperscript{2}https://eip.ceh.ac.uk/droughts
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 from the Wharfe is low. If we are able to increase the supply to Bradford from Lobwood, this will reduce the amount of water transferred 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. A slight recovery has occurred in the last month, and stocks are now just above where they were in 2003.

Figure 3.3 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.

Figure 3.4 shows the North West Reservoir Group weekly levels and Figure 3.5 shows the regional reservoir stocks as shown in our weekly water situation report. Both graphs show that stocks in 2018 are lower than they have been for many years. Only 1995 and 2003 have been drier in recent times. The other plots we have shown in the reservoir graphs figures are taken from our weekly reservoir stocks reports, which have data only from 2014.

Figure 3.6 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 additional abstraction
we are able to take from the River Wharfe will enable us to reduce the volume we take from the North West Area reservoirs and therefore aid recovery of these reservoirs.

Figure 3.5 – Regional Reservoir Group stocks (from Water Situation Report)

Figure 3.6 – Grimwith Reservoir stocks
Figure 3.7 – Washburn Valley (including Eccup) Reservoir stocks

Figure 3.8 – Nidd Group Reservoir stocks
The 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. The control lines are the grey curves shown in Figure 3.4 and 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 2012 based on minimum inflows from 1920 to 2011. In 2011 we experienced low rainfall and inflows in the south of the region resulting in very low reservoir levels in this area. A considerable amount of support was provided to compensation reservoirs by supply reservoirs, which led to a change in the way the control lines are calculated.

For the DCLs, net inflows assume that a downstream compensation reservoir supplies compensation flows at half the normal compensation, and this is fully supported by the supply reservoir. For the NCLs, full support to maintain the normal compensation release is assumed. The changes in control line derivation made in 2012 led to a decrease in yield for many reservoirs in the region, and/or an increase in the level of control lines. However, this yield decrease was not reflected in the regional deployable output. This was due to the conjunctive use operation of the grid system, whereby flows from multiple sources can be balanced across the grid.

Control lines have not been revised for our most recent draft drought plan as at the time of writing the plan there were no significantly dry years since 2011. However, we will carry out a further review of our control lines after the current drought period has ended.

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 then reduce to below yield later in the year to compensate.

### 3.4. The effects of the current water shortage

The current water supply situation is a result of the exceptional shortage of rainfall described in Section 3.3. 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 2018 (demonstrated in Sections 3.8 and 3.6). There is no immediate threat to supplies, but reservoir stocks are depleted, and to minimise risks to supplies next spring and summer, we are preparing for the possibility of a dry winter and spring.

Throughout the summer we 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. Our latest modelling (15 October 2018) indicates that if we had a repeat of 1995/96 inflows over the winter we would expect to cross drought permit triggers (our drought control line) in three of our five operating areas if we experienced high demands during the winter. Although our modelling shows that in most scenarios these permits will not be required, the fact that the rainfall...
patterns for 2018 are similar to those in 1995 and the rainfall quantities for the May to September period are similar, means that we need to plan for this worst case scenario.

Earlier in the summer our forecasts indicated that TUBs may be required during August and September in some areas. However, as the summer progressed, small amounts of rainfall pushed the TUBs forecasts further away in time. We did not trigger TUBs during the TUBs season (April-October inclusive), and so we have not implemented TUBs (in line with our drought plan).

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 increased use of the Lobwood abstraction (detailed in Section 3.3) has led us to plan for this winter permit to increase the annual abstraction licence total volume.

The threat to water supplies is a direct result of the weather conditions during this summer. The threat will only occur if the conditions continue to be dry. We have acted in line with our drought plan triggers, preparing for TUBs earlier in the summer when models suggested they would be required, and preparing for winter recovery drought permits.

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 2019 if the dry weather continues.

![Figure 3.9: Actual and forecast Reservoir stocks](image)

Figure 3.9 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 two scenarios - one for a repeat of 1995/96 inflows, at relatively high demands, and one for a repeat of 90% of 1995/96 inflows, but with very high winter demands. 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.

3.5. Population affected by the drought permit

This drought permit application will alter how we operate our Lobwood abstraction in the Grid SWZ. As the Lobwood abstraction is part of our conjunctive use grid system the population affected by the water shortage is that of our Grid SWZ (5,015,265 in 2017/18 estimated population from our draft WRMP 2019), although the application is relevant to the North West operating area in this zone.

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.

3.6. Summer 2018 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 2018 we have seen a much greater uplift in water use than in recent years.

Figure 3.10: Regional Weekly Demand (from Weekly Water Situation Report)

Figure 3.10 shows the high demands experienced in 2018 compared to the preceding three years and years selected to represent previous high demand years. This shows the peak demand occurred earlier and for a longer period than summer peaks in previous dry years, except for 1996, although a higher proportion of the 1996 demand was due to leakage. Demand exceeded 1400 Ml/d for three successive weeks, which is unprecedented in our region, with a weekly peak demand of 1465Ml/d.
This high demand has been driven by exceptionally high temperatures and dry weather (Hydrological summary June 2018, CEH\(^3\), states “it was the only June in series from 1910 to rank among both the three hottest and three driest Junes”).

