Monthly water situation report: Yorkshire Area

1 Summary - April 2024

Monthly rainfall was classed as notably high in most catchments. River flows were well above average. The highest flow peaks of the month occurred in the first week in the Pennine catchments and in the last few days of April in the Derwent, Rye and Esk. Groundwater levels were higher than normal for April in all aquifers. Reservoir stocks also remained above average and soils were wet.

1.1 Rainfall

April was a wet month; Yorkshire's catchments received between 144% and 199% of long term average (LTA) rainfall.

In the Pennine catchments rainfall was concentrated in the first half of the month. Rain gauges in the Dales catchments, the Calder and upper Don recorded between 75% and 90% of their April 2024 total by the end of day 15. The 16 to 26 April was a more settled period with a further wet episode on day 27.

In central and east Yorkshire rainfall was more even through the month. Rainfall was frequent in the Esk, Ouse, Rye and Derwent while a more settled period occurred in the Hull catchment during the second and third weeks.

The rainfall event from late on the 27 to the morning of 28 April was more significant in the south and east of the area than in the western Pennines. Totals of 20 to 30mm were recorded in the Rye, Derwent, Esk and Hull catchments.

The Met Office Had-UK data set from 1871 to present shows that it continued to be a wet start to 2024 and was the third wettest January to April for Yorkshire as a whole.

1.2 Soil moisture deficit

Yorkshire's soils started the month fully saturated and by the end of the month, all soils were still classified as wet with minimal change throughout the month.

1.3 River flows

In the Pennine catchments monthly mean flows were between 160% and 245% of the LTA. Flows were classified as above normal in the Don and Rother but exceptionally high on the responsive upper catchments of the Ure, Wharfe, Aire and Calder. Monthly mean flow in the Derwent was notably high at 169% of the LTA. In the east of the Area in the Chalk-fed West Beck monthly mean flows were slightly lower at 148% of the LTA.

The Pennine fed rivers started the month with daily mean flows generally in the above to notably high range, which was maintained until day 21 to 23 when flows reduced to the normal range. During the first 21 to 23 days, flows reached exceptionally high for short periods in

response to rainfall events. In the Don and Rother catchments flows also reached exceptionally high on day 28 in response to rainfall.

River flows in the Derwent and Rye were also above normal to notably high for the first three weeks of April and, like the Don catchment, also reached exceptionally high on day 28 in response to rainfall.

River flows in the West Beck responded differently to other catchments in Yorkshire maintaining above normal flows for the entire month. There was a gradual decline in flows caused by reducing groundwater spring flow from the Chalk. On day 28 river flows increased marginally in response to rainfall.

1.4 Groundwater levels

Magnesian Limestone

The groundwater level within the Magnesian Limestone at Brick House Farm decreased but remained exceptionally high for the time of year.

Millstone Grit

The groundwater level increased within the Millstone Grit at Hill Top Farm and returned to exceptionally high for the time of year. It *should be noted that this observation borehole is used for water abstraction by means of a pump. Therefore the groundwater level recorded here may be subject to the effects of this.*

Sherwood Sandstone

The groundwater level in the Sherwood Sandstone remained constant at both Great Ouseburn (exceptionally high) and Riccall Approach Farm (notably high).

Corallian Limestone

The groundwater level increased within the Corallian Limestone at Sproxton and was above normal for the time of year.

Chalk

The groundwater level decreased at both Wetwang (northern Yorkshire Wolds chalk) and Dalton Estate (central Yorkshire Wolds chalk). Wetwang remained within the above normal range and Dalton Estate remained within the notably high range.

1.5 Reservoir stocks

Minimal change of reservoir stocks occurred throughout the month. The rain that occurred within the month kept the reservoir stocks stable and close to capacity.

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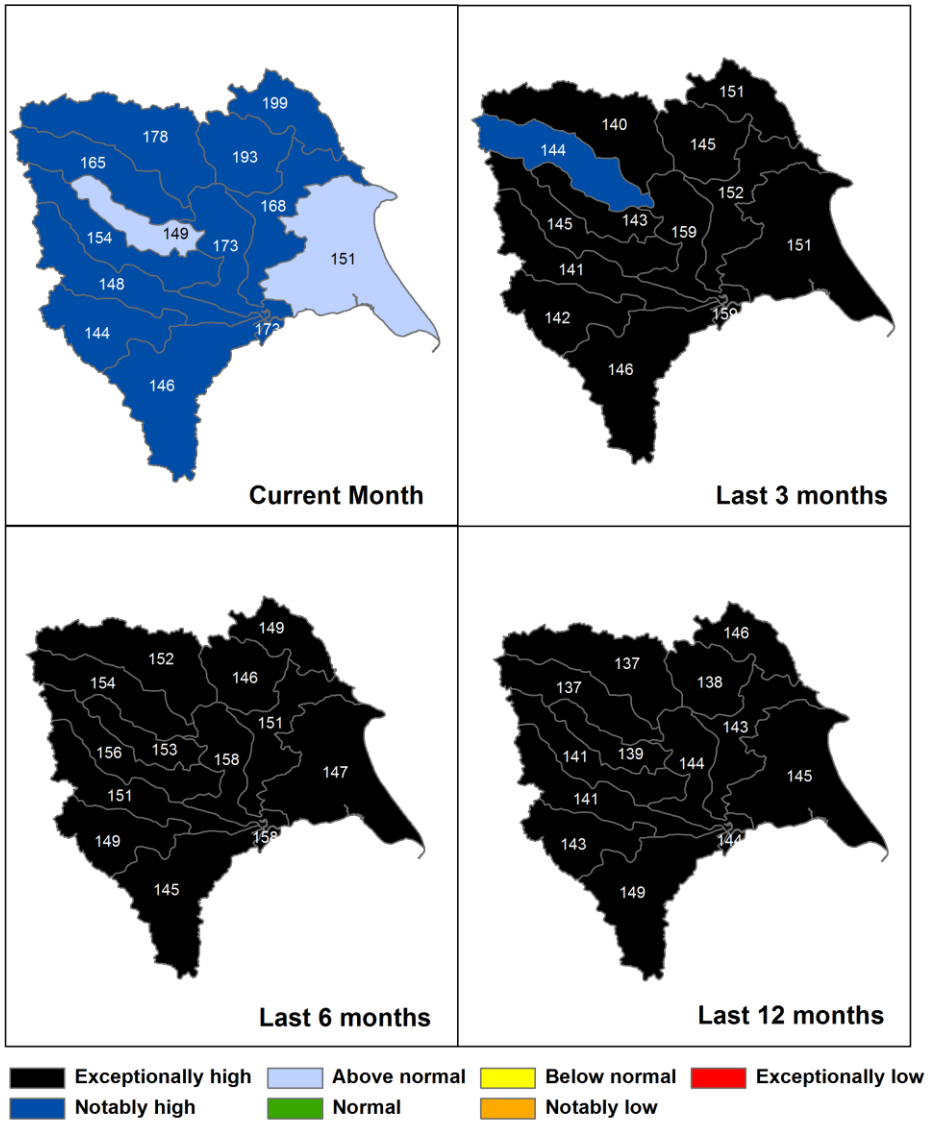
2 Rainfall

