Monthly water situation report: Yorkshire Area

1 Summary - November 2024

Most of November featured settled conditions apart from a major storm, named Bert, early in the fourth week which produced a response in river flows. Monthly rainfall totals and mean river flows were typically below the long-term average (LTA). Reservoir stocks rose slightly over the course of the month. Soils remained wet apart from in the south-east of the area. Most aquifers showed little change in groundwater levels this month.

1.1 Rainfall

Rainfall in the first three weeks up until day 22 was minimal across the northern Dales catchments, Rye, Derwent and Hull. In the third week low rainfall or snow totals were recorded in the Aire, Calder and Don. Most rain gauges recorded many daily totals of either no rain or less than 2mm up until day 22. Storm Bert then arrived on day 22 until day 24 and produced initial snow and then widespread rain from a storm front that travelled west to east. Rainfall totals from the event impacted the Pennine catchments and to a lesser extent the east catchments of the Hull, Derwent, Rye and Esk. Many rain gauges recorded between 50% and 76% of the November monthly LTA on day 23. A rain gauge in Gorpley located in the Calder catchment recorded 86mm on day 23 which was equivalent to 57% of the November 2024 monthly total. The remaining days of the month were much more settled across the area although day 27 was moderately wet in East Yorkshire.

1.2 Soil moisture deficit

The soils for the first three weeks were classed as wet for most catchments and normal in the lower Ouse, lower Don and Hull and Humberside. The driest of these soils were in the lower Ouse. There was very little change in soil moisture deficit (SMD) in the first three weeks, apart from those in the upper and mid Calder which became fully saturated by the end of week 3. By week 4 the arrival of Storm Bert ensured a reduction in SMD across all catchments and the majority of Yorkshire catchment soils were either fully saturated or had SMD below 10mm. The drier exceptions were the lower Aire, Don and Ouse and areas bordering the Humber which all remained classed as normal.

1.3 River flows

The monthly mean river flows ranged from normal to notably low and between 48% to 110% of the LTA, with the great majority less than the LTA. The Swale, Aire, Calder, Ouse, Derwent, Hull, Don and Rother were classified as normal for the month. The Ure, Nidd and Wharfe catchments were below normal and the Esk was notably low. This mainly reflected the rainfall distribution.

In the first few days of the month flows across most Yorkshire catchments began in a normal state. These then reduced and were reporting as below normal at the end of week 1 to notably

low for week 2. The Ure, Wharfe and Ouse catchments were recording exceptionally low flows by late in the third week.

An abrupt change occurred with the arrival of Storm Bert. Daily mean flows on day 22 were either notably or exceptionally low in the Swale, Ure, Nidd, Wharfe, Aire and Calder and peaked to exceptionally high on day 23, in response to snow melt and rainfall. The heaviest precipitation from the storm occurred over the upper Calder and peak river levels here ranged from second to fourth highest in record lengths of 21 to 28 years. Lower reaches of rivers including the Swale and Ouse peaked in response to rainfall by day 24 or 25. Flows from day 27 returned to within normal range for most catchments with the exception of the Rye which reduced to below normal by month end.

In the groundwater-fed West Beck catchment in the upper Hull, flows increased slightly until day 12 then were steady until day 22. A temporary rise in flow occurred following Storm Bert and baseflow remained elevated at month end. Relative to the long term record flows were above normal for the first two weeks and within the normal range from week 3 onwards.

1.4 Groundwater levels

Magnesian Limestone

The groundwater level within the Magnesian Limestone at Brick House Farm has remained constant and is now notably high for the time of year.

Millstone Grit

The groundwater level has decreased within the Millstone Grit at Hill Top Farm and has dropped to below normal for the time 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, remaining exceptionally high for the time of year while groundwater levels have increased at Riccall Approach Farm, remaining normal for the time of year.

Corallian Limestone

The groundwater level has remained constant within the Corallian Limestone at Sproxton and is now at below normal for the time of year.

Chalk

The groundwater level remained constant at Wetwang and is now normal for the time of year (northern Yorkshire Wolds chalk), while Dalton Estate (central Yorkshire Wolds chalk) decreased but remained normal for the time of year.

1.5 Reservoir stocks

Yorkshire's reservoir stocks slowly reduced over the first three weeks. Storm Bert did have an impact on the reservoir stocks and increased them by 8% on the previous week, producing a net increase overall during the month. By the end of November, Yorkshire's overall reservoir stocks were very close to the LTA.

1.6 Environmental Impact

In mid November 10 to 12 abstractions were restricted by hands-off flows. By the end of November, only 1 hands-off flow was in force and 26 abstractors had previously been warned that flows are low but were still able to abstract. Affected catchments included the Swale, Ure, Aire, Don, Derwent and Foulness catchments.

