Monthly water situation report: North West England

1 Summary – June 2024

1.1 Rainfall

The drier weather, particular in the latter half of June marks a significant departure from the generally wet, and unsettled weather of the past year. The first half of June saw some continuation of the wet weather observed in May, with indicator sites seeing most of their June totals falling from sporadic frontal showers during this period. High pressure systems then began to dominate during the second half of June, where on average, only 3 days saw rainfall above 1mm at indicator sites across the North West.

As a whole, rainfall for North West England was classed as normal for June, at 86% of the LTA. Cumbria and Lancashire (CLA) observed 94% of the LTA (classed as normal), while Greater Manchester, Merseyside, and Cheshire (GMC) observed lower totals at 70% of the LTA (classed as normal).

Rainfall totals were generally higher in CLA than in GMC, with the highest total found in the Kent hydrological area, which observed 102% of its LTA, classed as normal. The lowest total (68% of the LTA) was recorded in the Cheshire Rivers Group hydrological area, which was classed as below normal. All other hydrological areas were classed as normal.

Despite the lower rainfall totals, the 3-month cumulative rainfall totals still reflects the high rainfall totals seen in the past several months. With all hydrological areas within CLA being classed as exceptionally high, with the exception of:

- The Mersey and Irwell, and Cheshire Rivers Group hydrological areas, which were classed as notably high
- The Esk (Dumfries) hydrological area which was classed as above normal

The 3-month period ending in June was also ranked as:

- Third wettest for:
  - Cumbria
- Fourth wettest for:
  - North West England
- Sixth wettest for:
  - Lancashire

The 6-month cumulative rainfall period coincides with the first half of the year, and sees almost all hydrological areas being classed as exceptionally high, with the exception of the Esk (Dumfries) hydrological area, which was classed as above normal.

The 6-month period ending in June was the wettest first half of the year since 1871 for six hydrological areas in CLA and notably also:

- North West England at 753mm, breaking the previous record of 723mm in 1920
- Cumbria at 915mm, breaking the previous record of 895mm in 2002

The 12-month cumulative totals replicate the pattern observed in the 6-month cumulative rainfall totals, with almost all hydrological areas, except for the Esk (Dumfries) which was classed as above normal, being classed as exceptionally high.

The 12-month period ending in June was also the wettest since 1871 for all hydrological areas with the exception of the Esk (Dumfries) hydrological area, and notably for:

- North West England at 1763mm, breaking the previous record of 1572mm in 2020 by just over 190mm
- Cumbria at 2080mm, breaking the previous record of 1880mm in 2016 by 200mm
- Lancashire at 1874mm, breaking the previous record of 1671mm in 1981 by over 200mm
- GMC at 1388mm, breaking the previous record of 1204mm in 1931 by over 180mm
- the Kent hydrological area at 2572mm, breaking the previous record of 2210mm in 2016 by over 360mm
- the Douglas hydrological area at 1522mm, breaking the previous record of 1274mm in 2020 by just under 250mm
- the Wyre and Lune hydrological area at 2057mm, breaking the previous record of 1852mm in 2016 by over 200mm

1.2 Soil moisture deficit and recharge

Drier weather observed during the second half of June increased soil moisture deficits (SMD) across the North West compared to levels at the end of May. This is particularly the case for coastal areas of CLA.

SMD levels for the end of June across North West England fell within the range of 17mm to 75mm. This is lower than expected for the time of year for almost all areas, with the exception of the southern parts of Cumbria where the SMD levels were higher than expected.

1.3 River flows

Monthly mean river flows decreased across all catchments in response to the reduction in rainfall compared to May. With river levels in most catchments much closer to what would be expected for the time of the year. Overall, eight out of 25 sites were classed as above normal, while the remaining 17 sites were all classed as normal.

There were few spatial patterns to the mean river levels recorded in June, reflecting the sporadic nature of the rain that fell during the month. River flows were highest (in terms of percentage of the LTA) in the Ellen catchment at Bulgill (166% of the LTA, classed as above normal), and lowest at the Glaze catchment at Little Woolden Hall (79% of the LTA, classed as normal).

There were no notable peaks or lows in daily mean flow recorded during this period.

1.4 Groundwater levels

Please beware we have now increased the number of groundwater indicator sites which we report from six to 10 sites in total. These new sites are, in alphabetical order:

- Furness Abbey, Furness (Groundwater Body), Permo-Triassic Sandstone
- Great Musgrave, Eden Valley & Carlisle Basin (Groundwater Body), Permo-Triassic Sandstone
- Primrose Hill, Fylde (Groundwater Body), Permo-Triassic Sandstone
- Victoria Road, West Lancashire Quaternary Sand and Gravel (Groundwater Body), Superficial Deposits

Groundwater levels across the North West at the end of June were classed between exceptionally high and normal. Groundwater levels decreased at Victoria Road, and at Great Musgrave from notably high to above normal, at Primrose Hill from above normal to normal. While groundwater levels at Bruntwood Hall increased from above normal to notably high.

All other groundwater level remained at the same classification at

- Brown Bank Lay-By, classed as notably high
- Furness Abbey, classed as exceptionally high
- Lea Lane, classed as normal
- Priors Heyes, classed as exceptionally high
- Richmond Park, classed as exceptionally high
- Skirwith, classed as exceptionally high

1.5 Reservoir storage

Total reservoir storage for North West England decreased from 92% at the end of May to 84%, higher than the average of 78% at this time of the year, and higher than this time last year when total reservoir storage was at 70%.