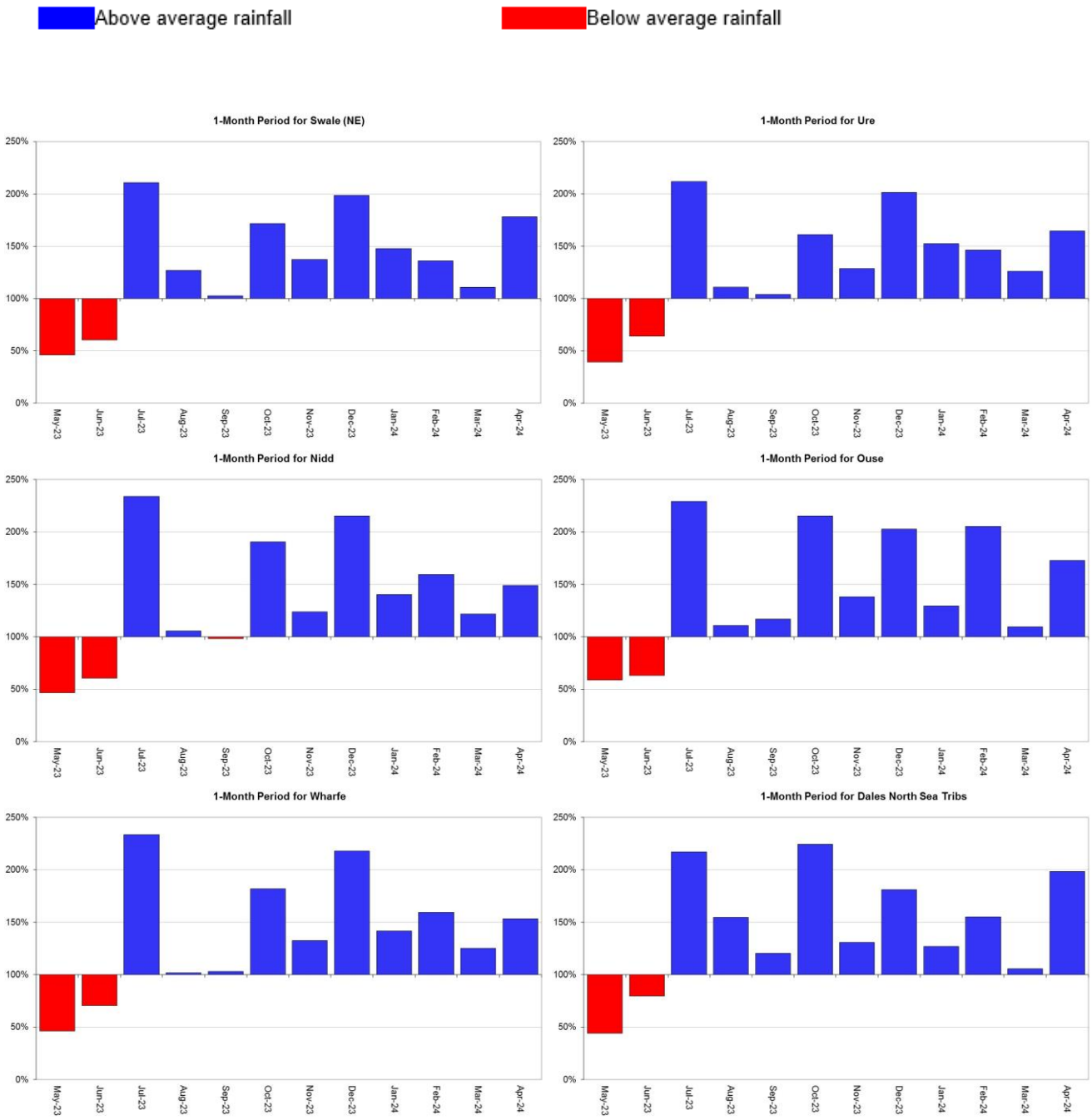
2.1 Rainfall map

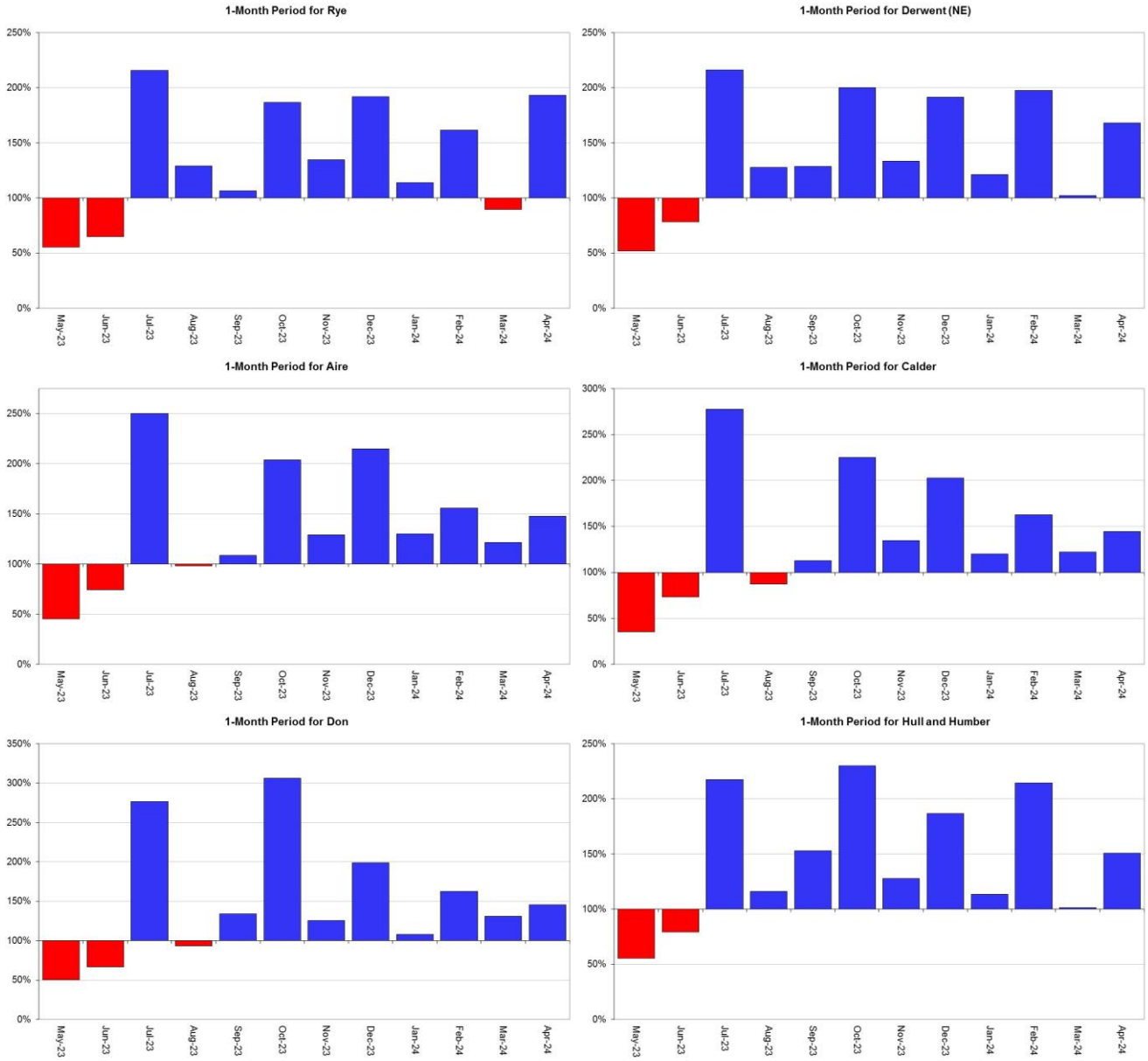
Figure 2.1: Total rainfall for hydrological areas for the current month (up to 30 April 2024), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. Table available in the appendices with detailed information.