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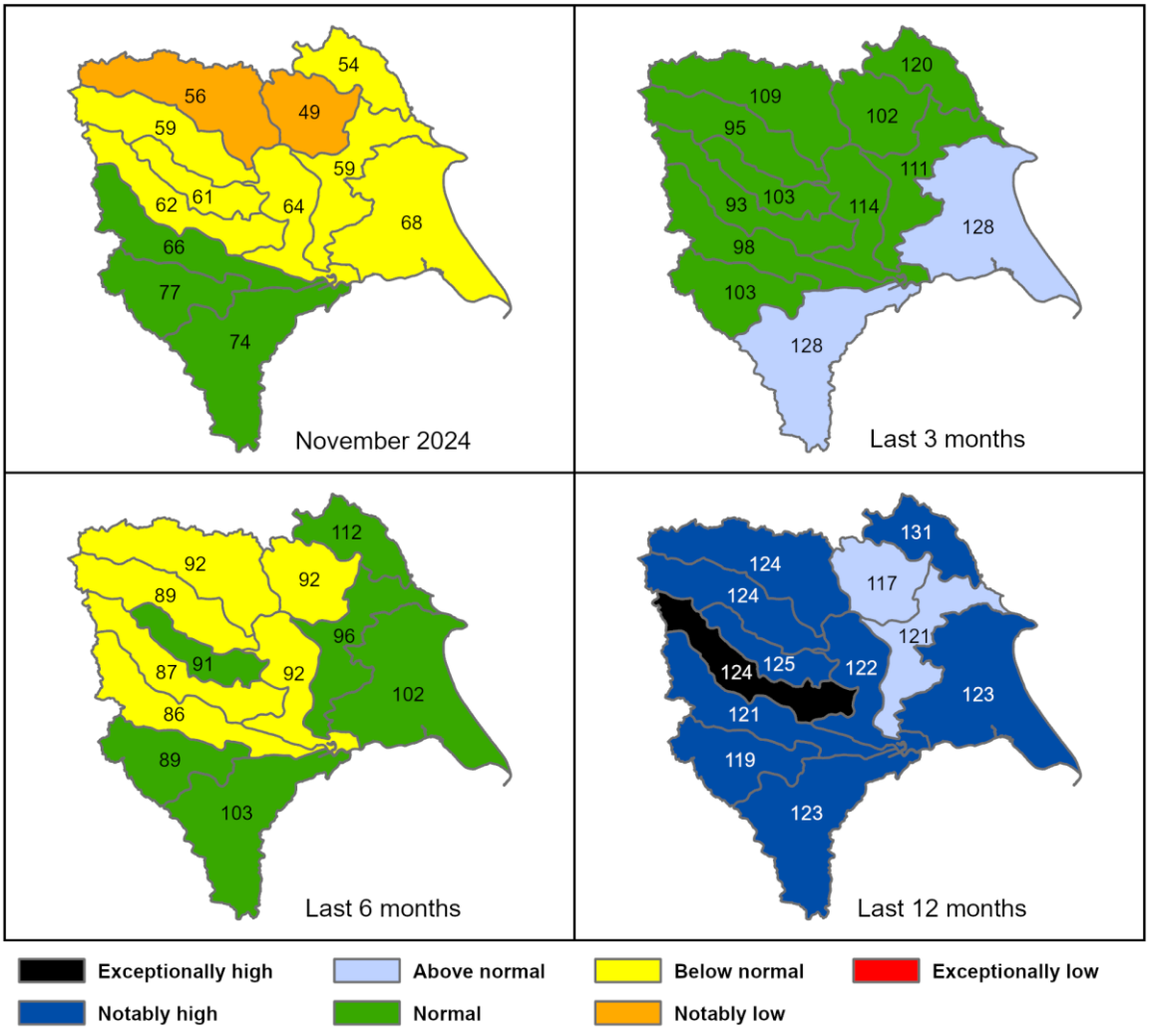
2 Rainfall

2.1 Rainfall map

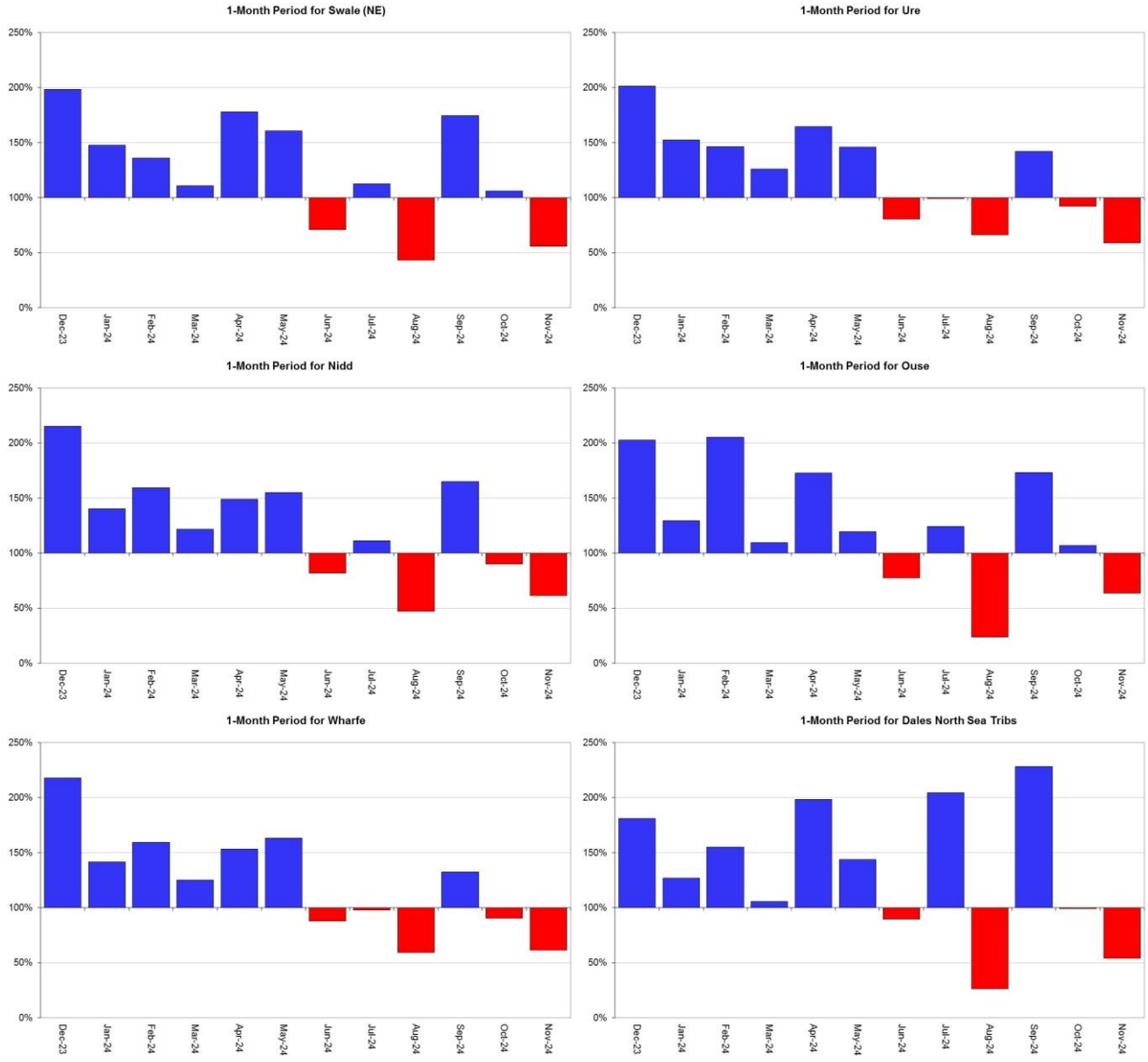
Figure 2.1: Total rainfall for hydrological areas for the current month (up to 30 November 2024), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. Table available in the appendices with detailed information.