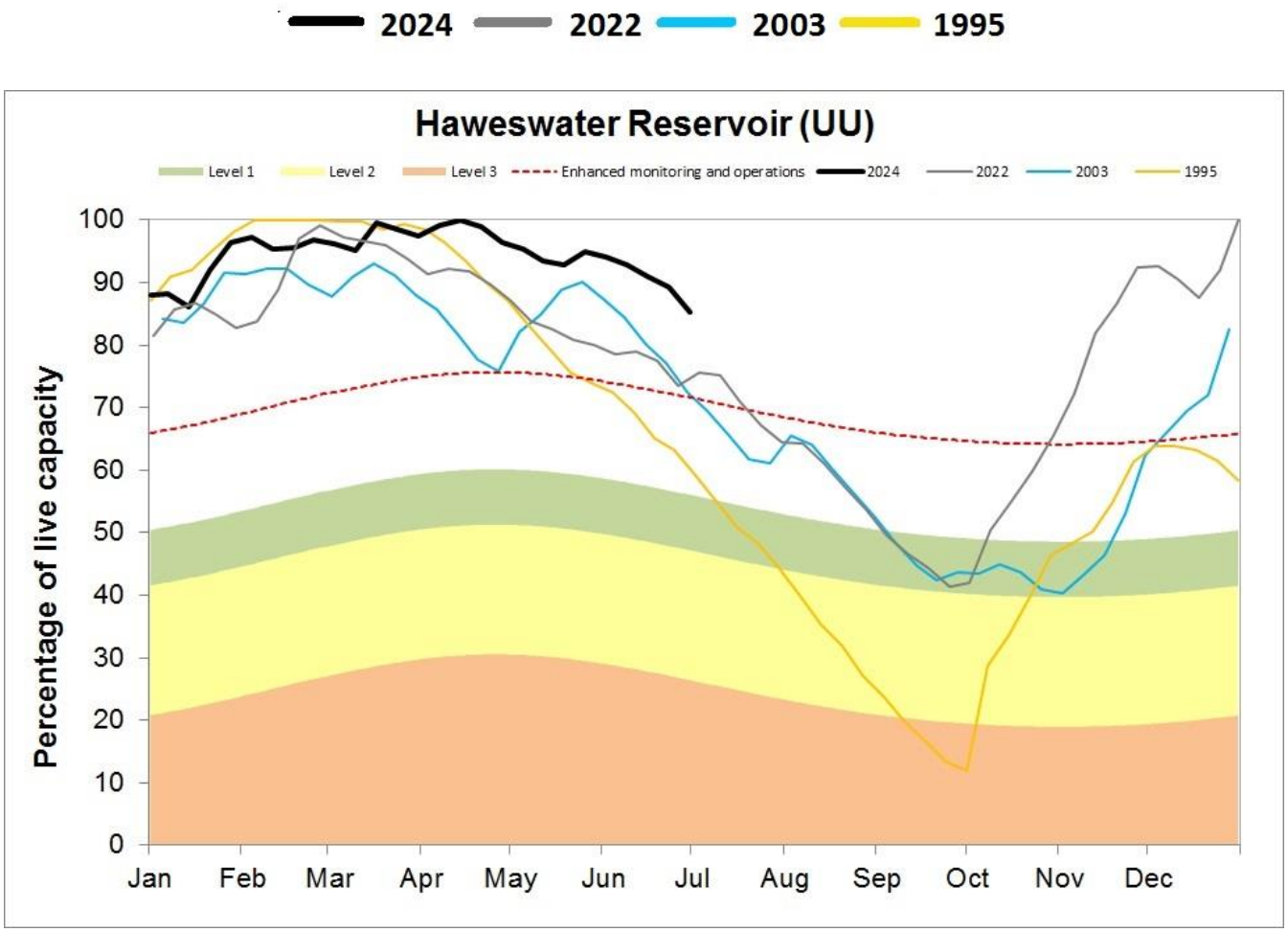
At the end of June, reservoir storage (in terms of percentage) was highest at Crummock Water and Ennerdale Water, which were both at 100% full. Storage was lowest at Rivington (73%). The combined storage at Haweswater and Thirlmere was 85%, higher than the average of 68% at this time of year, and much higher than the storage level at this time last year which was 61%.

Reservoirs kept low for maintenance works include:

- Part of the Longdendale system
  - Audenshaw No.1
  - Torside
  - Woodhead
- Part of the Rivington system
  - Anglezarke
  - High Bullough
- Part of the Worthington system
  - Arley
  - Worthington
- Part of the Bolton supply system
  - Dingle
  - Jumbles
- Part of the Poaka Beck system
  - Harlock
- Part of the Piethorne Valley system
  - Kitcliffe
  - Piethorne
- Part of the Ogden (Barley) system
  - Ogden Lower
  - Ogden Upper
- Part of the Barnacre Group system
  - Barnacre North
  - Barnacre South
- Part of the Longridge system
  - Alston No.2
- Part of the Dee (Celyn and Brenig) system
  - Llyn Celyn

- Part of the Coldwell system
  - Coldwell
- Part of the Cowpe system
  - Cragg
- Part of the Ridegate system
  - Ridegate

Figure 1.5: Storage in Haweswater Reservoir, including the drought levels for the reservoir and storage for the current year (2024) and representative years: 1995, 2003 and 2022 (*Source: United Utilities* (UU)).