Figure 3.11: Regional Monthly 2018 Demand and Temperature

Figure 3.11 shows monthly 2018 regional demand plotted alongside monthly average temperatures (Calculated from weekly MORECS data), for the 1993-2017 average and for 2018. The peak demand in July corresponds to the far higher than average temperatures, and the secondary peak in March follows the low temperatures in February caused by the “Beast from the East”

We maintain a Domestic Consumption Monitor (DCM) to estimate water use by unmeasured household properties. Unmeasured households are properties where water charges are based on the rateable value of the property rather than a metered supply. The DCM consists of, on average, 1000 unmeasured properties which have logged meters installed but which continue to pay for water on an unmetered basis. The properties have been selected to be representative of our unmeasured property base, including property type, number of occupants and geographic location. Consumption data from all properties on the survey is obtained daily through a telemetry system. From this we obtain the average daily volume of water used by our unmeasured household customers, known as unmeasured household per capita consumption (PCC).

Analysis of data from the Domestic Consumption Monitor provides evidence of a significant increase in unmeasured household demand in June and July 2018 when compared to the previous two years. The survey contains around 120 properties in the Bradford and Skipton FCZs and comparative use for these properties in these two zones is shown Figure 3.12 and Figure 3.13.

\(^3\)http://nora.nerc.ac.uk/id/eprint/520548/
Both areas showed a significant increase in demand in June and July 2018 compared to previous years, with demand decreasing in August 2018 as average temperatures and sunshine hours reduced. This is illustrated Figure 3.14 and Figure 3.15 below which show the relationship between regional average PCC and average temperature and sunshine hours during Summer 2018.
Statistical analysis of regional weekly demand and weather data has been undertaken for the period April 2009 to September 2018. Boxplots comparing the distributions of PCC and weather data (soil moisture deficit, temperature and rainfall) were produced as part of this analysis.

Box plots (also known as box and whisker diagrams) are used to display information about the range of the data including the minimum, maximum, median and quartile values. Lines extending vertically from the boxes (whiskers) indicate variability outside the upper and lower quartiles.
The Domestic Consumption Monitor provides average monthly PCC values from 1996. However, to allow more granular analysis of demand and weather patterns over the summer months the calculated average PCC from Netbase (our leakage and demand monitoring database) has been used, as this provides a weekly data set. This data is the average PCC for all household properties (measured and unmeasured) estimated in Netbase as part of leakage operability calculations. The Netbase database was established in April 2009, therefore weekly PCC is available from this date onwards.

Limiting the analysis to this period allows assessment of the 2018 data against comparative years. Customer average water use is partly dependent on technology. PCC has reduced in recent years, due to more water efficient appliances such as dishwashers and washing machines. Toilet cisterns have also reduced in size, the typical capacity in modern systems is six to seven litres per flush compared to up to 14 litres per flush in older cisterns. Because of this, is not appropriate to compare demand in Summer 2018 with demand in the 1990’s or early 2000’s, as the historic higher average daily use would mask the uplift seen this year.

Weekly weather data was obtained from the Met Office MORECS (Met Office Rainfall and Evapo-transpiration Calculation System) database.

The boxplot for PCC is shown in Figure 3.16. This shows the difference in the distribution of PCC values in June to August 2018 when compared to June to August in the previous 9 years (2009 to 2017).

The horizontal line across a box identifies the median value. The median PCC values for all years from 2009 to 2017 was 126.25 l/h/d. For 2018 the median value was 134.29 l/h/d, a difference of 8 l/h/d. Statistical analysis showed the PCC was significantly higher in summer 2018 compared to previous years.

3.7. Leakage control

Figure 3.10 shows the high demand experienced in 2018 has only been exceeded previously in 1995/96. In 2006 our region experienced peak demand in August that was greater than the 2018 peak, but this was for a shorter duration. In 1995/96 reported leakage was 485Ml/d. The subsequent
introduction of mandatory leakage targets, and significant investment in monitoring infrastructure to facilitate detection and repair, has resulted in a 40% reduction in reported leakage to the current target level of 292Ml/d.

Each year we find and repair leaks on our distribution network to ensure our average daily leakage does not exceed our leakage target. Our regional leakage target for 2018/19 is 292Ml/d and was determined in our 2014 Water Resources Management Plan (WRMP14). For our PR19 business plan and the draft WRMP19 we have set a target to reduce leakage by 40% by 2025 through annual reductions in regional leakage over seven years, starting in 2018/19. This will be achieved through additional find and fix resources and new and innovative leakage detection techniques. Details of additional leakage detection activity employed during 2018 is provided in Section 4.3.

