Monthly water situation report: Yorkshire Area

1 Summary - May 2024

May was a drier month, although included wet spells in the second part of the month. River flows declined from the previous month and most monthly mean flows were above normal. Reservoir stocks remained near capacity. Groundwater levels declined. Soils started to drain but due to rainfall soon returned back to wet by month end.

1.1 Rainfall

May was a month of two parts, it began with dry conditions and then was followed by short intense episodes of rain that affected the majority of Yorkshire. The monthly mean rainfall was within above normal range for most catchments, with the exception of the Don, Rye and Derwent, which were within normal range and the Aire and Wharfe classified as notably high. The highest rainfall totals were captured in the Aire, which recorded 166% of the long term average (LTA). Other catchments recorded between 108% and 160% of the LTA, with wetter conditions in the west than in the east of Yorkshire.

Early in the month many rain gauges recorded minimal to no rain until around day 11. The Pennine catchments were affected by moderately heavy rain on the 12 May. During the second fortnight of the month there were two short intense periods of rainfall across Yorkshire, the first on day 21 to 22 and the other around day 26 to 28. Skipton Snaygill rain gauge recorded 80% of the monthly LTA on day 22 and at least 42% of the LTA on days 26 and 28.

1.2 Soil moisture deficit

Yorkshire's soils started the month fully saturated. Soil moisture deficit (SMD) gradually increased in the east and by week 3 soils in the mid and east of Yorkshire were classified as normal. By the end of week 4 all soils were again classified as wet and at month end only the lower Hull and Holderness had SMD just within the normal range.

1.3 River flows

The monthly mean flows were above normal for the Swale, Ure, Nidd, Ouse Wharfe, Derwent and upper Hull, mostly between 130% and 180% of the LTA. Similarly in the Calder, Don and Rother flows for the month were above normal at 112% to 143% of the LTA. May flow values were notably high in the Aire and to the east in the Esk and Rye. Overall in comparison to the previous month, the monthly mean flows across Yorkshire have all reduced considerably.

In the Pennine catchments flows started the month within normal range, which was maintained until around day 22, when in response to heavy rainfall flows increased to exceptionally high. The multiple rain events from day 21 onwards ensured that the flows remained in a high state

from day 22 until month end. Flows were most elevated in the Aire, reflecting the high rainfall, and monthly mean flow was 240% of the LTA.

Flows followed a similar pattern in the Don and Rother catchments to the south. For the first three weeks of May these rivers were classified within the normal range and then reached exceptionally high on day 22 in response to the widespread rainfall event. Flows receded towards month end.

Daily mean flows in the Rye and Derwent were above normal or notably high for the majority of May, supported by strong inflows from groundwater sources after the wet spring. Flows were receding gradually but increased again on day 22 to 24 in response to the widespread rainfall event.

In the east of the Area in the Chalk-fed West Beck flows continued to decline, but remained in the above normal range with a monthly mean 144% of the LTA for May.

1.4 Groundwater levels

Magnesian Limestone

The groundwater level within the Magnesian Limestone at Brick House Farm continues to decrease but remains exceptionally high for the time of year.

Millstone Grit

The groundwater level has decreased within the Millstone Grit at Hill Top Farm and is back to normal 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 Great Ouseburn (exceptionally high) but decreased in Riccall Approach Farm. Riccall Approach Farm remains notably high.

Corallian Limestone

The groundwater level decreased within the Corallian Limestone at Sproxton but is now notably high 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 is now in the normal range but Dalton Estate remains within the notably high range.

1.5 Reservoir stocks

A small 2.6% decline of overall reservoir stocks occurred throughout the month. The rain that occurred within the month kept the reservoir stocks replenished and 5% above average at the end of May.

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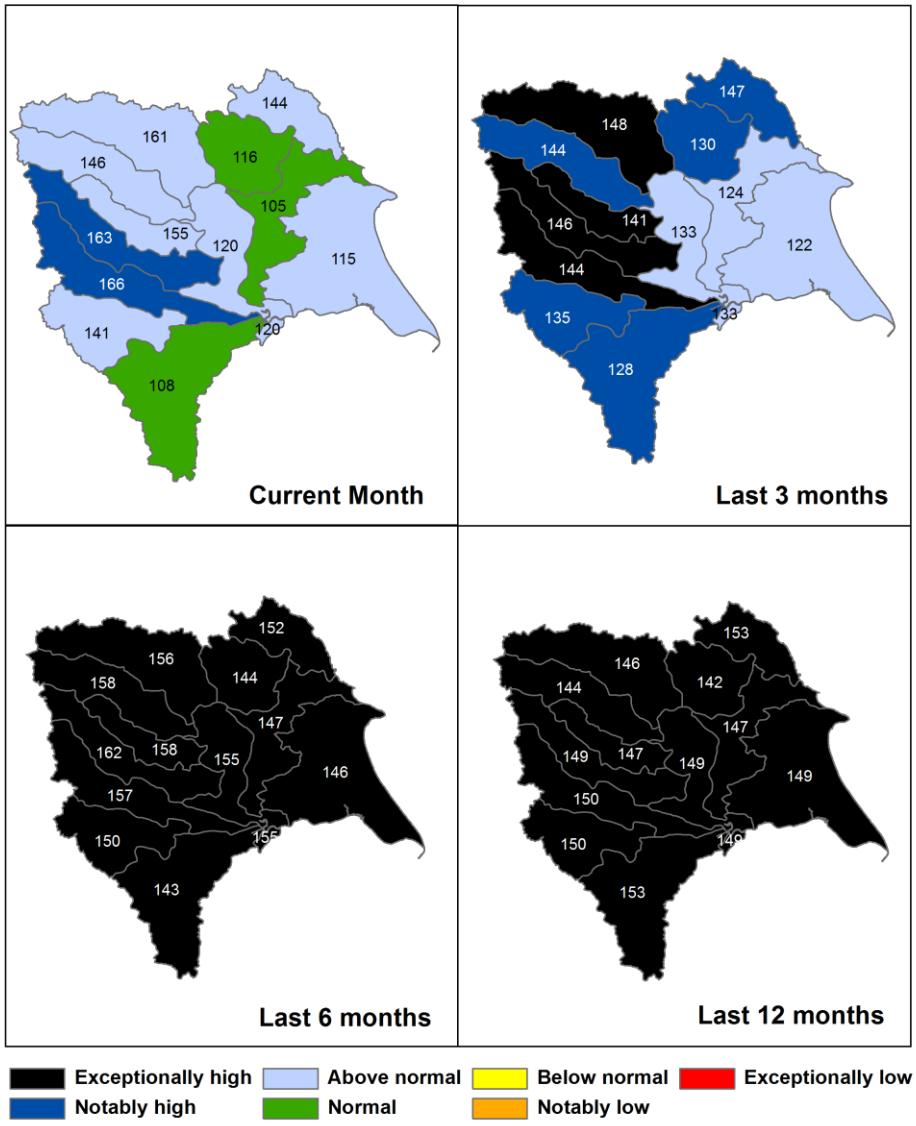
2 Rainfall