2.2 Rainfall charts

Figure 2.2: Monthly rainfall totals for the past 24 months as a percentage of the 1961 to 1990 long term average for each region and for England.



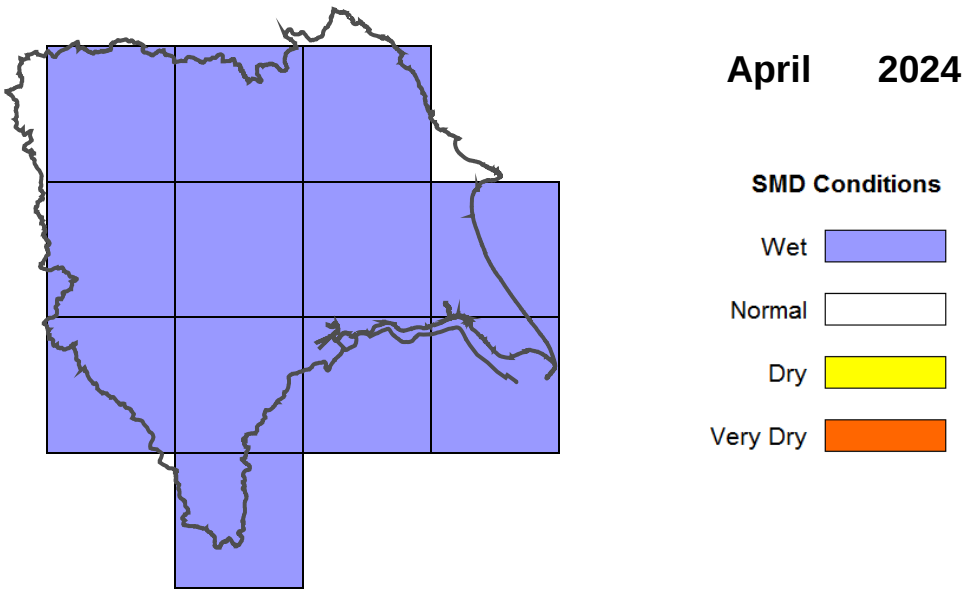


Rainfall data for 2023, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived from registered rain gauges (Source: Met Office. Crown copyright, 2024).

3 Soil moisture deficit

3.1 Soil moisture deficit map

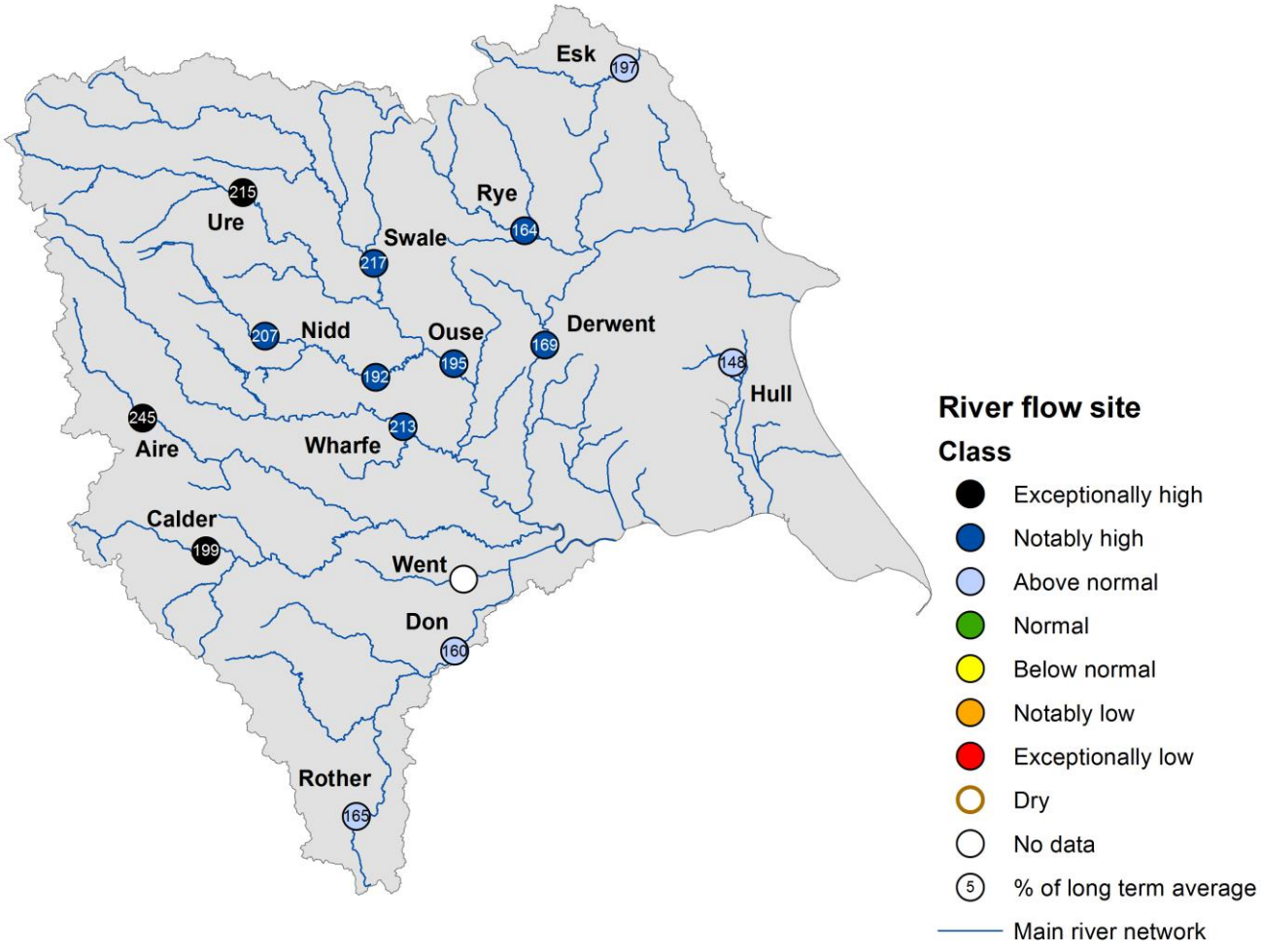
Figure 3.1: Soil moisture deficits for weeks ending 30 April 2024. Shows the difference (mm) of the actual soil moisture deficit from the 1961 to 1990 long term average soil moisture deficits. MORECS data for real land use.