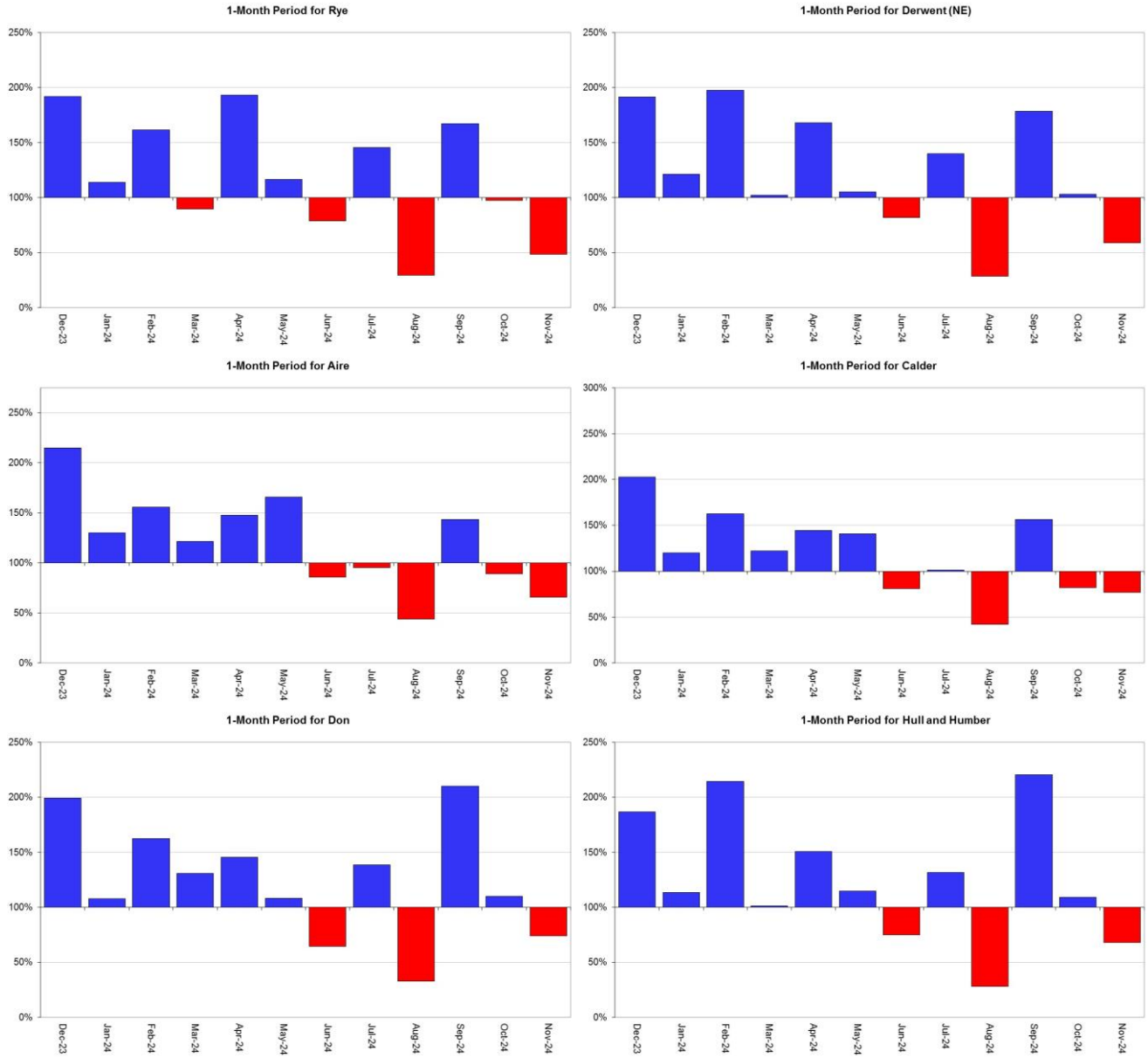


HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office. Crown copyright, 2024). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved.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