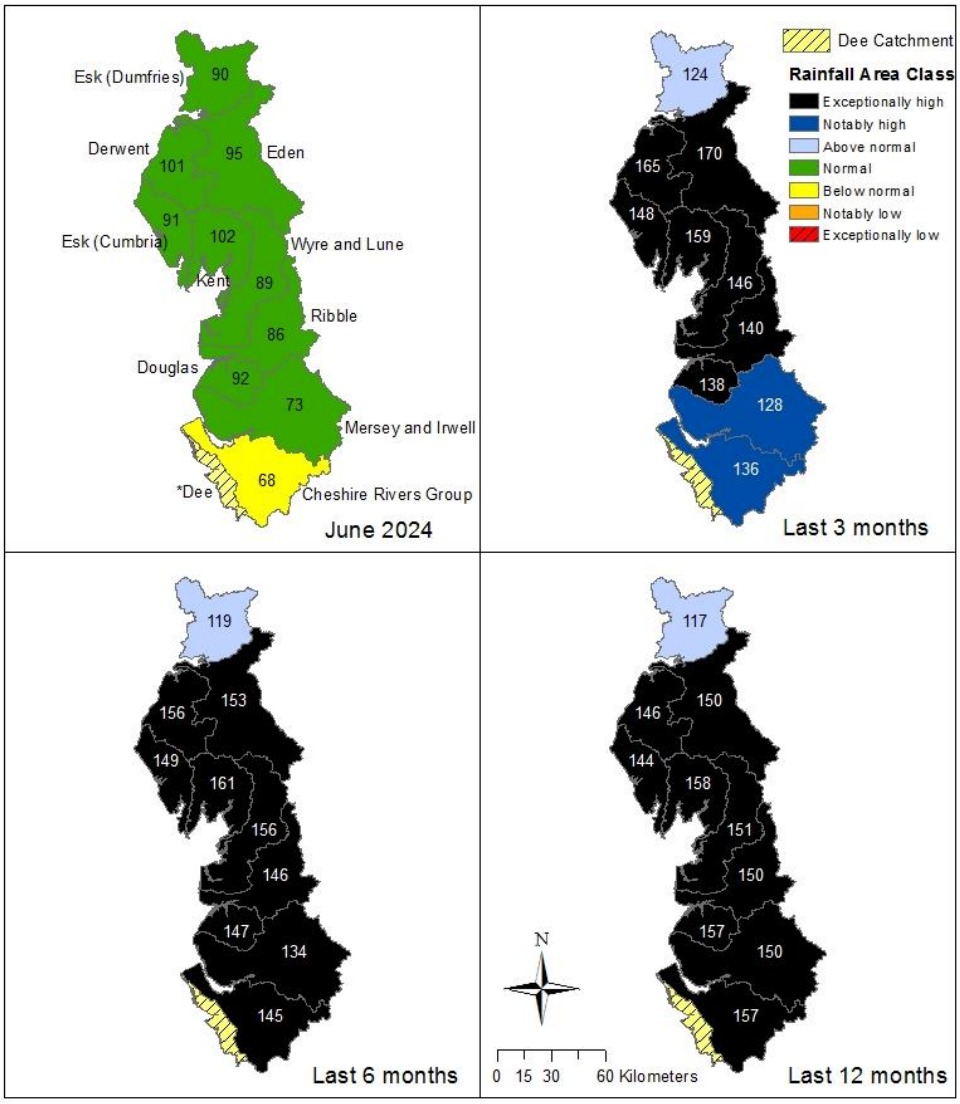


Author: Cumbria and Lancashire Hydrology, hydrology.CMBLNC@environment-agency.gov.uk

2 Rainfall

2.1 Rainfall map

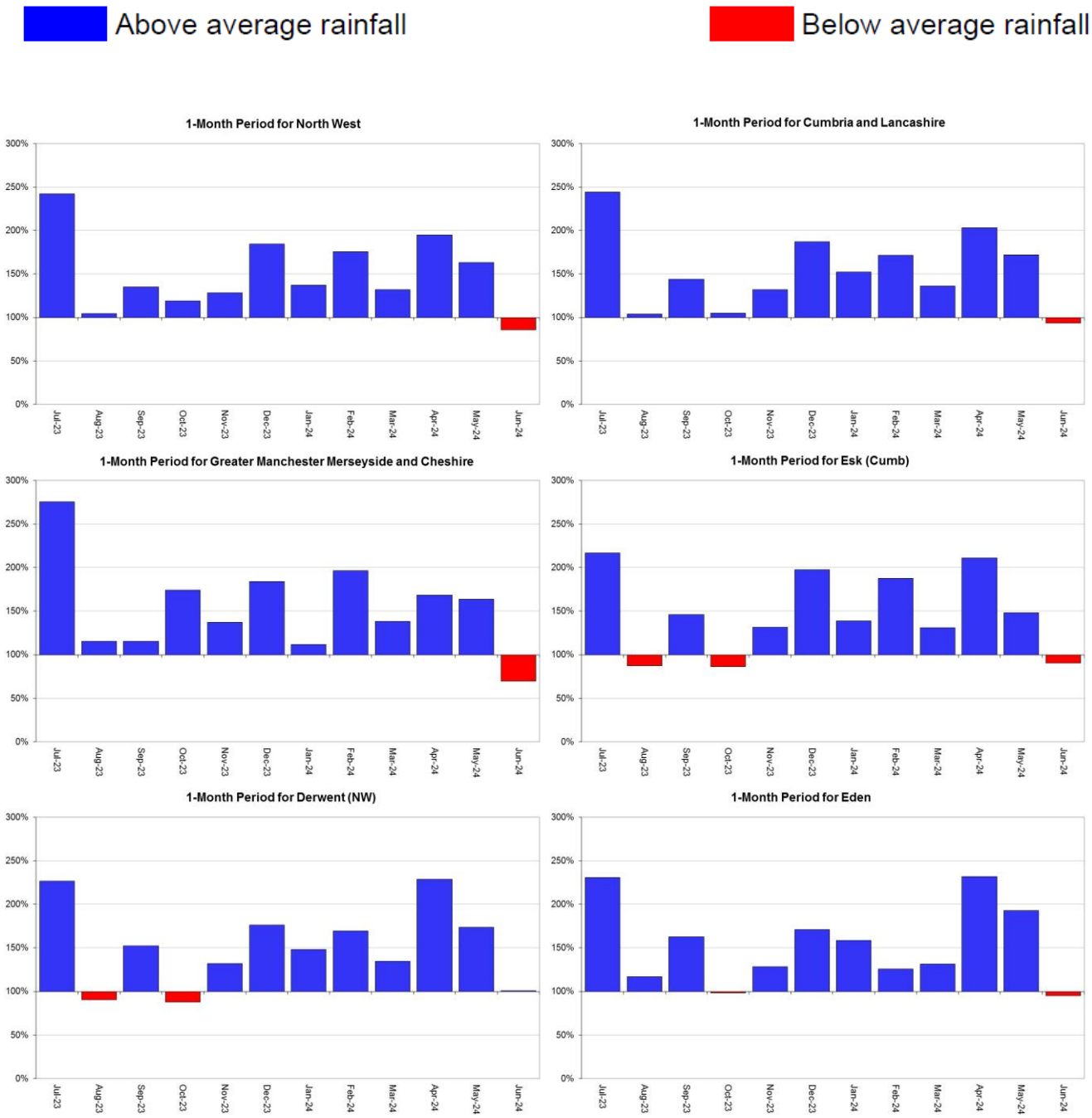
Figure 2.1: Total rainfall (as a percentage) for hydrological areas for the current month (up to 30 June 2024), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. Table available in the appendices with detailed information.