4 River flows

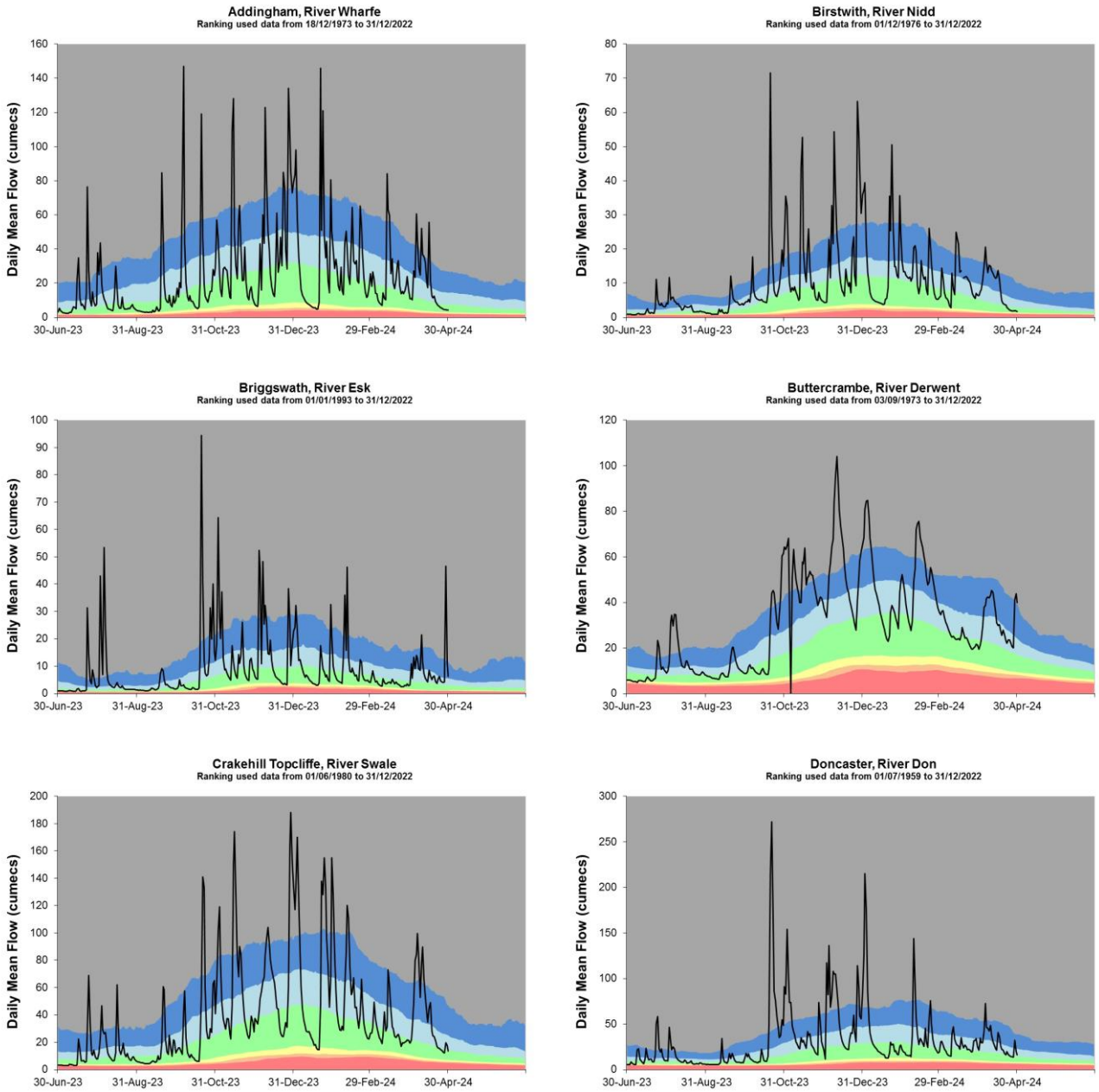
4.1 River flows map

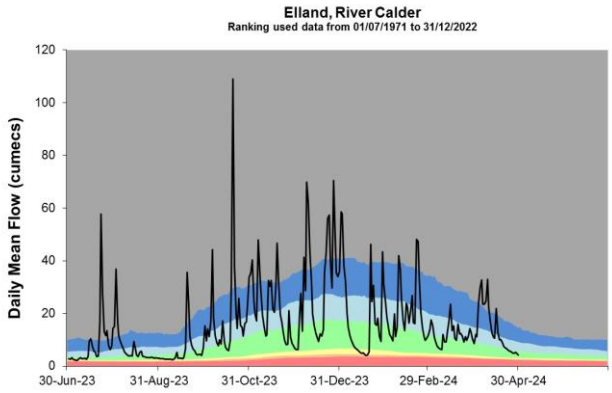
Figure 4.1: Monthly mean river flow for indicator sites for April 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic April monthly means Table available in the appendices with detailed information.