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 break out 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 60%.

We started this financial year 25Ml/d above normal leakage levels due to the severity of the freeze thaw event in March. Our additional leakage reduction activity successfully reduced leakage to normal levels by the beginning of May. However, we saw a second increase of 25Ml/d at the beginning of July which again we successfully reduced to normal levels by the beginning of November. Our current leakage figure (which relies on some in-year estimates) is 290Ml/d, which is above our forecast for this year due to the coincidence of both extreme weather events.

3.8. 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.

<table>
<thead>
<tr>
<th>Yorkshire Water Forecasting Zones</th>
<th>Area</th>
<th>Demand in Zone (10-17 October 2018) Ml/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leeds &amp; Harrogate</td>
<td>North/Central</td>
<td>234</td>
</tr>
<tr>
<td>Sheffield</td>
<td>South</td>
<td>244</td>
</tr>
<tr>
<td><strong>Bradford &amp; Skipton</strong></td>
<td>North West</td>
<td>179</td>
</tr>
<tr>
<td>Calderdale &amp; Wakefield</td>
<td>South West</td>
<td>226</td>
</tr>
<tr>
<td>Hull</td>
<td>East</td>
<td>150</td>
</tr>
<tr>
<td>Malton, York, Doncaster, Selby</td>
<td>Grid and groundwater</td>
<td>214</td>
</tr>
<tr>
<td><strong>Regional</strong></td>
<td>Regional</td>
<td>1248</td>
</tr>
</tbody>
</table>

Table 3.3: Weekly Water Demand

For assessing demand, the Yorkshire region is divided into forecasting zones (FCZ). 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.

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*It’s part of our Blueprint for Yorkshire*
The Grid water network in the Grid SWZ utilises Elvington and Loftsom Bridge WTWs in the East and Chellow Heights WTW in Bradford to support the local supply sources in the Yorkshire region. The Elvington and Loftsom Bridge WTW 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.

<table>
<thead>
<tr>
<th>WTW</th>
<th>Current Output to Grid Ml/d</th>
<th>Main Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elvington</td>
<td>196</td>
<td>River Derwent at Elvington and River Ouse at Moor Monkton</td>
</tr>
<tr>
<td>Loftsom Bridge</td>
<td>69</td>
<td>River Derwent at Loftsom Bridge</td>
</tr>
<tr>
<td>Chellow Heights</td>
<td>138</td>
<td>Nidd Barden and Grimwith Group and Thornton Group and River Wharfe at Lobwood</td>
</tr>
</tbody>
</table>

Table 3.4: Grid Water Treatment Works

Current demand in the Bradford and Skipton area is shown in Figure 3.17 and historical regional demand in Figure 3.10.

![Bradford & Skipton Weekly Demand](image)

Figure 3.17: North West Area Weekly Demand

### 3.9. 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. Because we have maximised river abstractions (as stipulated in our drought plan) we risk running out of our annual licence at Lobwood on the River Wharfe and on the River Derwent at Loftsom Bridge unless we increase the annual abstraction volume for 2018/19.

At present we have reduced abstractions at Lobwood so that we would be able to maximise them if required during a period of high demands in winter, and to ensure that we operate in accordance with our licence. However, if this permit was granted, we would be able to continue to abstract from
Lobwood at a higher rate and for longer, reducing the volume taken from our reservoirs and so helping to maximise reservoir recharge.

As described in Section 3.2 we also considered reducing the releases from Grimwith Reservoir to the River Dibb as part of the ongoing WFD compensation flow trial, but decided not to reduce the compensation releases due to the relatively small benefit and concerns over the impact a reduction would have on the trial.

We have followed the steps in our Drought Plan 2018 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, and worse than the extreme droughts modelled in our drought plan. This permit will aid winter recovery, as shown in Table 3.1, and allow us to enter spring 2019 with the best chance of having reservoir stocks above our regional Normal Control Line.

We include an option in our Drought Plan to reduce the support form Grimwith Reservoir when flows are in Band D. We also include an option to reduce the compensation flow releases we provide as part of the flow trial agreement we hold with the Environment Agency which we are not planning on implementing this year. However, we do not include an option to increase the annual abstraction volume in our Drought Plan 2018. This action has developed from the 2018 drought where an unprecedented prolonged peak in summer demand has led to greater use of the Wharfe at Lobwood abstraction than experienced in previous years, including drought years.

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 maximise river abstractions at a time when river flows are higher, and even if river flows are low, any abstractions will be fully supported. Having this permit in winter will improve recovery in reservoir stocks and decrease the likelihood of permits resulting in reduced summer flows, which could cause more environmental issues.