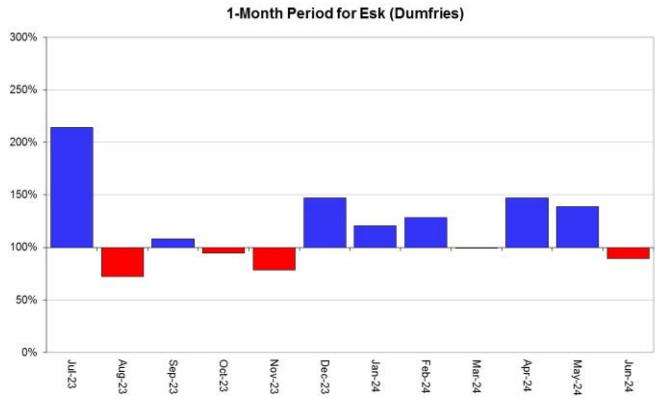


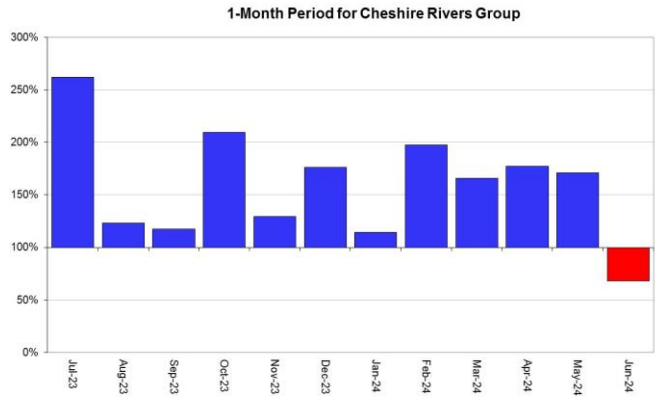
Rainfall data since 2023, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived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

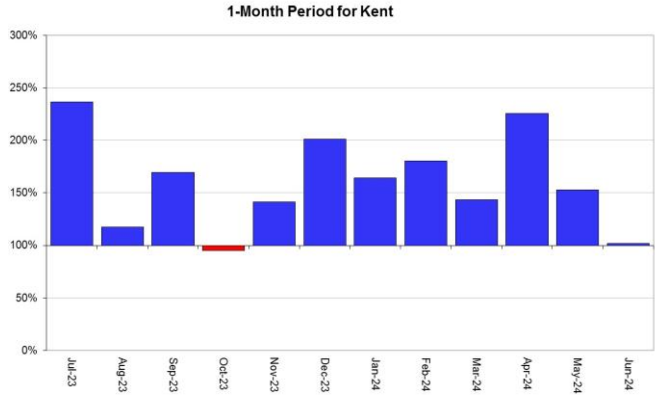
2.2 Rainfall charts

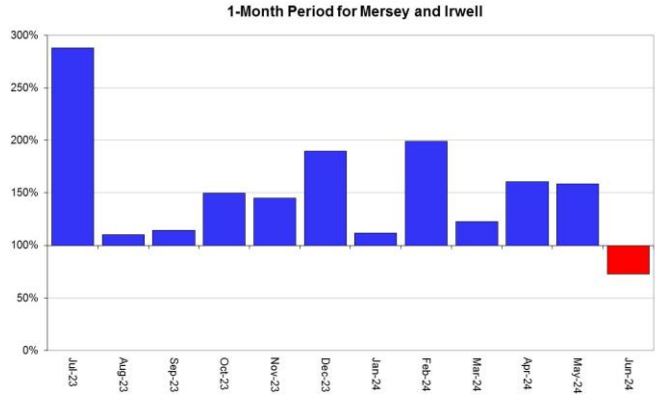
Figure 2.2: Monthly rainfall totals for the past 12 months expressed as a percentage of the 1961 to 1990 long term average for North-west England and its hydrological areas.