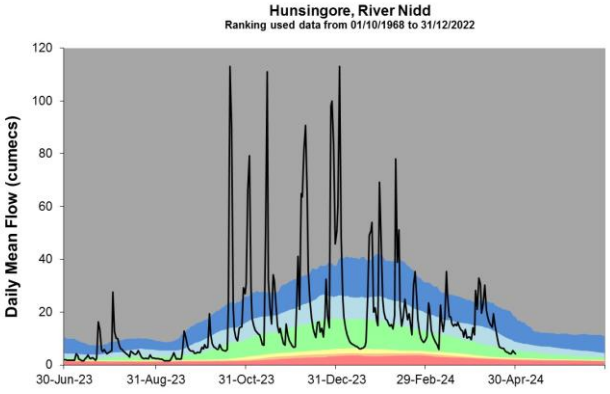


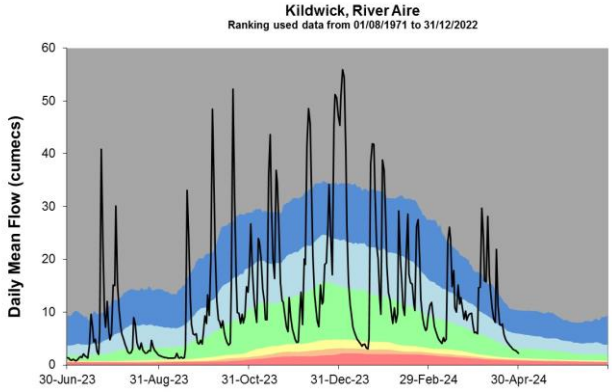
4.2 River flow charts

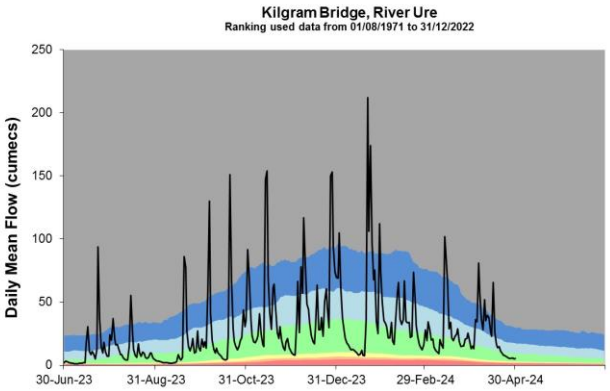
Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows, and long term maximum and minimum flows.

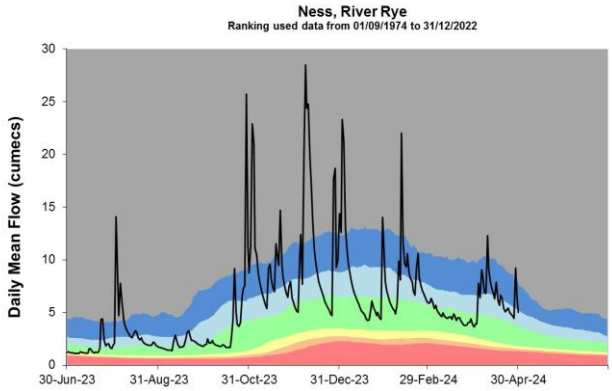


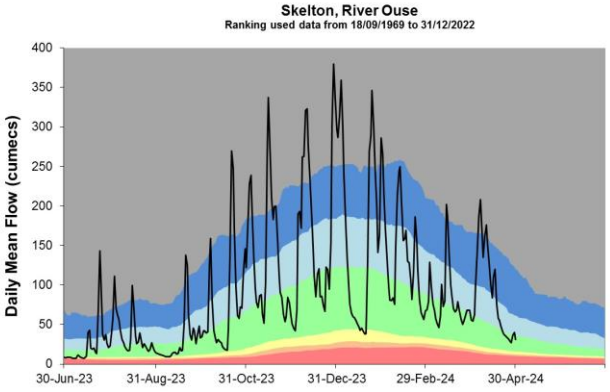

Elland, River Calder
Ranking used data from 01/07/1971 to 31/12/2022
Daily Mean Flow (cumecs)
0
20
40
60
80
100
120
30-Jun-23
31-Aug-23
31-Oct-23
31-Dec-23
29-Feb-24
30-Apr-24

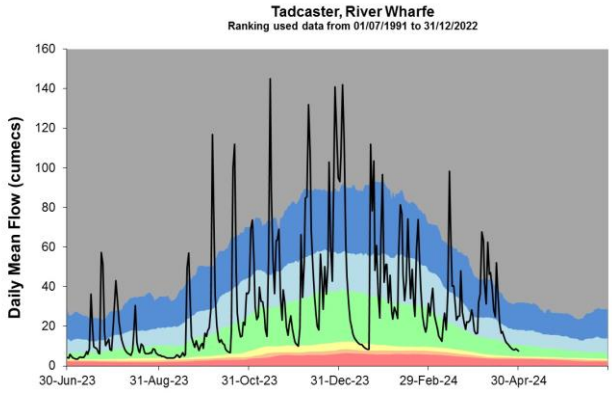

Hunsingore, River Nidd
Ranking used data from 01/10/1968 to 31/12/2022
Daily Mean Flow (cumecs)
0
20
40
60
80
100
120
30-Jun-23
31-Aug-23
31-Oct-23
31-Dec-23
29-Feb-24
30-Apr-24

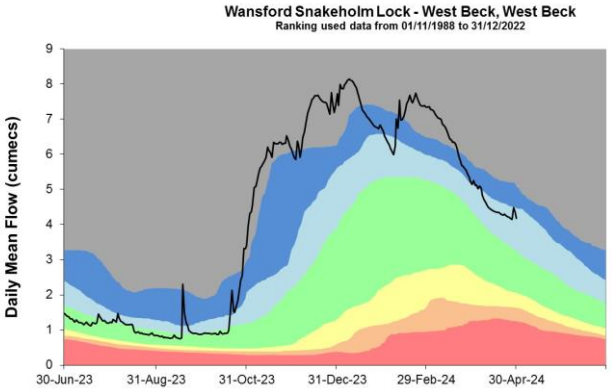

Kildwick, River Aire
Ranking used data from 01/08/1971 to 31/12/2022
Daily Mean Flow (cumecs)
0
10
20
30
40
50
60
30-Jun-23
31-Aug-23
31-Oct-23
31-Dec-23
29-Feb-24
30-Apr-24

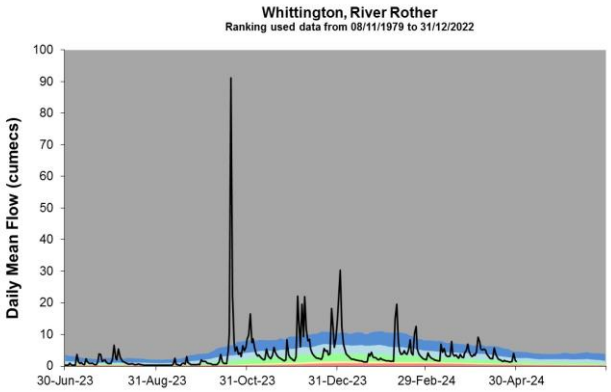

Kilgram Bridge, River Ure
Ranking used data from 01/08/1971 to 31/12/2022
Daily Mean Flow (cumecs)
0
50
100
150
200
250
30-Jun-23
31-Aug-23
31-Oct-23
31-Dec-23
29-Feb-24
30-Apr-24