2.1 Rainfall map

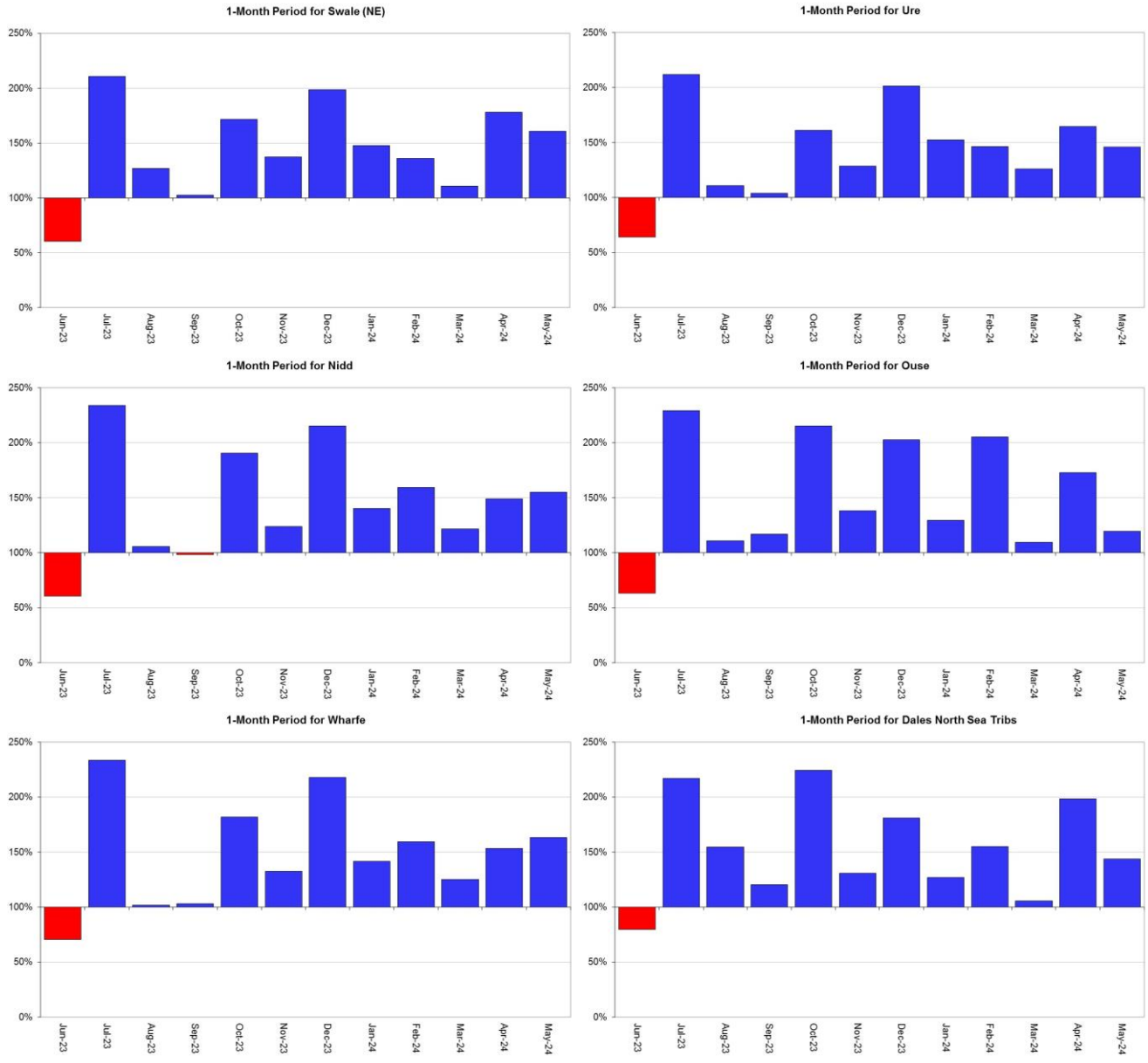
Figure 2.1: Total rainfall for hydrological areas for the current month (up to 31 May 2024), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. Table available in the appendices with detailed information.