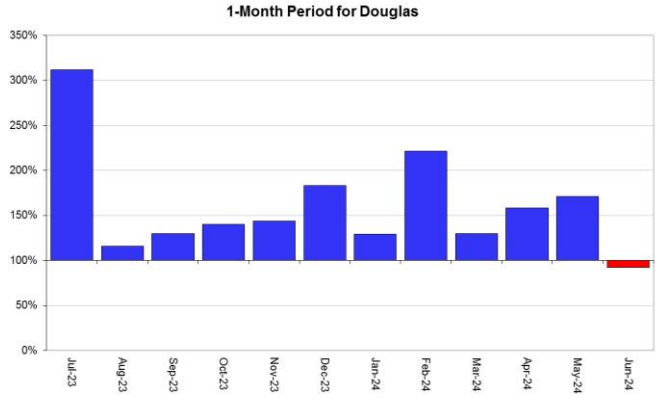


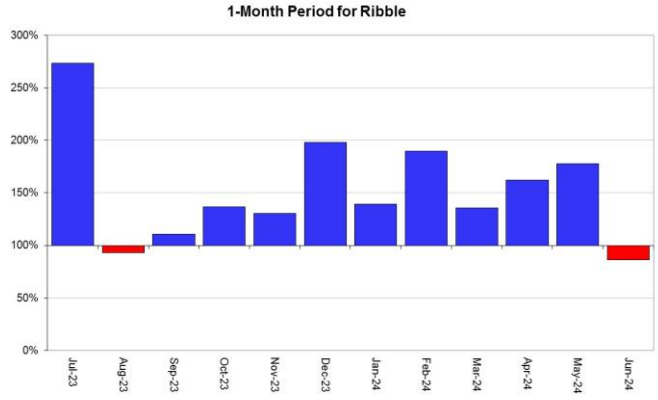

1-Month Period for Esk (Dumfries)
300%
250%
200%
150%
100%
50%
0%
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Jan-24
Feb-24
Mar-24
Apr-24
May-24
Jun-24

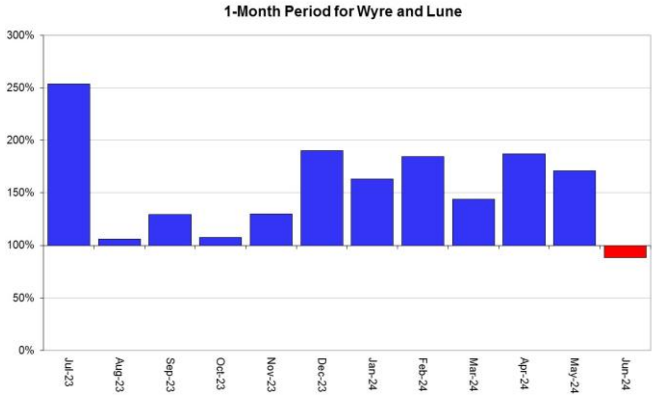

1-Month Period for Cheshire Rivers Group
300%
250%
200%
150%
100%
50%
0%
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Jan-24
Feb-24
Mar-24
Apr-24
May-24
Jun-24


1-Month Period for Kent
300%
250%
200%
150%
100%
50%
0%
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Jan-24
Feb-24
Mar-24
Apr-24
May-24
Jun-24


1-Month Period for Mersey and Irwell
300%
250%
200%
150%
100%
50%
0%
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Jan-24
Feb-24
Mar-24
Apr-24
May-24
Jun-24


1-Month Period for Douglas
350%
300%
250%
200%
150%
100%
50%
0%
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Jan-24
Feb-24
Mar-24
Apr-24
May-24
Jun-24


1-Month Period for Ribble
300%
250%
200%
150%
100%
50%
0%
Jul-23
Aug-23
Sep-23
Oct-23
Nov-23
Dec-23
Jan-24
Feb-24
Mar-24
Apr-24
May-24
Jun-24