3.10. Consequences if the drought permit is not granted

We have considered not applying for a drought permit to increase the annual licence at Lobwood, and our modelling of past events shows that we could maintain supplies through historic droughts without permits. However, in that scenario our reservoir stocks would be reduced. Our modelling and forecasts to date have been based on the licensed annual maximum. If we had a repeat of 1995 inflows and this permit was in place, reservoir stocks in the North West group could be increased by up to 10% in the North West Area and by 2.5% regionally if the changes applied for in this permit are used in full.

We have modelled the impact of these permits in our Water Resources Simulation Model, and shows an increase in North West reservoir stocks of just over 5%, with regional stocks just under 2% greater at the start of April in a relatively high demand scenario with a repeat of 1995/96 inflows. The actual benefit of the drought permit would depend on river flows during the period, and how much and where reservoir stocks had recovered.
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 reaction to crossing drought triggers in 2018. 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, starting 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 2018 lower than normal reservoir stocks triggered the need for appeals for voluntary reductions, but we did not meet our trigger for imposing restrictions on customer use.

In April 2018 our regional reservoir stocks were above 95% and we started the summer in a good position, with reservoirs full apart from those drawn down for planned reservoir safety works. At this time, we were implementing our normal water efficiency measures and preparing for our annual summer campaign. High temperatures resulted in high demand, above 1350ML/d for five weeks from the week ending 27th June to the week ending 25th July 2018. As a result of the peak demand and lower than average rainfall from May to August 2018, 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 reaction to crossing these triggers.

The following sections list the actions we carried out as a result of crossing control lines. A timeline of the customer communications appealing for reductions in water use during 2018 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 (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 and purchase water butts or other home retrofit devices. It includes a page dedicated to water resource management with our current Drought Plan and Water Resource Management Plan (WRMP) are available to download.

We have education centres at a number of our sites (Headingley WTW, Ewden WTW and Tophill Low Nature Reserve) which schools and other groups can arrange to visit. Various topics on water and wastewater services are discussed during the visits, including water efficiency. 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 Communications Team delivers a water efficiency campaign, which aims to promote the free packs and encourage our customers to reduce water use in the home. This typically involves promotions on social media and attending community events and local shows. The Yorkshire Water website and social media are used to promote each summer campaign, offering water saving tips and free self-fit water saving devices.

This year’s campaign adopted a bespoke segmentation model, tailored to a local needs level. For example, messages were targeted to demographics most likely to relate to the messages.
attended local events in the region to promote water saving and engage with customers directly. At each event a stand with water saving messages was set up and customers were encouraged to sign up for a free water saving pack while visiting the stand. In 2018 we attended 50 days’ worth of local events.

We have extended our annual water saving activity to include a home audit and retrofit programme. This was launched in September 2018 and will be delivered to 2,000 to 3,000 customers as a trial over the next two years, with the intention of continuing from 2020 onwards if successful.

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 53%. Almost all commercial properties are metered, with the only 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. However, demand for meters has recently slowed due to a number of factors including a relatively static unmeasured bill value. As an alternative to our usual meter promotion routes we are reviewing accounts of customers who could save money from having a water meter installed. This is in response to increasing requests from customers for a similar arrangement to the energy sector where suppliers must ensure customers are on the best tariff.

As a pilot, we have identified 100,000 customers who are currently in a property with a high rateable value and a small number of occupants. Therefore, their bills are likely to be higher than they would be if they were billed according to the amount of water they consume. As part of this pilot, when customers agree to switching to a metered supply we will assess whether the customers have saved money. If they haven't, we will switch them back to the unmetered rate.

While this initiative will increase the number of metered customers and ensure we meet our forecast meter penetration in our draft WRMP19, it may not drive a significant demand reduction as the reduced bill value from moving from a high rateable value bill to a lower metered bill may not result in a financial incentive to reduce water use.

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. In 2018 we had already enhanced our leakage activity before the dry weather occurred, as part of the delivery plan to meet our 2025 leakage target (see Section 3.7). This year we have employed additional resources to find and fix leaks and bursts in our region, which included:

- Employing an extra 230 leakage technicians to find leaks across Yorkshire in addition to the 120 regular leakage technicians. This is a mix of 55% experienced staff and 45% trainees.
- Additional personnel fixing leaks - we have 100 teams out fixing leaks, a 50% increase on last year.
- We have proactively found and fixed 14,260 leaks in the first 6 months of this financial year compared to 3,150 in the same period last year.
• We are optimising the pressure to 73,500 properties by installing new reducing valves and to 333,300 properties by optimising pump and valve controls to reduce leakage and assist in demand management.
• We have renewed 7.75km of water mains to prevent bursts and leaks.
• We have repaired or renewed 4,500 customers’ leaking supply pipes to help our customers tackle their leakage.
• We have used drones to find leaks on trunk mains in rural areas where leaks are more difficult to identify.