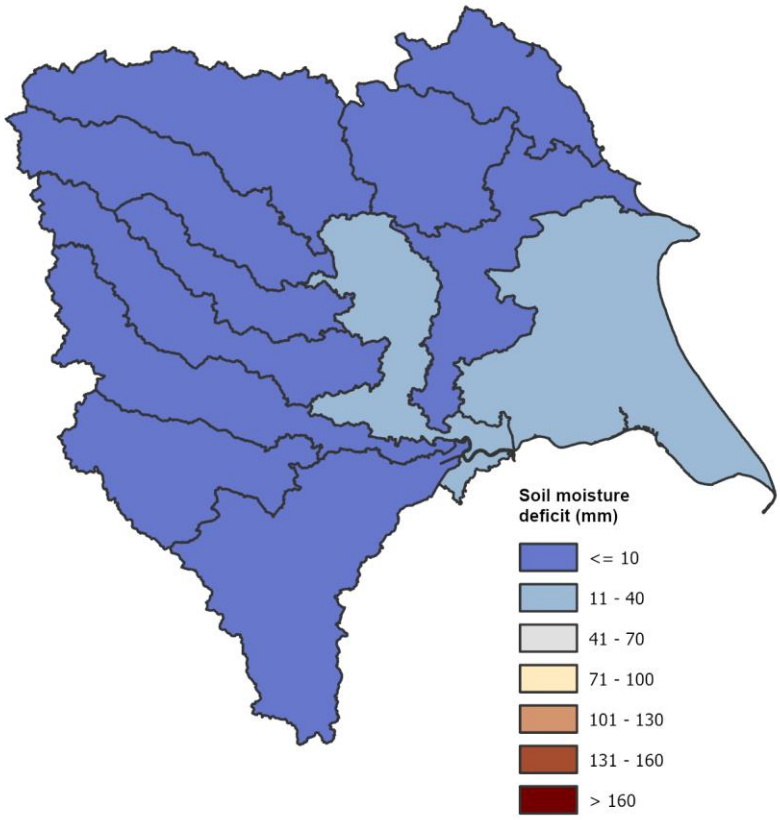


Rainfall data for 2023 and 2024, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset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

3 Soil moisture deficit

3.1 Soil moisture deficit map

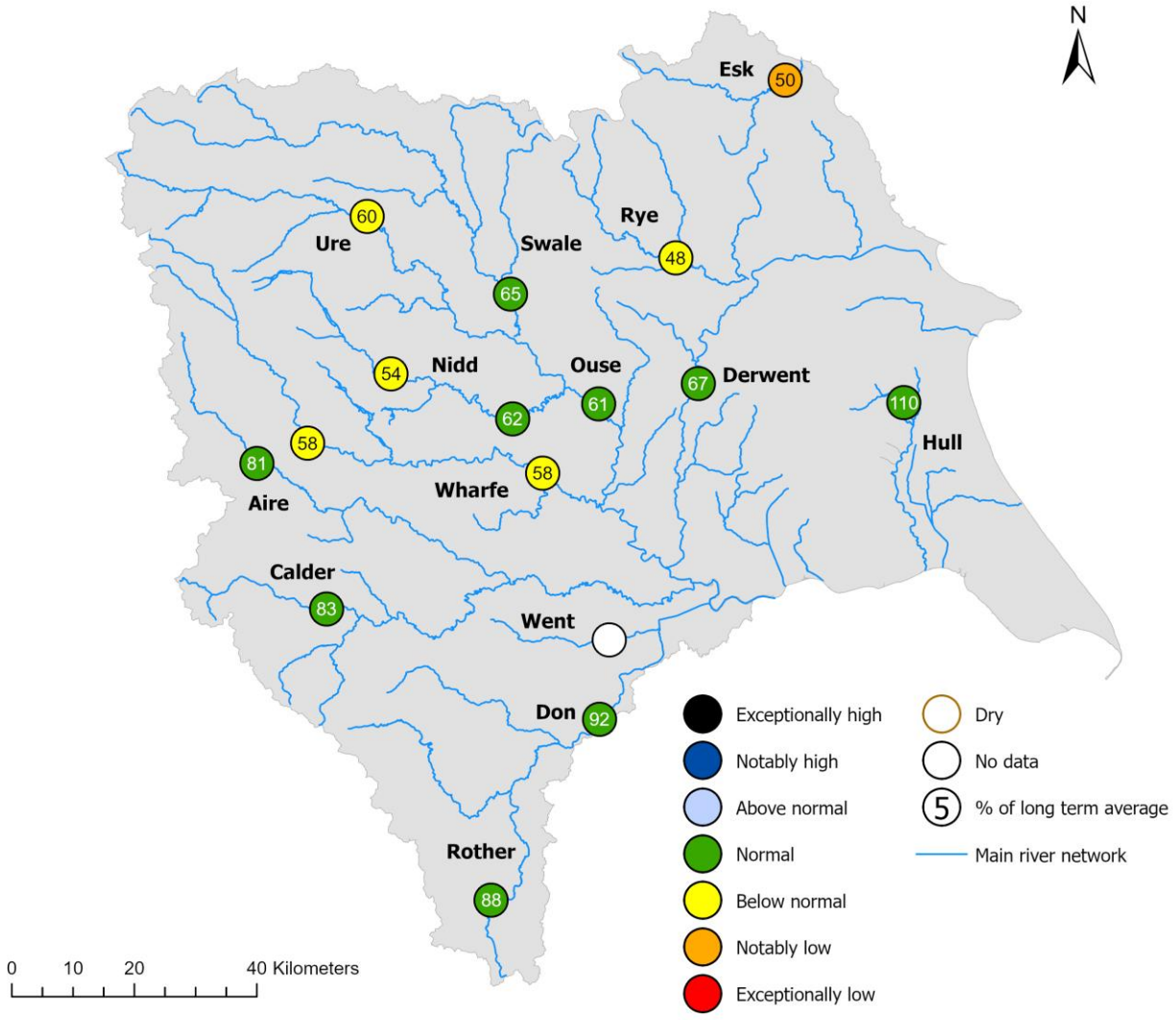
Figure 3.1: Soil moisture deficits for weeks ending 30 November 2024. Shows the difference (mm) of the actual soil moisture deficit from the 1961 to 1990 long term average soil moisture deficits. MORECS data for real land use.