Ness, River Rye
Ranking used data from 01/09/1974 to 31/12/2022
Daily Mean Flow (cumecs)
0
5
10
15
20
25
30
30-Jun-23
31-Aug-23
31-Oct-23
31-Dec-23
29-Feb-24
30-Apr-24


Skelton, River Ouse
Ranking used data from 18/09/1969 to 31/12/2022
Daily Mean Flow (cumecs)
0
50
100
150
200
250
300
350
400
30-Jun-23
31-Aug-23
31-Oct-23
31-Dec-23
29-Feb-24
30-Apr-24



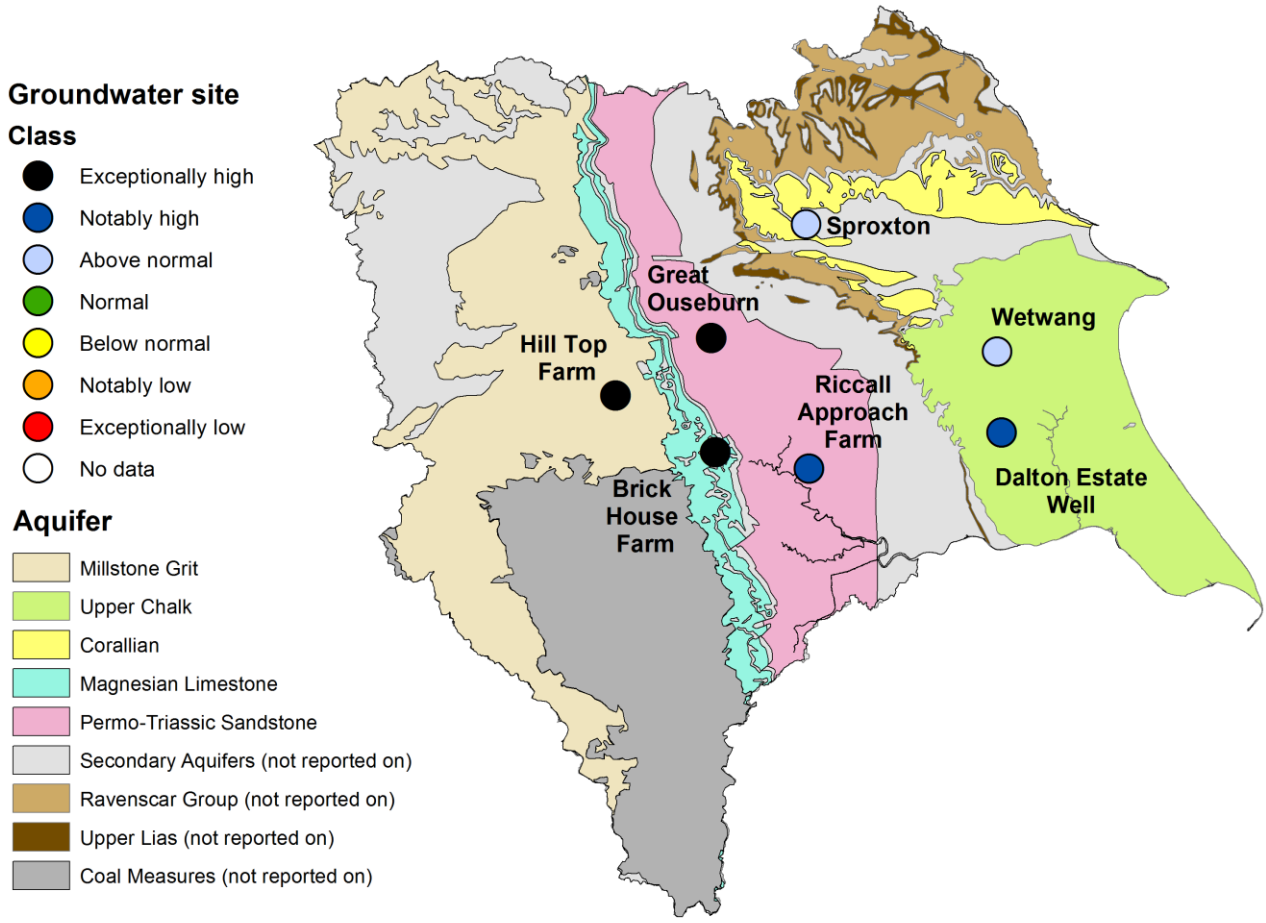




5 Groundwater levels

5.1 Groundwater levels map

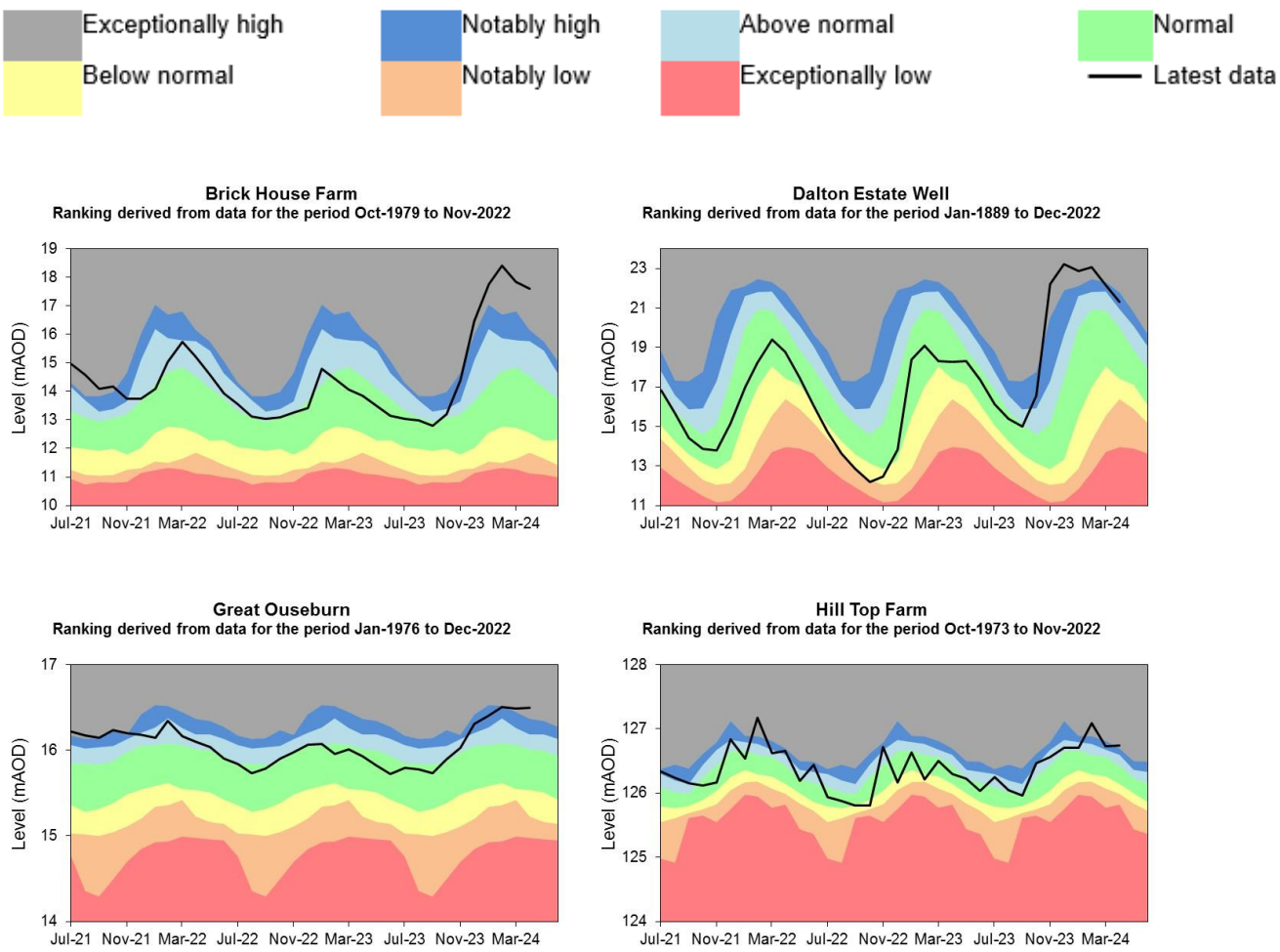
Figure 5.1: Groundwater levels for indicator sites at the end of April 2024, classed relative to an analysis of respective historic April levels. Table available in the appendices with detailed information.