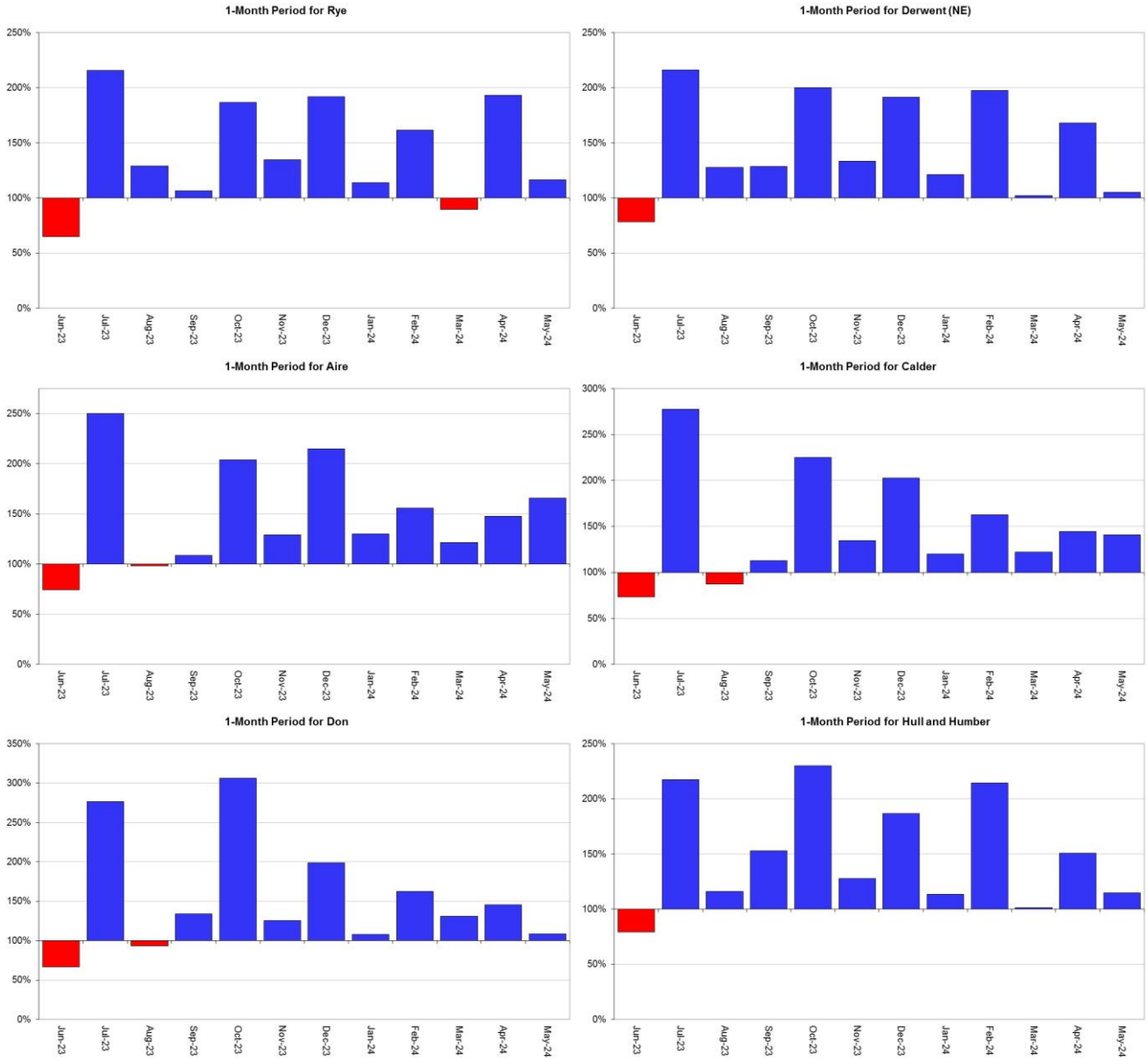


HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office. Crown copyright, 2024). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

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.



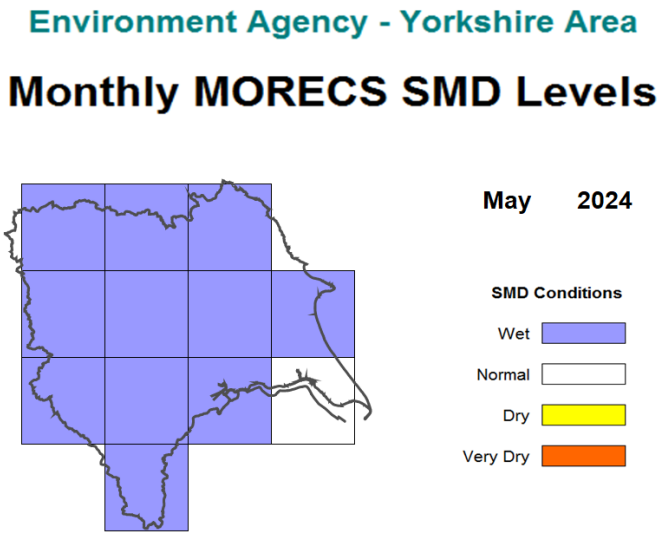


Rainfall data for 2023 and 2024, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset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