Leakage activity in the North West Area
As part of our ongoing work to reduce leakage in our region and achieve a 40% reduction by 2025 we have focused a number of new approaches in the North West Area;
• We have permanently installed 4,600 acoustic loggers listening for leaks in areas historically prone to leaks developing, this includes several areas in Keighley and Skipton.
• We have used satellite imaging to find leaks in rural areas where leaks are more difficult to identify.

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 2018 regional reservoir stocks crossed the normal control line on 21st May 2018. In reaction 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 Wharfe at Lobwood in order to reduce abstraction from the Nidd reservoir group (Scar House and Angram) as much as possible as described in Section 3.3. Although regional stocks crossed the NCL on 21 May, 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 all areas are equally at risk.

At this stage water efficiency messages and promotions were in place offering free water saving packs and we were planning our annual water efficiency campaign. Our Communications Team were preparing the artwork for the annual campaign and organising the media channels we would use and were ready to enhance the messages used in these communications if stocks reduced to the next trigger level.

4.5. Trigger: Reservoirs crossed Environment Agency early warning trigger line
Regional reservoir stocks reached the Environment Agency early warning trigger on 6th July 2018 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 WaterUK 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 2018 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 to 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.

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 10 weeks from the drought control line. During 2018 regional stocks did not reach this level. During dry periods we model reservoir stocks against forecasts of a repeat of previous droughts in our region. On the 5th July 2018 our modelling predicted a risk of reservoir stocks reaching the 10 weeks from crossing our drought control line on 6th August 2018 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. Occasional rainfall and lower demands than predicted on 5th July 2018 slowed the rate of reservoir stocks decline. This meant on 6th August 2018 we were not 10 weeks from the drought control line. Our modelling on 6th August 2018 indicated that we would hit the drought control line in one area (North West) on 10th December 2018 and hit it in another two areas (South and South West) in January 2019.

As our modelling was predicting a risk of reservoir stocks reaching the drought control line on 5th July 2018, 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 2018 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).
5.0 Environmental impacts of drought permit

During the preparation of the Drought Plan 2018, a number of assessments were carried out, and documents produced, including a Habitats Regulations Assessment (HRA), a Strategic Environmental Assessment (SEA), a ‘shelf copy’ Environmental Assessment Report (EAR), and an Environmental Monitoring Plan (EMP).

The EMP, submitted as part of the overall Drought Plan sets out, for each drought option, the required baseline, on-set of drought, in-drought and post-drought monitoring requirements. Baseline monitoring commenced in 2015 and has incorporated annual fish and invertebrate monitoring, together with one-off geomorphology surveys, water quality monitoring and Sites of Special Scientific Interest (SSSI) monitoring. The ‘shelf copy’ EAR identifies sensitive features, which require such monitoring. Baseline monitoring is essential for assessing the actual effects of the drought permit implementation over and above those of the natural drought, through comparison with the on-set and in-drought monitoring. The on-set of drought monitoring assesses that baseline situation immediately prior to drought permit implementation and also identifies potential mitigation monitoring. In-drought monitoring covers monitoring during the implementation of the drought permit, whilst post-drought monitoring is then used to assess a site’s recovery once the drought permit has ceased to be in operation.

In accordance with our Drought Plan and accompanying EMP, following a prolonged dry spring and summer, Yorkshire Water commenced on-set of drought environmental monitoring, which comprised reconnaissance walkover surveys. The trigger for starting this work is when reservoir stocks are forecast to be 10 weeks away from hitting the relevant DCL. During 2018 we did not meet this trigger line but as our modelling was showing a risk we acted early. Weekly modelling of reservoir stocks against customer demand and rainfall data, subsequently meant that this trigger was not reached, but on-set of drought monitoring continued to ensure the company was ready to apply for drought permits when required.

During the prolonged dry weather, dialogue was initiated with the Environment Agency, and consultants were instructed to develop a programme of drought on-set monitoring, together with preparing the ‘application-ready’ EARs and a bespoke monitoring and mitigation plan. A drought onset inception meeting was held with representatives from Yorkshire Water, the appointed consultants and the Environment Agency on 26/07/2018 to initiate discussions on:-

- The prioritisation of drought areas/options for undertaking reconnaissance walkovers and preparing drought permit applications.
- The suite of proposed monitoring and mitigation.
- Updates to environmental assessment reports (EARs), to ensure they were ‘application ready’.
- The format and frequency of proposed collaborative workshops during the onset period.

Several meetings/workshops have since been held between Yorkshire Water, the Environment Agency and appointed consultants to discuss the above, progress with walkovers and suggested plans for monitoring and mitigation for each of the drought permit sites we are considering applying for in November/December 2018.