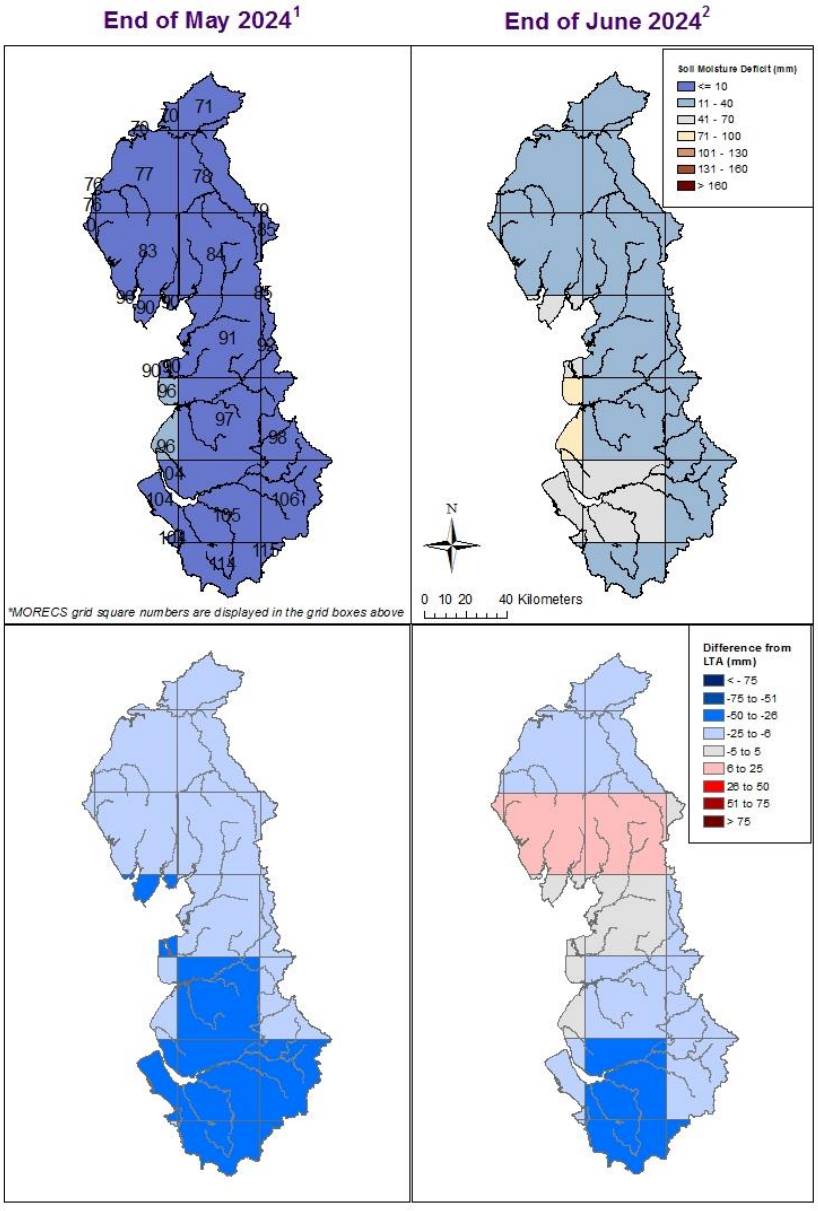


Rainfall data since 2023, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived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

3 Soil moisture deficit

3.1 Soil moisture deficit map

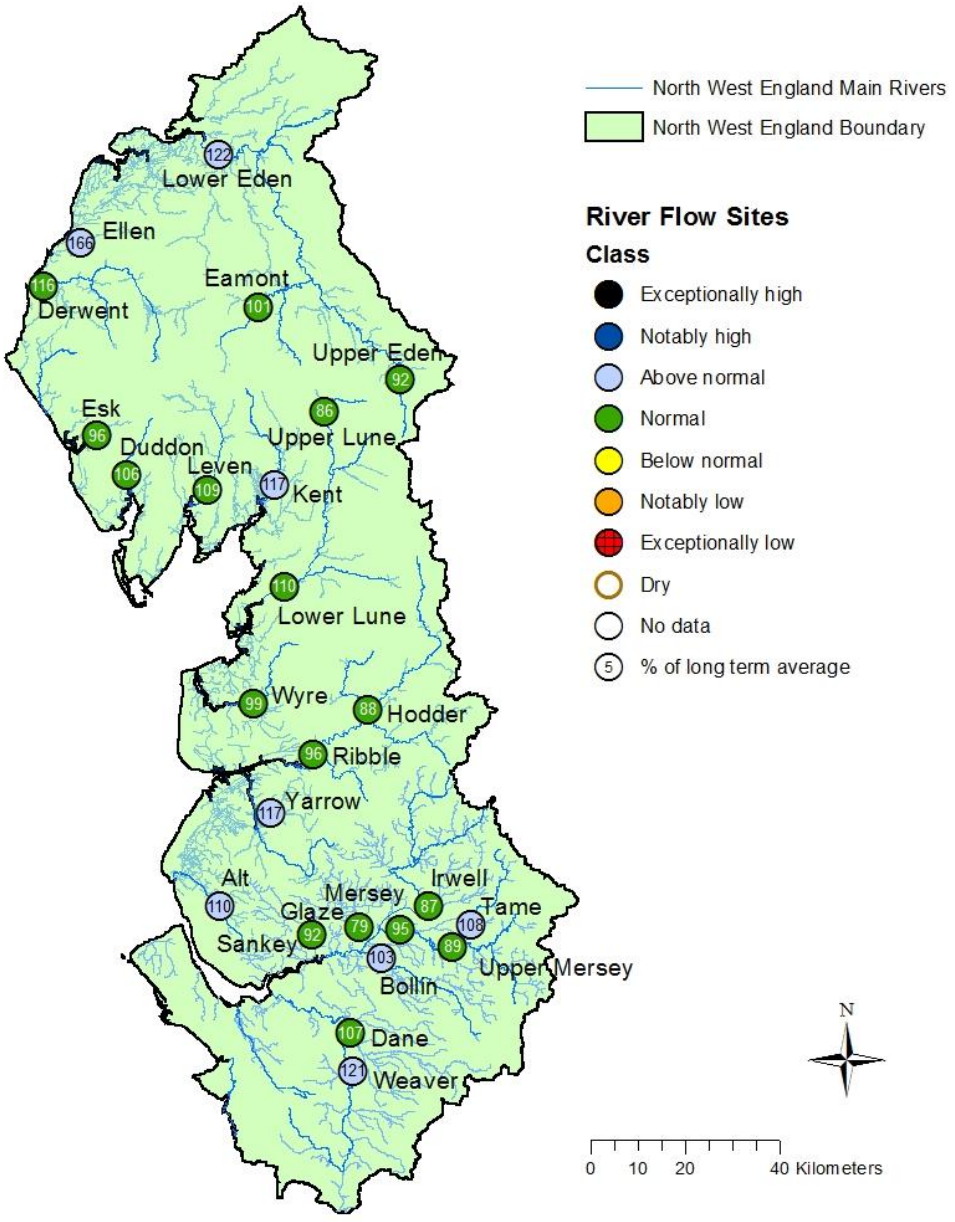
Figure 3.1: Soil moisture deficits for weeks ending 30 May 2024[1] (left panel) and 26 June 2024[2] (right panel). Top row shows actual soil moisture deficits (mm) and bottom row shows the difference (mm) of the actual from the 1961-90 long term average soil moisture deficits. MORECS data for real land use.