4 River flows

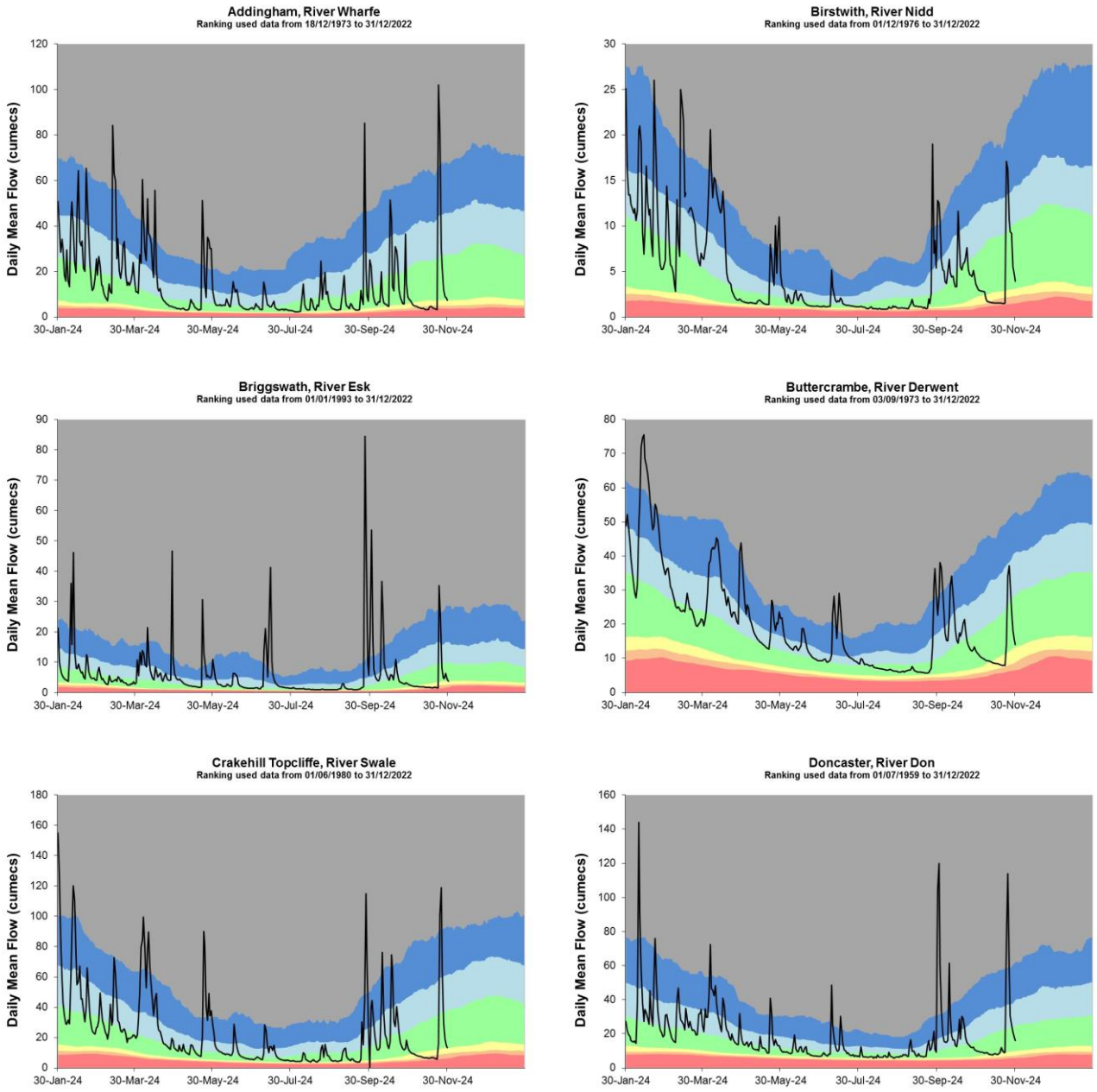
4.1 River flows map

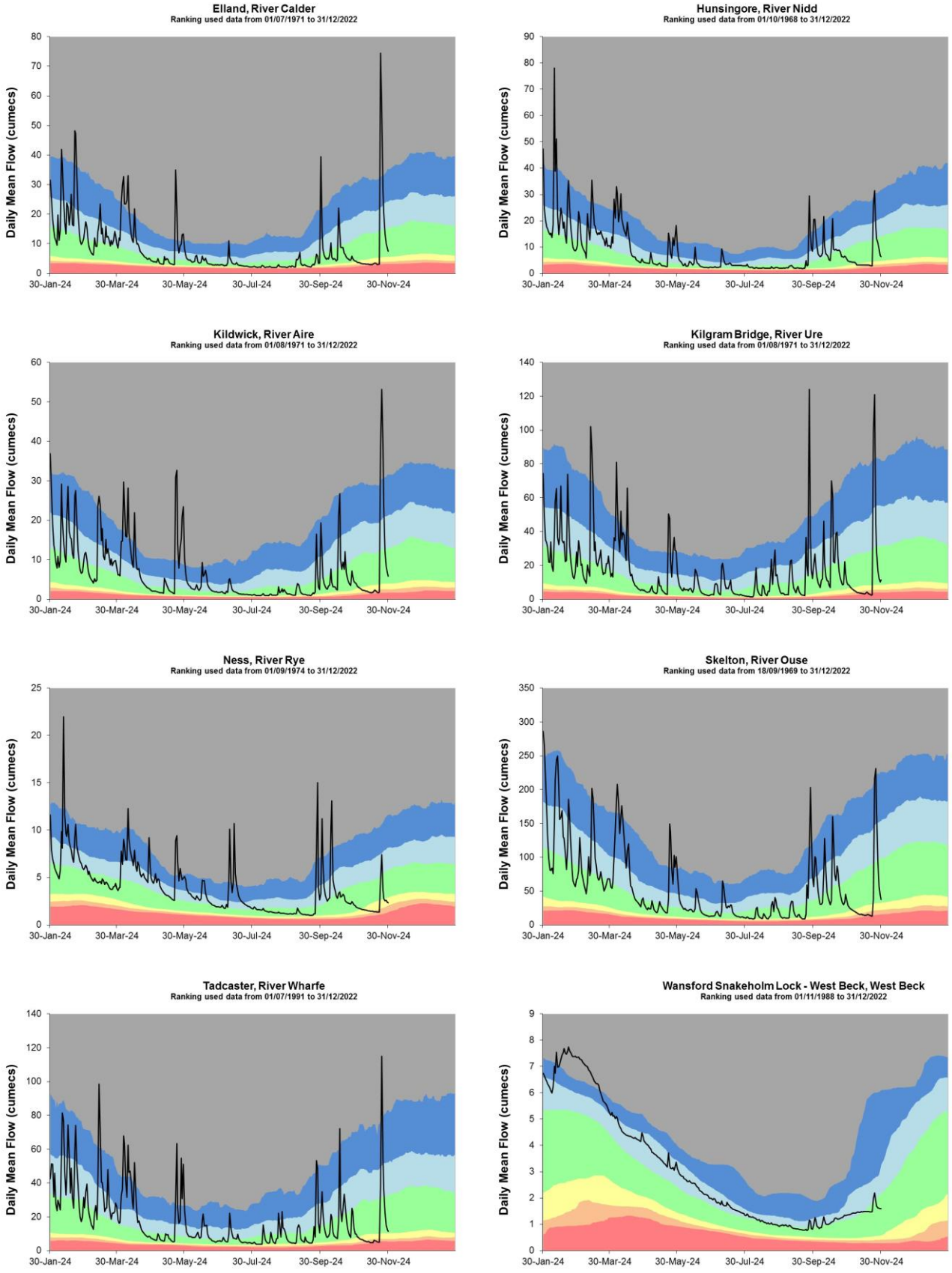
Figure 4.1: Monthly mean river flow for indicator sites for November 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic November monthly means Table available in the appendices with detailed information.