Surveillance walkovers of potentially impacted river reaches commenced on the 6th August 2018 in priority order, in collaboration with the Environment Agency, with both the Environment Agency and Yorkshire Water’s appointed consultants providing the resources to carry out these surveys. The walkover surveys assessed the pre-drought permit implementation environmental conditions and sensitive features and informed further monitoring requirements and potential mitigation measures, which were agreed between the Environment Agency and Yorkshire Water prior to submitting this drought permit application. Yorkshire Water has also consulted with Natural England over designated sites, where relevant.
Observations and data collected during the drought on-set period have informed the updating of the 'shelf-copy' of the River Wharfe at Lobwood EAR into an 'application ready' EAR. A copy of the River Wharfe at Lobwood Drought Permit EAR has been provided in support of this drought permit application.

5.1. **Summary of the potential environmental impacts of implementing the drought permit and monitoring and mitigation actions**

The Environmental Assessment Report (EAR), provided in support of this application, provides an independent and robust assessment of the potential environmental effects of the implementation of Yorkshire Water’s River Wharfe at Lobwood drought option.

In accordance with the Environment Agency’s drought plan guidance, the environmental assessment comprises the following components:

1. An assessment of the hydrological or hydrogeological effects of the proposed action.
2. An assessment of the environmental sensitivity of the affected areas.
3. Identification of mitigation or compensation measures for impacted features.
4. Development of an environmental monitoring plan, if required.

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.

5.2. **Hydrological and physical environmental assessment**

The detailed hydrological and physical environmental assessment can be found in the EAR. In summary, a review of hydrological information, and physical habitat characteristics of the area surrounding Lobwood intake and Grimwith Reservoir has informed the study area for this hydrological impact assessment.

<table>
<thead>
<tr>
<th>Reach</th>
<th>Impact on Reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>River Dibb (downstream of Grimwith Reservoir to the confluence with the River Wharfe)</td>
<td>Negligible</td>
</tr>
<tr>
<td>River Wharfe (between its confluence with the River Dibb and the Lobwood intake)</td>
<td>Negligible</td>
</tr>
<tr>
<td>River Wharfe (between Lobwood intake and the tidal limit (Lobwood Reach 1))</td>
<td>Minor</td>
</tr>
<tr>
<td>River Wharfe tidal limit to Humber Estuary</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

Table 5.1: Summary results of the Wharfe at Lobwood drought permit environmental assessment

A summary of the environmental assessment outcome is shown in Table 5.1. Of the relevant reaches there was only one river reach identified as impacted by the drought option and the impact was considered to be MINOR and this is discussed below;

**River Wharfe (between Lobwood intake and the tidal limit (Lobwood Reach 1))**

Overall flows in this reach are likely to be reduced as a result of the drought permit, as the drought permit proposes that the regulated release of 22.7ML/d additional supporting flow is not released at times of abstraction when flow at the Addingham gauge is less than 252ML/d. The regulated release, under the drought permit conditions will provide a flow equal to that of the volume we abstract at the Lobwood intake. The screening review, using hydrological winter flow statistics identifies that a reduction of 22.7ML/d would reduce the winter extreme low flow statistic (winter Q99) at Addingham...
gauge (close downstream of the Lobwood abstraction) by 15%. The drought permit would not affect flows in the River Wharfe which are higher than 252ML/d at Addingham, and therefore there would be no impact on the winter low flow statistic (winter Q95) at Addingham gauge or downstream.

The potential hydrological impact of the drought permit on this reach is considered to be MINOR. For the purposes of screening, the impact of the scheme would remain minor until the tidal limit of the Wharfe.

The type of hydrological change from an increase in the annual total abstraction cannot be assessed using the same approach. The type of impact of the drought permit on flows in the River Wharfe will depend on the range of flows in winter 2018/2019. If flows are low (less than 252ML/d), with a drought permit, we will release from Grimwith Reservoir the amount abstracted from the River Wharfe at Lobwood. Where flows are less than 389ML/d but higher than 252ML/d at Addingham, regulation would be required to support abstraction and there would be no change in river flow downstream of Lobwood with this drought permit condition. If flows are moderate or high (more than 389ML/d at Addingham) without the drought permit there would be typically 21ML/d less flow in the river. There may be occasional days when, without a drought permit, abstraction would have been suspended. Where these days are moderate or high flow days, abstracting 88 ML/d would be a corresponding reduction in river flow. Such reductions are normal within the daily licence conditions and would be for short periods of time at moderate to high flows and without sustained influence on the hydrograph or channel habitats.

The annual total abstraction volume increase is considered as a NEGLIGIBLE additional effect on the River Wharfe.

5.3. Environmental sensitivity screening

Designated biodiversity sites (LNR, NNR, SSSI, SAC, SPA, Ramsar) and Natural Environment and Rural Communities (NERC) Act Section 41 species/habitats located on or within 500m of the impacted reaches were identified as part of the environmental screening. Susceptibility to flow/level impacts were then identified according to whether interest features of the site or the species were water dependent. Sensitivity was then determined according to professional judgment based on susceptibility and the level of hydrological impact at the location.