3 Soil moisture deficit

3.1 Soil moisture deficit map

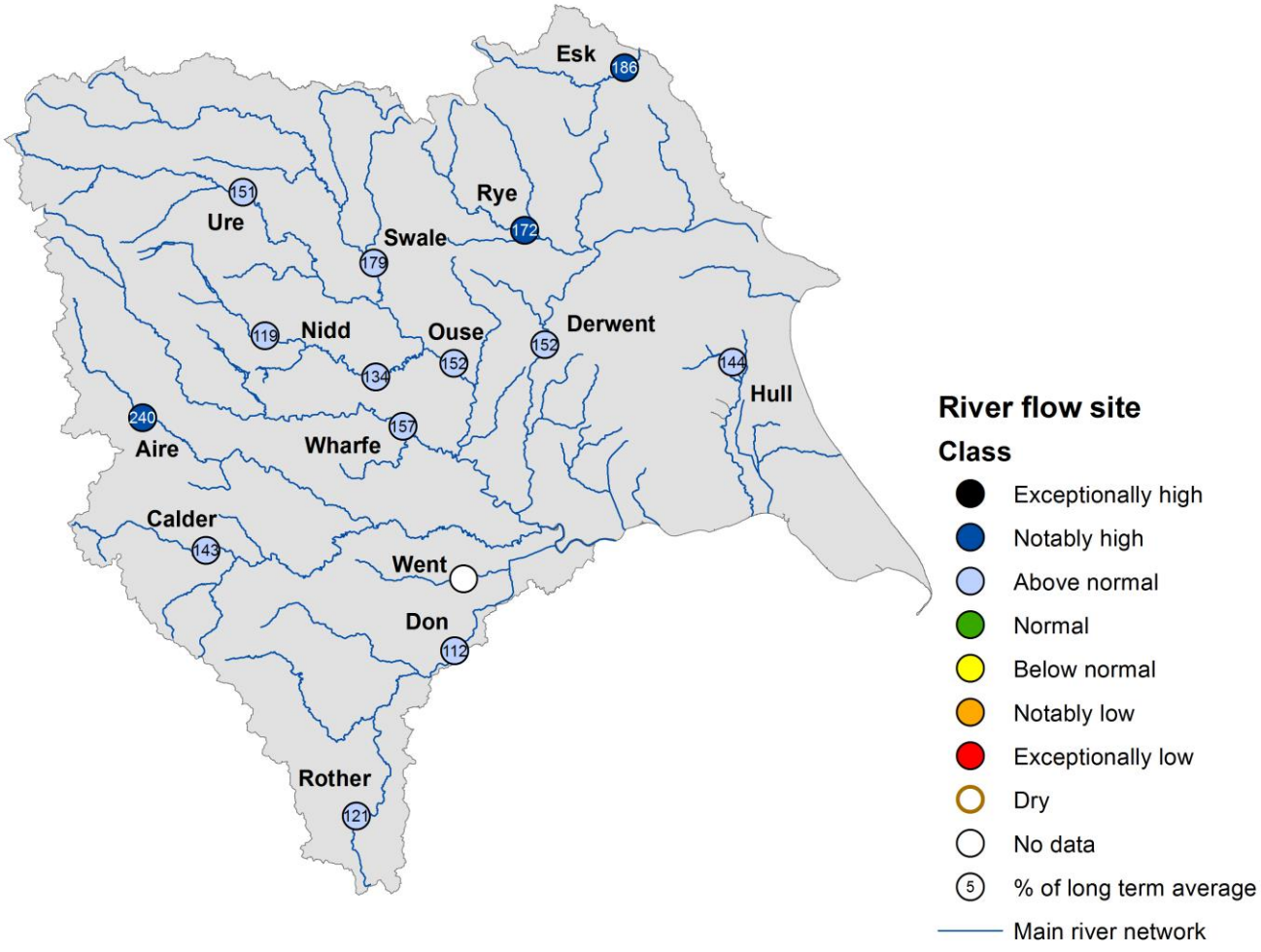
Figure 3.1: Soil moisture deficit for month ending 31 May 2024. MORECS data for grass.