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.

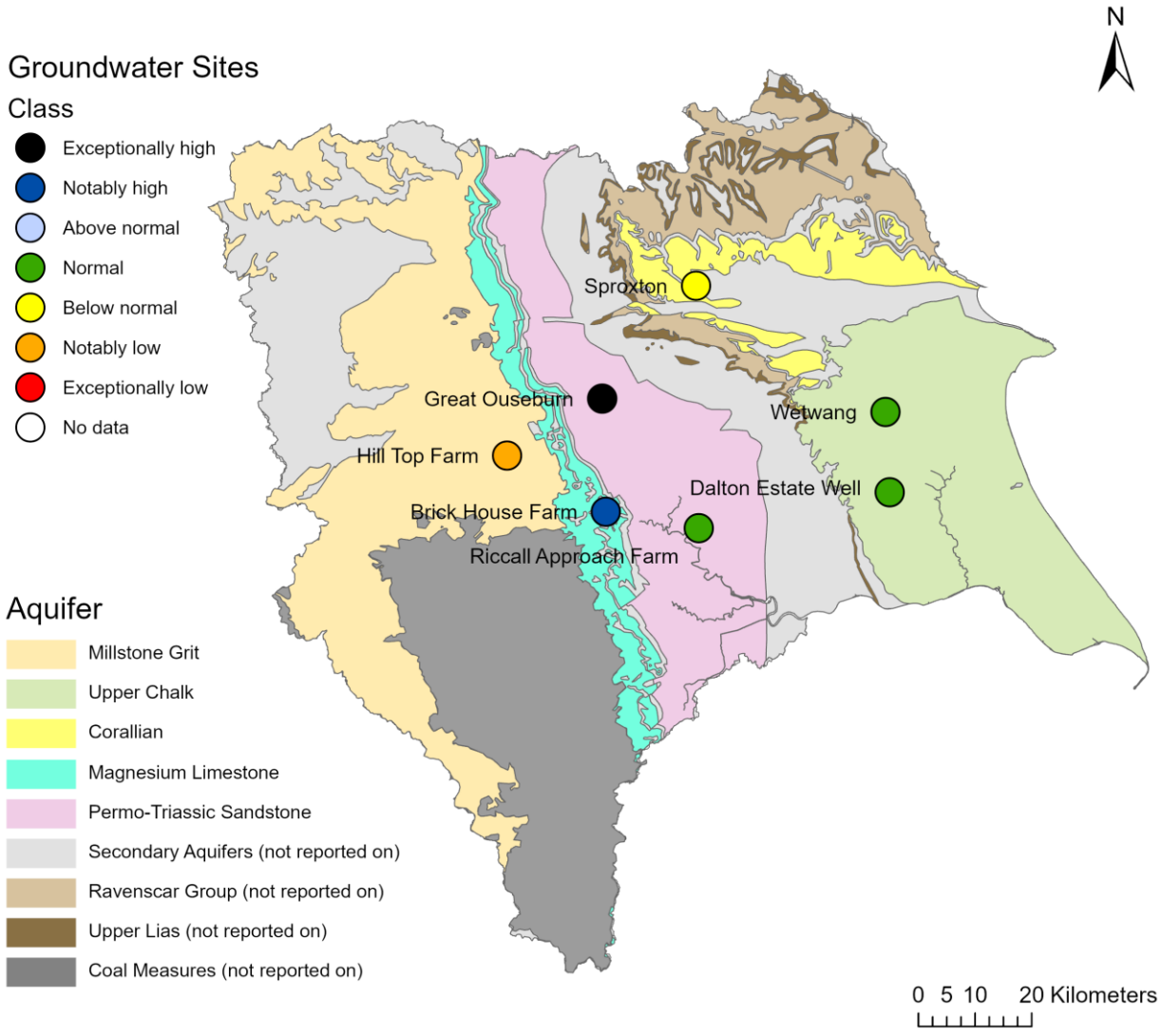




5 Groundwater levels

5.1 Groundwater levels map

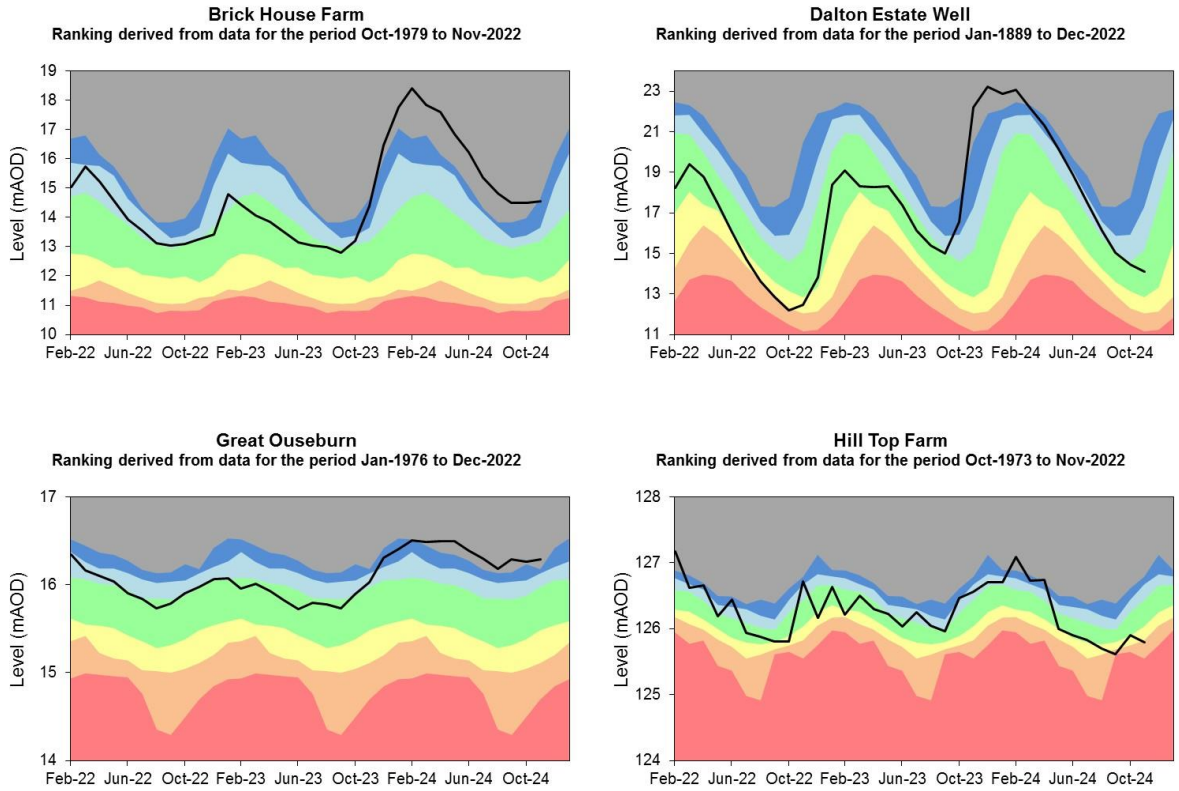
Figure 5.1: Groundwater levels for indicator sites at the end of November 2024, classed relative to an analysis of respective historic November