In line with the Drought Plan Guidance, only features identified as either: 1) uncertain; 2) moderate-major sensitivity; or 3) minor sensitivity in a designated site formed the scope of monitoring, environmental assessment and consideration of mitigation actions. On this basis, and following consultation with Natural England, no further environmental assessment is required.

5.4. Drought permit water quality impacts

The EARS identify the likely water quality impacts of drought options (both individually and in-combination) based around Water Framework Directive status classification. The potential hydrological impact of this drought permit application has been assessed as being negligible – minor, and thus no impacts on water quality have been identified.

The drought permit application is for permission to alter the abstraction regime for the River Wharfe at Lobwood licence. This will not impact on water quality for public supply.

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4 Typically impacts represented as the difference in daily average conditions for the baseline (67 ML/d) and drought permit (88 ML/d).
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 are applying for drought permits for implementation until 31st March 2019 to aid reservoir stock recovery.

As we operate to balance supplies across our region it has resulted in low stocks in the majority of our reservoirs. Table 6.1 lists all the permit applications we are currently discussing with the Environment Agency and intend to submit during November and December 2018. We are phasing the submission of applications and the River Wharfe at Lobwood is the first. Notices of each application will be sent to interested parties and uploaded on our website at the same time as this formal submission to the Environment Agency.

<table>
<thead>
<tr>
<th>Permit application</th>
<th>Drought Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>River Wharfe at Lobwood abstraction Licence</td>
<td>Increase annual licence volume and reduce support from Grimwith Reservoir at low flows</td>
</tr>
<tr>
<td>River Derwent at Loftsome Bridge</td>
<td>Transfer abstraction licence permissions from Elvington abstraction point on the River Derwent to Loftsome Bridge abstraction point downstream.</td>
</tr>
<tr>
<td>South Yorkshire – Scout Dyke, Underbank/Midhope, Damflask and Rivelin Reservoirs and Dunford Bridge maintained flow</td>
<td>Reduce compensation releases</td>
</tr>
<tr>
<td>North Yorkshire – Leighton Reservoir and Lindley Wood Reservoir</td>
<td>Reduce compensation releases</td>
</tr>
<tr>
<td>North West Yorkshire – Doe Park and Eldwick Reservoirs</td>
<td>Reduce compensation releases</td>
</tr>
<tr>
<td>South West Yorkshire - Booth Wood, Ryburn, Brownhill, Digley, Gorple Lower, Walshaw Dean Lower, Widdop, Ogden, Butterley, Scammonden, Doe Park and Eldwick reservoirs and maintained flows at Springhead Weir and Slitheroe Bridge.</td>
<td>Reduce compensation releases</td>
</tr>
</tbody>
</table>

Table 6.1: Drought permit applications

In addition to the drought permit applications listed in Table 6.1 we have reduced the compensation flow release from Holme Styes Reservoir in our South West Area. Holme Styes is not linked to public water supply and releases are for compensation to the downstream watercourse only. The releases from Holme Styes are defined by a flow trial agreement between the Environment Agency and Yorkshire Water and are greater than the statutory compensation flow we are legally required to provide. A drought permit is not required for reducing the compensation flow from Holme Styes as we are not reducing it below the legal requirement.
We are also considering reducing the compensation flow from Thruscross Reservoir in our North Area, which is used to support a public water supply reservoir. We will only do this if there is a risk Thruscross Reservoir cannot support the current compensation flows. We do not require a drought permit for this action as there is no legal requirement to release flow from the reservoir.

If we receive sufficient rainfall during the winter of 2018/19 we may reduce the number of permit applications or we may no longer submit any.

If we do not receive sufficient reservoir refill for our region to be no longer in drought by 1st April 2019 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 are currently researching customer attitudes to water conservation and we are planning an “open data” event on our weekly water resource data (e.g. reservoir levels, demand data).

In 2019 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 are working in partnership with the Environment Agency on an innovative approach to deliver water efficiency, which will initially be implemented as a pilot in the Yorkshire region then we will work with other water companies to deliver nationally.

During the winter of 2018/19 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.

Analysis has been undertaken to determine “winter hotspots” (areas where we have had most contacts previously linked to frozen pipes) and areas where we may have resilience issues around water supply. 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. The advertising will be geo-targeted to relevant areas, and we will have the ability to upscale activity should the weather take a turn for the worse.

As part of the campaign we are looking to create a limited number of free winter packs for customers to order on line, these will link in with the free water saving packs and offer additional items such as pipe lagging and tap covers. We are also looking to work with a partner in hotspot areas to install winter kits in homes that are more susceptible to frozen pipes, and for customers who we know need extra help through our priority services register.

Alongside the overall winter campaign, we will be promoting our Priority Services Register to ensure we know about customers who need an extra bit of help. This message will also be targeted at three areas that we have identified as hotspots. Media activity and campaign messaging will be targeted on the relevant channels to have maximum impact.