4 River flows

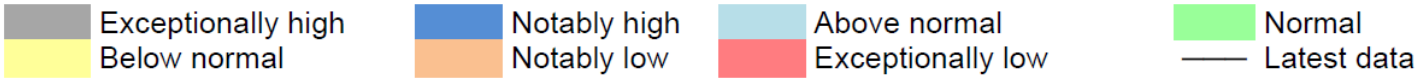
4.1 River flows map

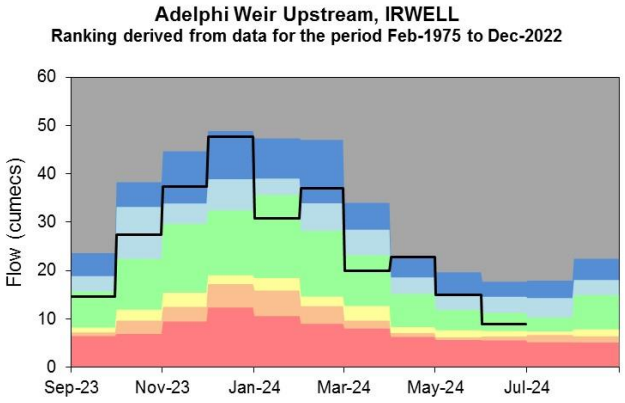
Figure 4.1: Monthly mean river flow for indicator sites for June 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic June monthly means. Table available in the appendices with detailed information.

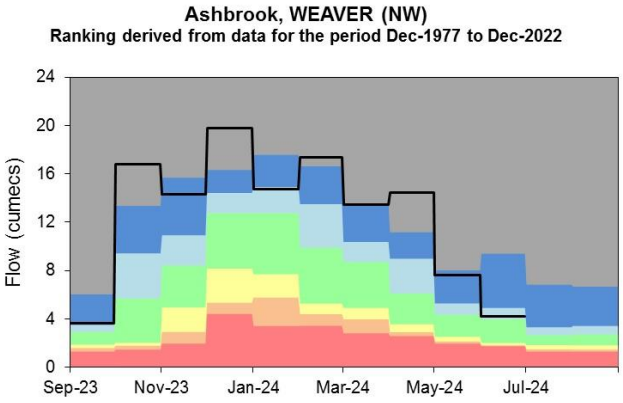


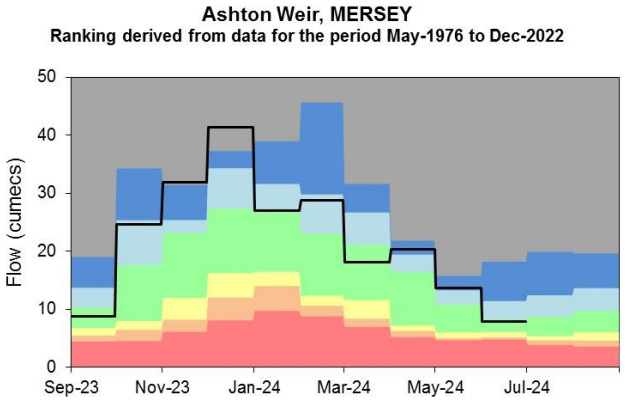
4.2 River flow charts

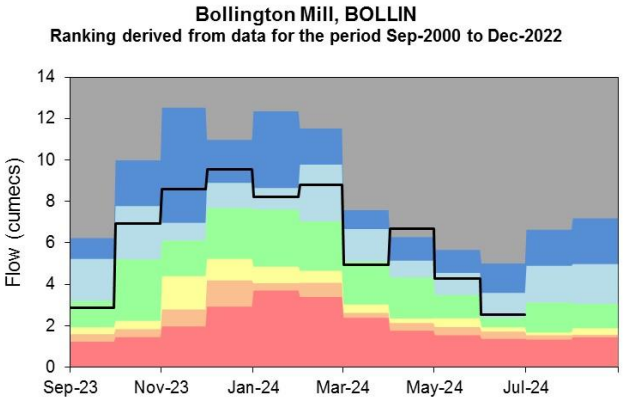
Figure 4.2: Monthly mean river flow for index sites over the past year, compared to an analysis of historic monthly mean flows.



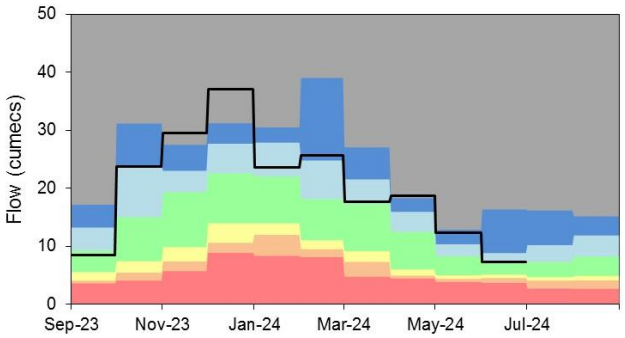




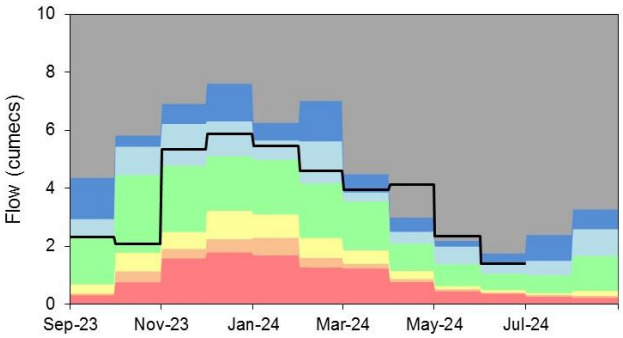




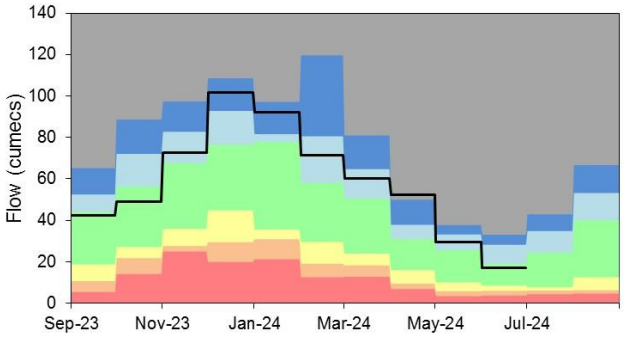
Brinksway, MERSEY
Ranking derived from data for the period Jan-1974 to Dec-2022