levels. Table available in the appendices with detailed information.

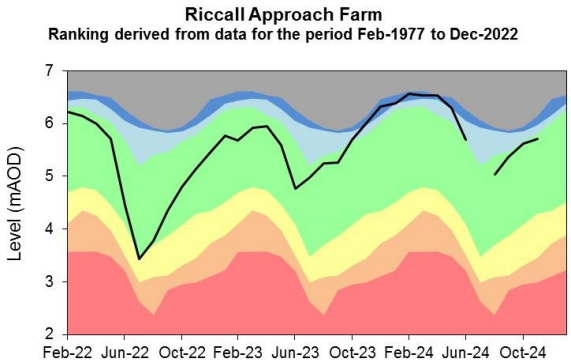


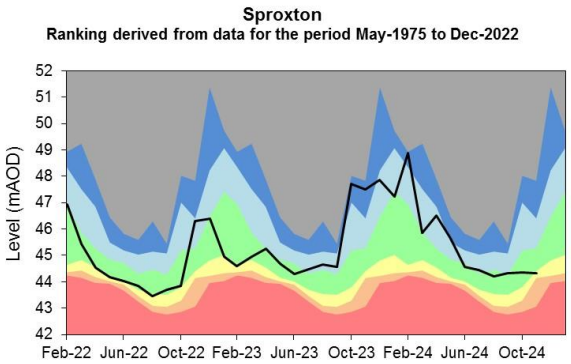
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

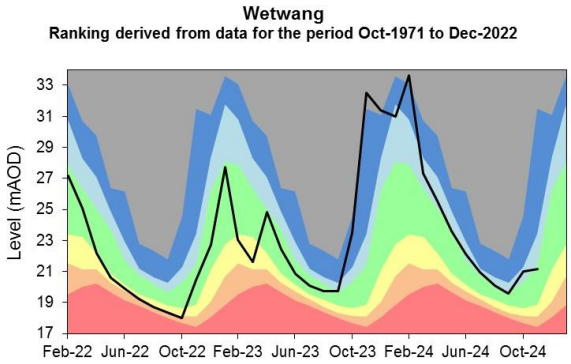
5.2 Groundwater level charts

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.