If we are still in drought by the end of winter, we will redirect our advice to summer water use and repeat the activities described in Section 0. If stocks do recover over winter, we will still deliver a summer water saving campaign as we routinely do each year regardless of reservoir levels. Table 6.2 provides a summary of the actions we are planning for winter 2018/19 and spring / summer 2019. During 2019, if reservoir stocks reach the trigger (regional reservoirs stocks six weeks from crossing the DCL) for implementing water use restrictions, these will be imposed following current legislation
and the UKWIR Code of Practice on water use restrictions (Managing through droughts: code of practice and guidance for water companies on water use restrictions, UKWIR 2013).

There is a risk we will be required to apply for summer drought permits in 2019 but the applications we are submitting in 2018 will reduce this risk and therefore reduce the potential for more severe environmental impacts.

A severe shortage of rainfall in 2019 may also result in an increased number of permit applications than the list provided in Table 6.1. This will depend on reservoir stocks. If our water resource modelling shows regional reservoir stocks to be four weeks from crossing the DCL it will trigger drought permit applications.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer research on attitudes to water conservation</td>
<td>October / November</td>
</tr>
<tr>
<td>Announce publication of water resource data through Open Data and plan to run joint campaign with Environment Agency</td>
<td>November</td>
</tr>
<tr>
<td>Development workshop with Environment Agency to develop next water conservation campaign</td>
<td>November</td>
</tr>
<tr>
<td>Winter ready campaign launches</td>
<td>November</td>
</tr>
<tr>
<td>Launch of joint EA/YW water conservation campaign</td>
<td>Early 2019</td>
</tr>
<tr>
<td>Step up water conservation campaign activity</td>
<td>Spring 2019</td>
</tr>
<tr>
<td>Full water conservation campaign running (scaled to meet level of need)</td>
<td>Summer 2019</td>
</tr>
</tbody>
</table>

Table 6.2 Water saving actions for 2018/19

### 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 in 2019. These options will provide additional resources for public supply and will only be implemented if there is a risk 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 2018 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 has been 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 30 November 2018. A copy of the notice is provided in Appendix 2.

The notice will be advertised on 22 November 2018 in the Craven Herald, which is circulated in the area potentially affected if the permit is granted, and on 15 November 2018 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 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 have been 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 were made available at the following locations from 15 November 2018:

- 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.
- Environment Agency, Lateral, 8 City Walk, Leeds, LS11 9AT.

Prior to submitting the application to the Environment Agency, we consulted with a number of organisations with an interest in the area potentially impacted by the application is granted. These are discussed below.

7.2 Environment Agency

We met with our local Environment Agency in July 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**

We have notified Natural England of our intention to submit drought permit applications for the winter of 2018/19. If there is potential for a proposed drought permit to impact on a designated area we are required to consult Natural England prior to submitting the application.

For the River Wharfe at Lobwood application we have consulted Natural England on the potential impact of the proposed drought permit on East Keswick Fitts SSSI. This was as a result of the sensitivity of the site to a November to March Drought Permit being initially assessed as “uncertain”. Further assessment was carried out and, following consultation with Natural England, it was agreed that high-flow events would be negligibly impacted, and no further assessment is required. This was agreed with Natural England via email on 2 November 2018.

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

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Samples of creative used during the campaign are provided below
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 PERMIT
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 a drought permit under section 79A of the Water Resources Act 1991 in the River Wharfe catchment.

The drought permit is intended to apply until 31 March 2019 inclusive and proposes to increase the annual abstraction limit at Lobwood abstraction point on the River Wharfe and amend the Grimwith Reservoir releases during low flows.

Lobwood abstraction (grid reference SE 07 51) and Grimwith Reservoir releases (grid reference SE 06 64)

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 entitled 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 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 increase its annual abstraction limit to 27,397,000 cubic meters (an increase of 3,655,000 cubic meters) for the licensing year 2018/19 and, from the date which the permit is granted until 31 March 2019 inclusive, 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.

Yorkshire Water is also entitled 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”). The licence conditions for the Yorkshire Water abstraction at Arthington 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 permit, 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.

The increase in the annual abstraction from the River Wharfe at Lobwood has potential to impact on the River Wharfe downstream of the abstraction point and the River Dibb and River Wharfe downstream of the Grimwith Reservoir. 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.
- Environment Agency, Lateral, 8 City Walk, Leeds, LS11 9AT.

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 23 November 2018. Objectors may send a copy of their objection to the address below.

Objectors may send a copy of their objection to Western House, Halifax Road, Bradford, BD6 2SZ or publicaffairs@yorkshirewater.co.uk.

Dated: 15 November 2018
Signed: Pamela Doherty Perminder Kaur
                Director of Service Delivery Head of Legal Services