4 River flows

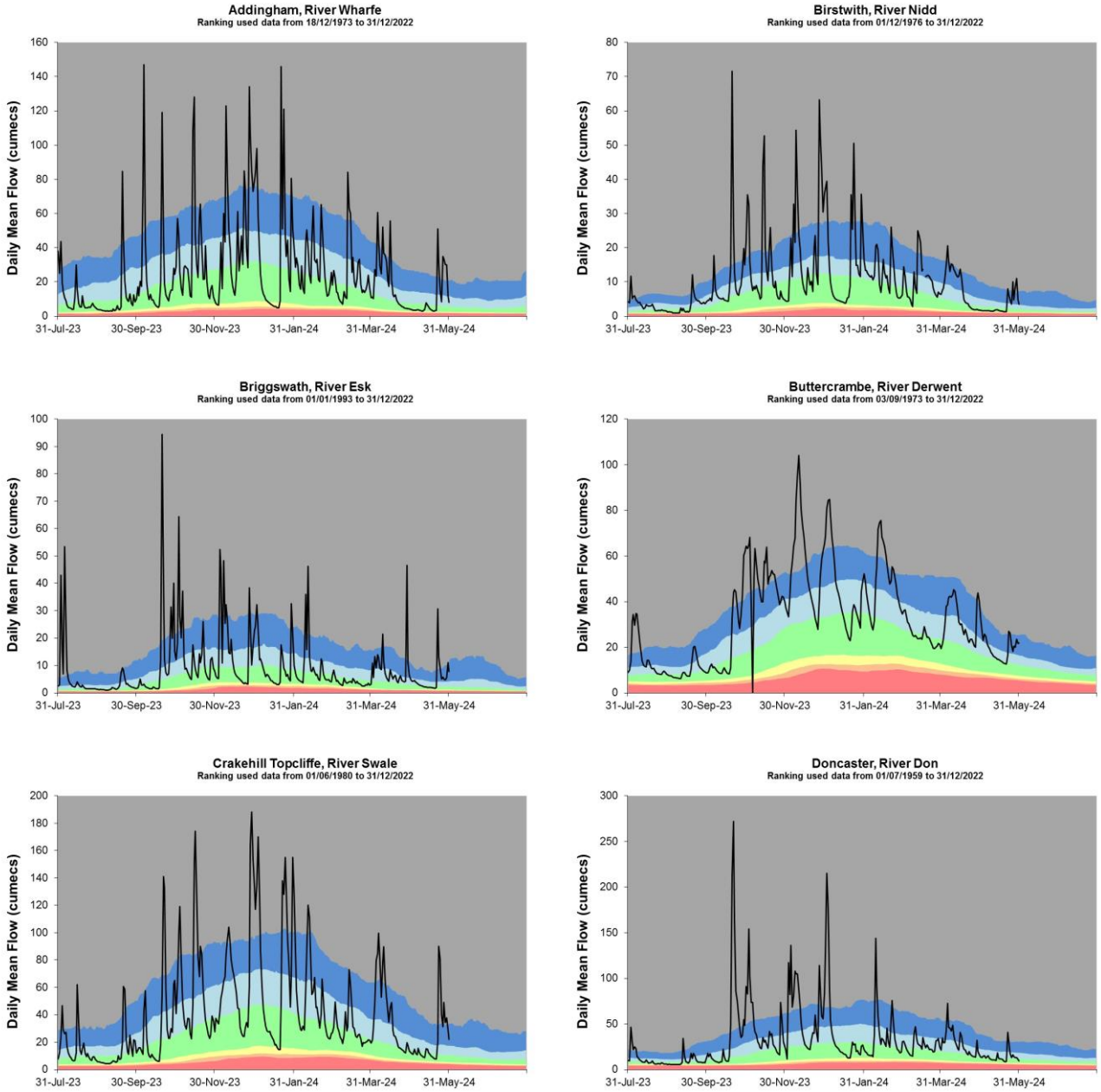
4.1 River flows map

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

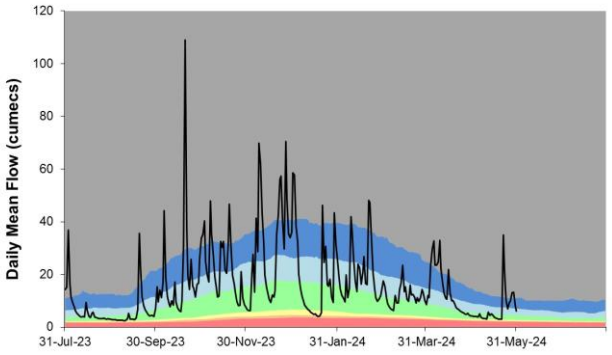


4.2 River flow charts

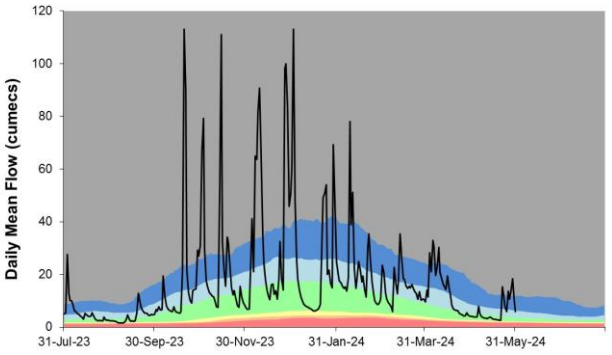
Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows.



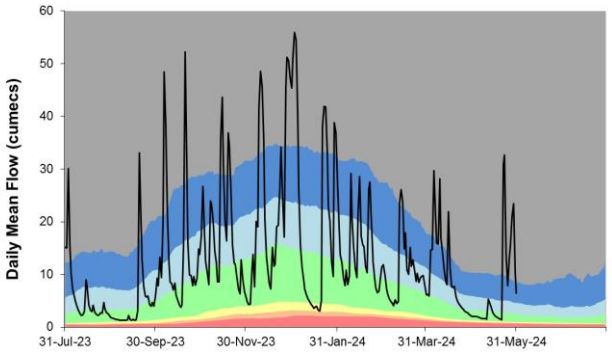
Elland, River Calder
Ranking used data from 01/07/1971 to 31/12/2022



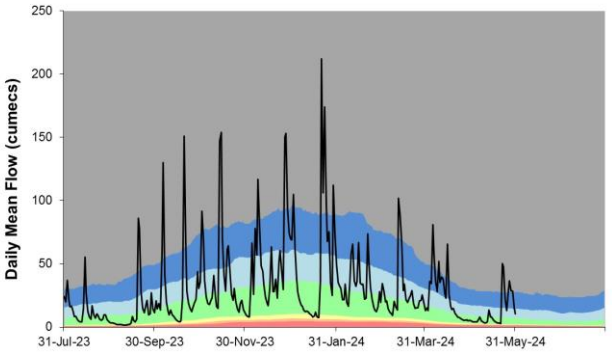
Hunsingore, River Nidd
Ranking used data from 01/10/1968 to 31/12/2022



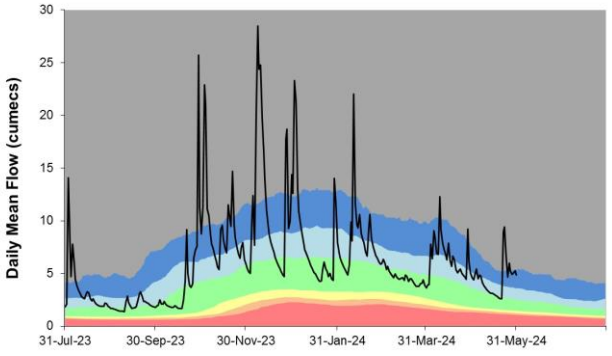
Kildwick, River Aire
Ranking used data from 01/08/1971 to 31/12/2022



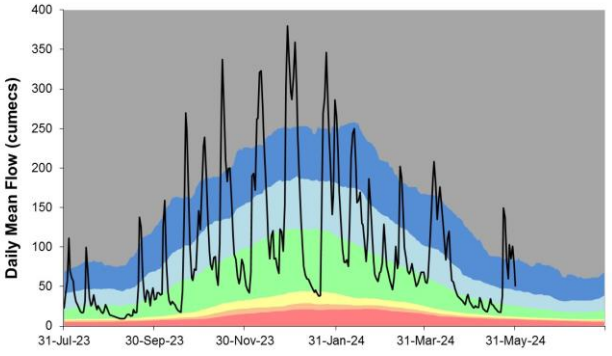
Kilgram Bridge, River Ure
Ranking used data from 01/08/1971 to 31/12/2022