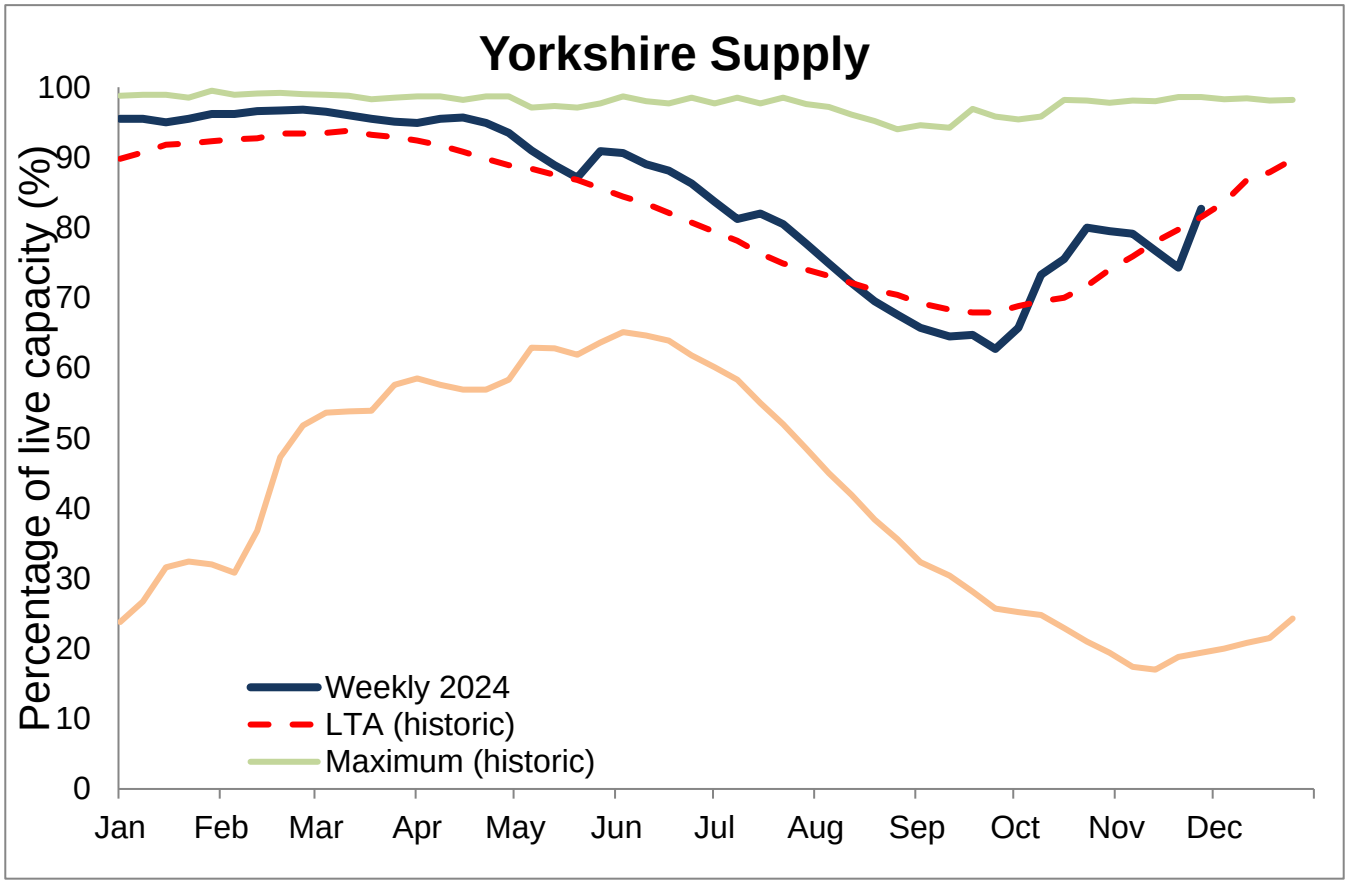




 N.B. Hill Top Farm observation borehole is used for abstraction. Therefore the groundwater level record will be directly affected by pumping

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	Nov 2024 rainfall % of long term average 1961 to 1990	Nov 2024 band	Sep 2024 to November cumulative band	Jun 2024 to November cumulative band	Dec 2023 to November cumulative band
Aire	66	Normal	Normal	Below normal	Notably high
Calder	77	Normal	Normal	Normal	Notably high
Dales North Sea Tribs	54	Below Normal	Normal	Normal	Notably high
Derwent (ne)	59	Below Normal	Normal	Normal	Above normal
Don	74	Normal	Above normal	Normal	Notably high
Hull And Humber	68	Below Normal	Above normal	Normal	Notably high
Nidd	61	Below Normal	Normal	Normal	Notably high
Ouse	64	Below Normal	Normal	Below normal	Notably high
Rye	49	Notably Low	Normal	Below normal	Above normal
Swale (ne)	56	Notably Low	Normal	Below normal	Notably high
Ure	59	Below Normal	Normal	Below normal	Notably high

Wharfe	62	Below Normal	Normal	Below normal	Exceptionally high

8.2 River flows table

Site name	River	Catchment	Nov 2024 band	Oct 2024 band
Addingham	Wharfe	Wharfe Middle	Below normal	Normal
Birstwith	Nidd	Nidd Middle	Below normal	Normal
Briggswath	Esk	Esk Yorks	Notably low	Above normal
Buttercrambe	Derwent	Derwent Yorks Middle	Normal	Above normal
Crakehill Topcliffe	Swale	Swale Lower	Normal	Above normal
Doncaster	Don	Don Lower	Normal	Notably high
Elland	Calder	Calder Yorks Upper	Normal	Normal
Hunsingore	Nidd	Nidd Lower	Normal	Normal
Kildwick	Aire	Aire Upper	Normal	Normal
Kilgram Bridge	Ure	Ure Middle	Below normal	Normal
Ness	Rye	Rye	Below normal	Normal
Skelton	Ouse	Ouse Yorks	Normal	Normal
Tadcaster	Wharfe	Wharfe Lower	Below normal	Normal
Wansford Snakeholm Lock	West Beck	Hull Upper	Normal	Above normal

Whittington	Rother	Rother Yorks	Normal	Above normal

8.3 Groundwater table

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