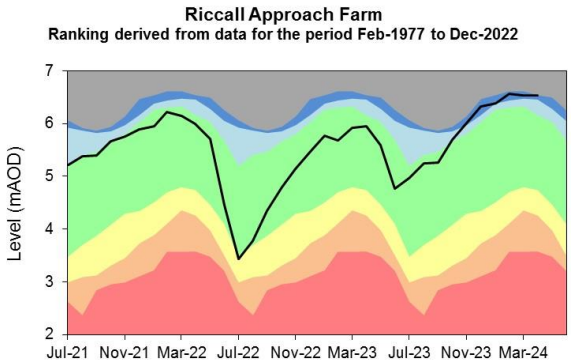


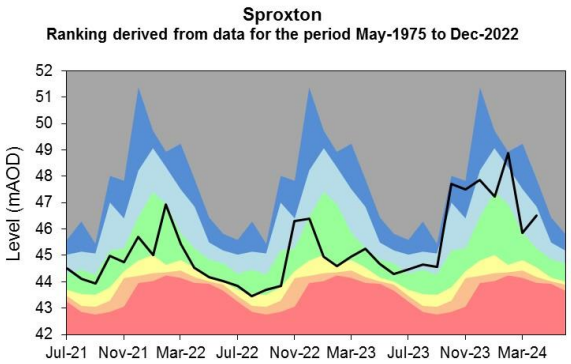
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

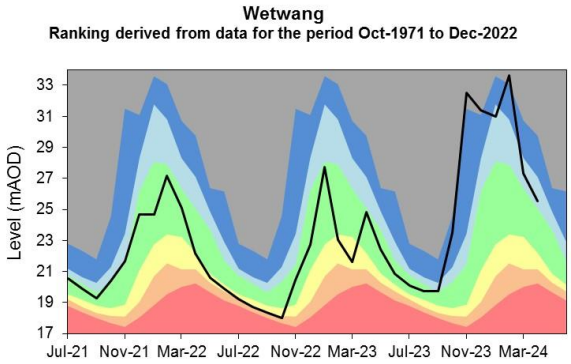
5.2 Groundwater level charts

Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 22 months compared to an analysis of historic end of month levels.