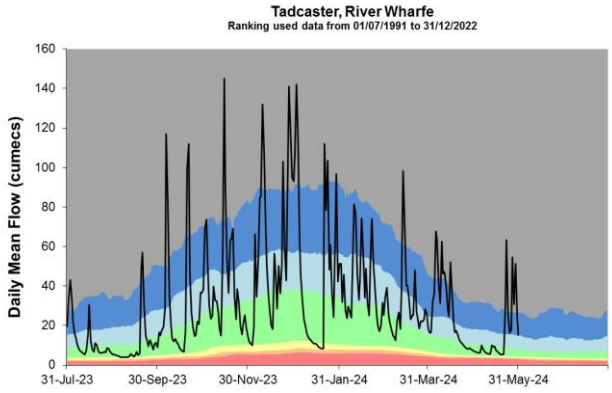


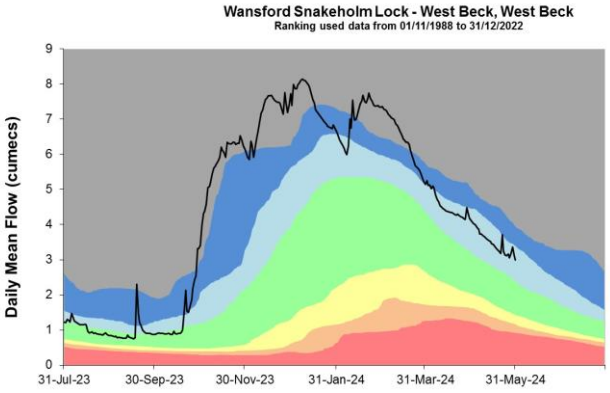
Ness, River Rye
Ranking used data from 01/09/1974 to 31/12/2022

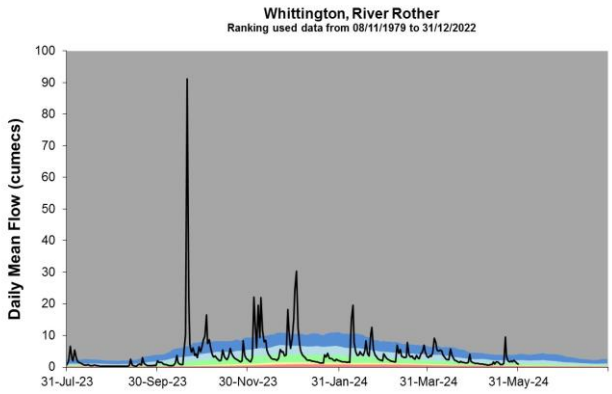


Skelton, River Ouse
Ranking used data from 18/09/1969 to 31/12/2022





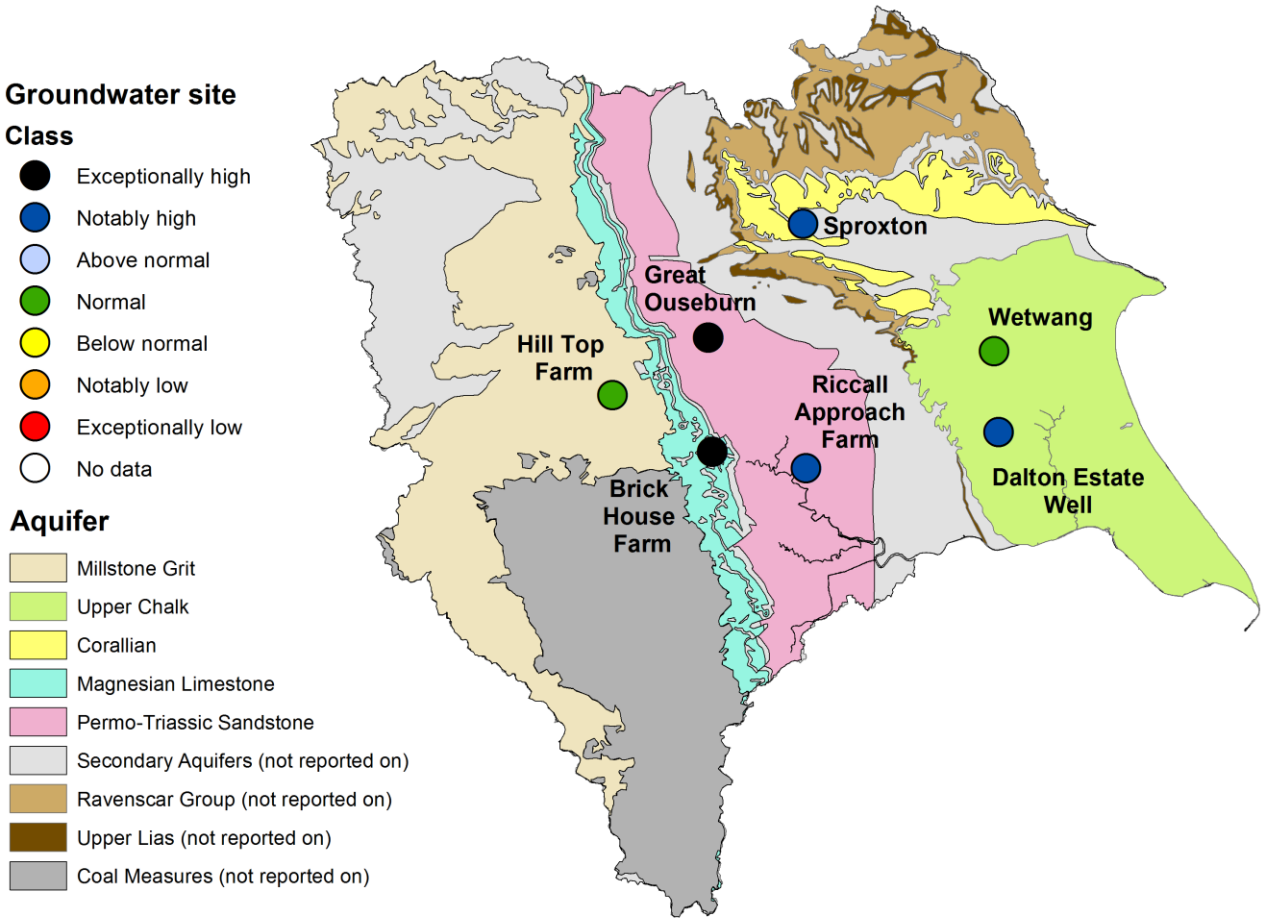




5 Groundwater levels

5.1 Groundwater levels map

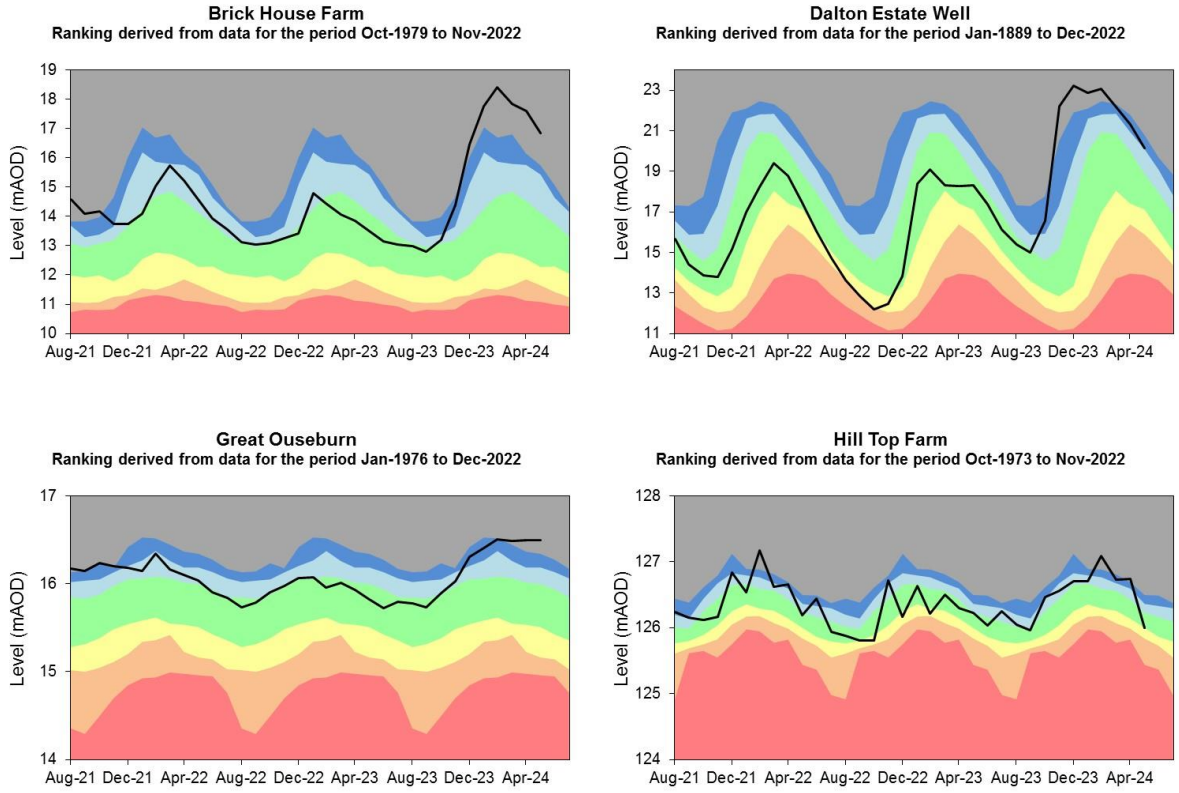
Figure 5.1: Groundwater levels for indicator sites at the end of May 2024, classed relative to an analysis of respective historic May levels. Table available in the appendices with detailed information.

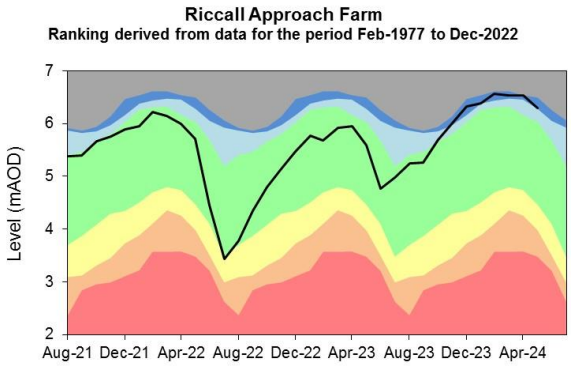


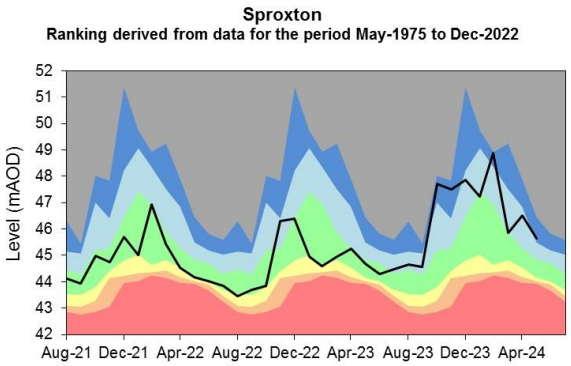
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

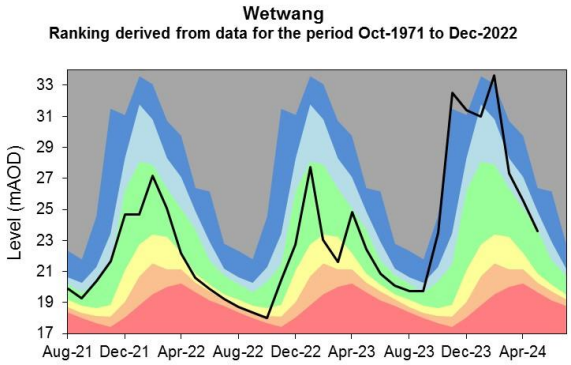
5.2 Groundwater level charts

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.