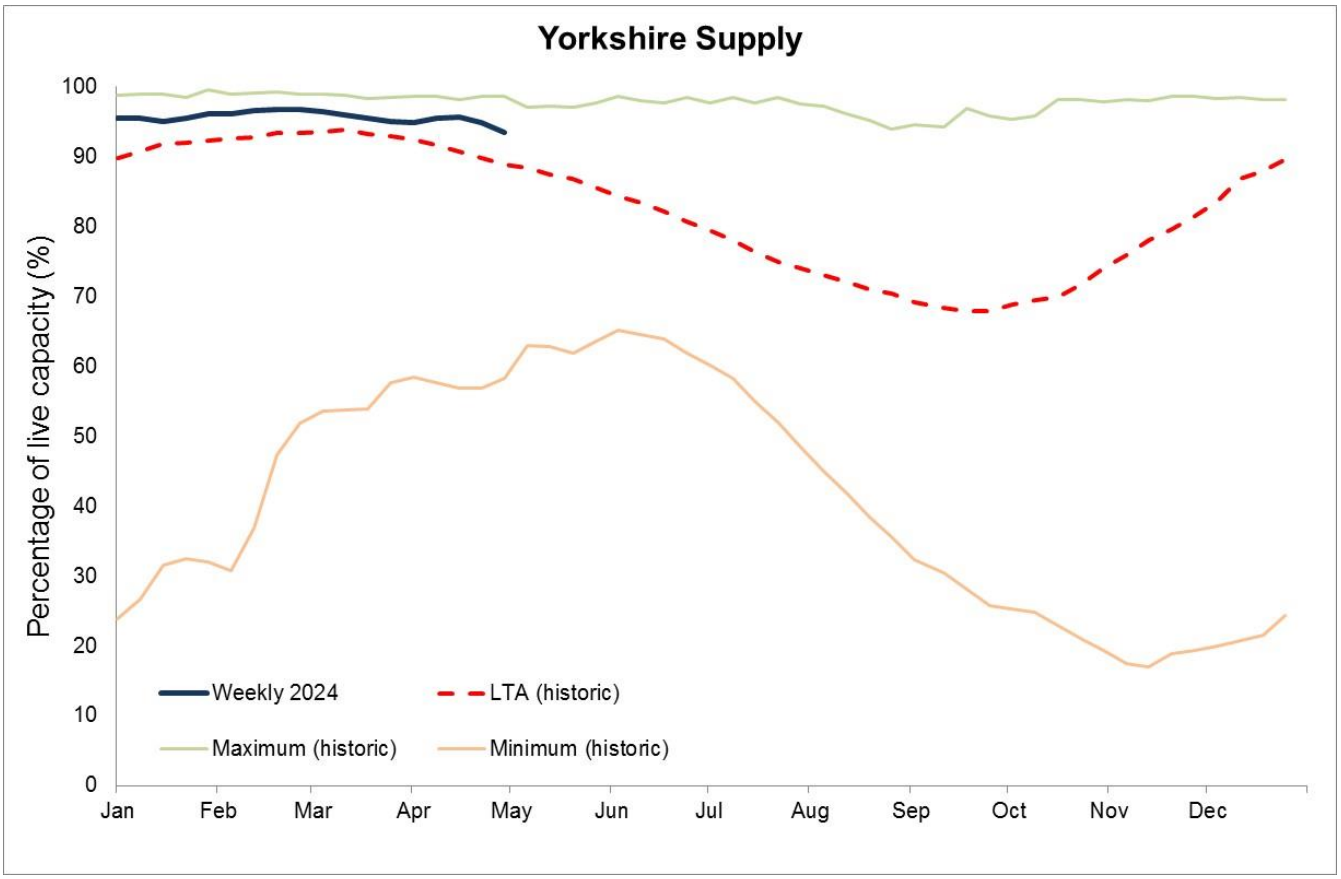




 N.B. Hill Top Farm observation borehole is used for abstraction. Therefore the groundwater level record will be directly affected by pumping

6 Reservoir stocks

Figure 6.1: End of month regional reservoir stocks compared to long term maximum, minimum and average stocks. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in length.



7 Glossary

7.1 Terminology

Aquifer

A geological formation able to store and transmit water.

Areal average rainfall

The estimated average depth of rainfall over a defined area. Expressed in depth of water (mm).

Artesian

The condition where the groundwater level is above ground surface but is prevented from rising to this level by an overlying continuous low permeability layer, such as clay.

Artesian borehole

Borehole where the level of groundwater is above the top of the borehole and groundwater flows out of the borehole when unsealed.

Cumecs

Cubic metres per second (m^{3s-1}).

Effective rainfall

The rainfall available to percolate into the soil or produce river flow. Expressed in depth of water (mm).

Flood alert and flood warning

Three levels of warnings may be issued by the Environment Agency. Flood alerts indicate flooding is possible. Flood warnings indicate flooding is expected. Severe flood warnings indicate severe flooding.

Groundwater

The water found in an aquifer.

Long term average (LTA)

The arithmetic mean calculated from the historic record, usually based on the period 1961 to 1990. However, the period used may vary by parameter being reported on (see figure captions for details).

mAOD

Metres above ordnance datum (mean sea level at Newlyn Cornwall).

MORECS

Met Office Rainfall and Evaporation Calculation System. Met Office service providing real time calculation of evapotranspiration, soil moisture deficit and effective rainfall on a 40 by 40 km grid.

Naturalised flow

River flow with the impacts of artificial influences removed. Artificial influences may include abstractions, discharges, transfers, augmentation and impoundments.

NCIC

National Climate Information Centre. NCIC area monthly rainfall totals are derived using the Met Office 5 km gridded dataset, which uses rain gauge observations.

Recharge

The process of increasing the water stored in the saturated zone of an aquifer. Expressed in depth of water (mm).

Reservoir gross capacity

The total capacity of a reservoir.

Reservoir live capacity

The capacity of the reservoir that is normally usable for storage to meet established reservoir operating requirements. This excludes any capacity not available for use (for example, storage held back for emergency services, operating agreements or physical restrictions). May also be referred to as ‘net’ or ‘deployable’ capacity.

Soil moisture deficit (SMD)

The difference between the amount of water actually in the soil and the amount of water the soil can hold. Expressed in depth of water (mm).

7.2 Categories

Exceptionally high

Value likely to fall within this band 5% of the time.

Notably high

Value likely to fall within this band 8% of the time.

Above normal

Value likely to fall within this band 15% of the time.

Normal

Value likely to fall within this band 44% of the time.

Below normal

Value likely to fall within this band 15% of the time.

Notably low

Value likely to fall within this band 8% of the time.

Exceptionally low

Value likely to fall within this band 5% of the time.

8 Appendices

8.1 Rainfall table

Hydrological area	Apr 2024 rainfall % of long term average 1961 to 1990	Apr 2024 band	Feb 2024 to April cumulative band	Nov 2023 to April cumulative band	May 2023 to April cumulative band
Aire	148	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Calder	144	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Dales North Sea Tribs	199	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Derwent (ne)	168	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Don	146	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Hull And Humber	151	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Nidd	149	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Ouse	173	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Rye	193	Notably High	Exceptionally high	Exceptionally high	Exceptionally high

Swale (ne)	178	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Ure	165	Notably High	Notably high	Exceptionally high	Exceptionally high
Wharfe	154	Notably High	Exceptionally high	Exceptionally high	Exceptionally high

8.2 River flows table

Site name	River	Catchment	Apr 2024 band	Mar 2024 band
Addingham	Wharfe	Wharfe Middle	Exceptionally high	Above normal
Birstwith	Nidd	Nidd Middle	Notably high	Notably high
Briggswath	Esk	Esk Yorks	Above normal	Normal
Buttercrambe	Derwent	Derwent Yorks Middle	Notably high	Normal
Crakehill Topcliffe	Swale	Swale Lower	Notably high	Normal
Doncaster	Don	Don Lower	Above normal	Above normal
Elland	Calder	Calder Yorks Upper	Exceptionally high	Normal
Hunsingore	Nidd	Nidd Lower	Notably high	Notably high
Kildwick	Aire	Aire Upper	Exceptionally high	Above normal
Kilgram Bridge	Ure	Ure Middle	Exceptionally high	Above normal
Ness	Rye	Rye	Notably high	Normal
Skelton	Ouse	Ouse Yorks	Notably high	Normal
Tadcaster	Wharfe	Wharfe Lower	Notably high	Above normal

Wansford Snakeholm Lock	West Beck	Hull Upper	Above normal	Exceptionally high
Whittington	Rother	Rother Yorks	Above normal	Above normal

8.3 Groundwater table

Site name	Aquifer	End of Apr 2024 band	End of Mar 2024 band
Dalton Estate Well	Hull & East Riding Chalk	Notably high	Notably high
Wetwang	Hull & East Riding Chalk	Above normal	Above normal
Hill Top Farm	Millstone Grit	Exceptionally high	Notably high
Great Ouseburn	Sherwood Sandstone	Exceptionally high	Exceptionally high
Riccall Approach Farm	Sherwood Sandstone	Notably high	Notably high
Sproxton	Corallian Limestone	Above normal	Normal
Brick House Farm	Wharfe Magnesian Limestone	Exceptionally high	Exceptionally high