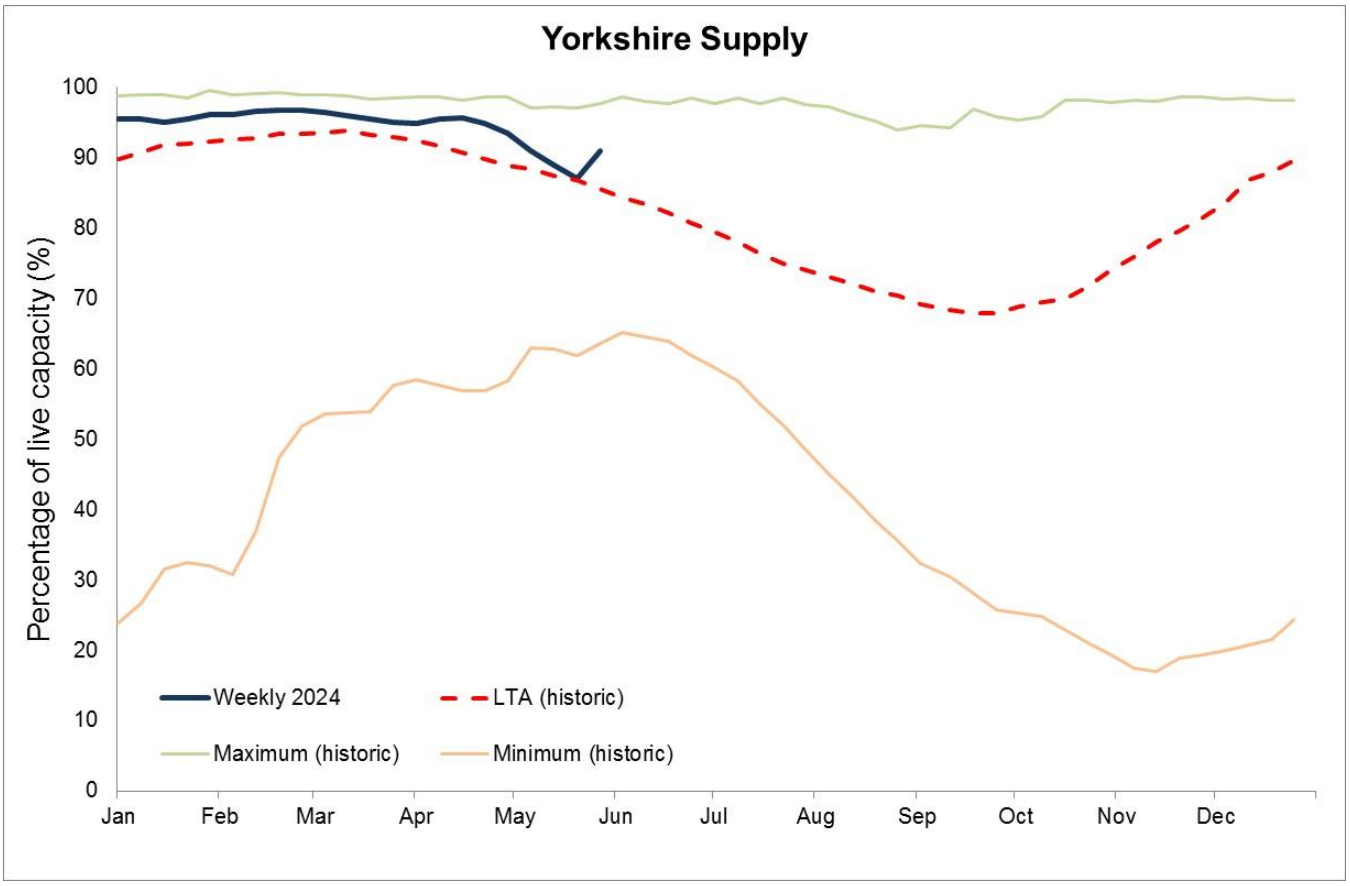




 N.B. Hill Top Farm observation borehole is used for abstraction. Therefore the groundwater level record will be directly affected by pumping

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	May 2024 rainfall % of long term average 1961 to 1990	May 2024 band	Mar 2024 to May cumulative band	Dec 2023 to May cumulative band	Jun 2023 to May cumulative band
Aire	166	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Calder	141	Above Normal	Notably high	Exceptionally high	Exceptionally high
Dales North Sea Tribs	144	Above Normal	Notably high	Exceptionally high	Exceptionally high
Derwent (ne)	106	Normal	Above normal	Exceptionally high	Exceptionally high
Don	108	Normal	Notably high	Exceptionally high	Exceptionally high
Hull And Humber	115	Above Normal	Above normal	Exceptionally high	Exceptionally high
Nidd	155	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Ouse	120	Above Normal	Above normal	Exceptionally high	Exceptionally high
Rye	117	Normal	Notably high	Exceptionally high	Exceptionally high

Swale (ne)	161	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Ure	146	Above Normal	Notably high	Exceptionally high	Exceptionally high
Wharfe	163	Notably High	Exceptionally high	Exceptionally high	Exceptionally high

8.2 River flows table

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

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

8.3 Groundwater table

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