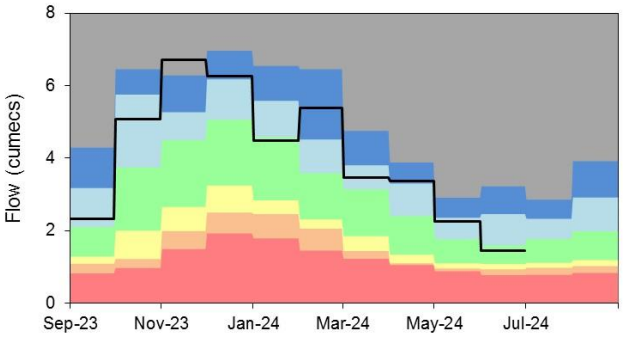
Bullgill, ELLEN
Ranking derived from data for the period Jan-1976 to Dec-2022



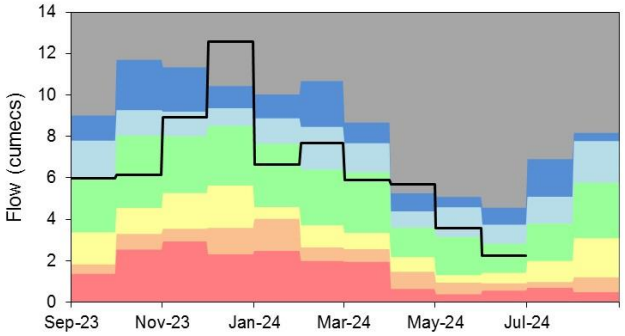
Caton, LUNE
Ranking derived from data for the period Jan-1959 to Dec-2022



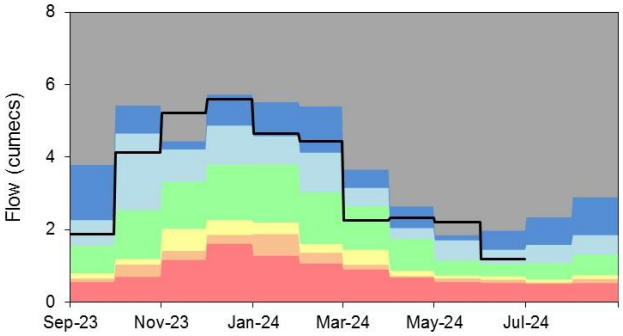
Causey Bridges, SANKEY
Ranking derived from data for the period Jan-1977 to Dec-2022



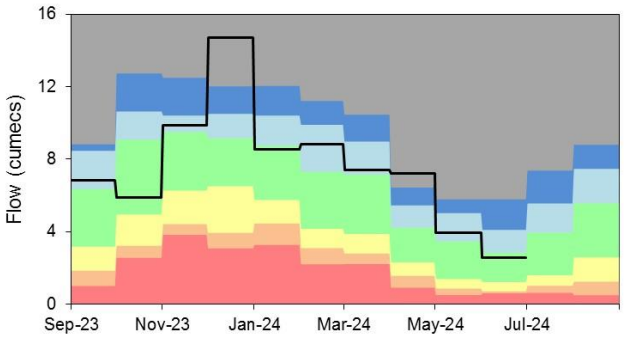
Cropple How, ESK (NW)
Ranking derived from data for the period Jan-1976 to Dec-2022



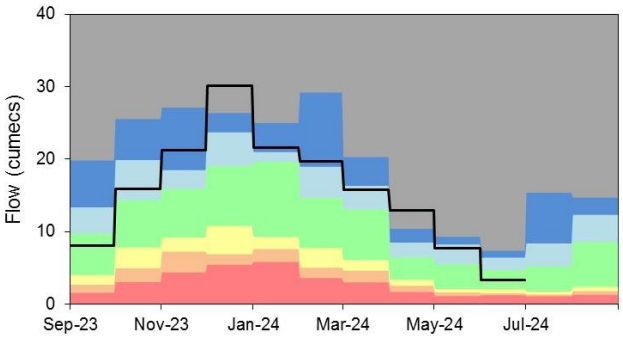
Croston, YARROW
Ranking derived from data for the period Jan-1976 to Dec-2022



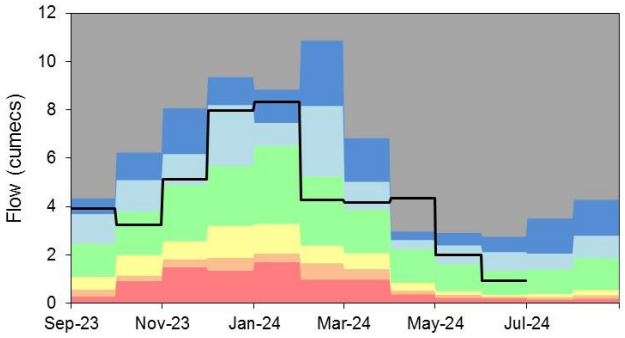
Duddon Hall, DUDDON
Ranking derived from data for the period Mar-1968 to Dec-2022



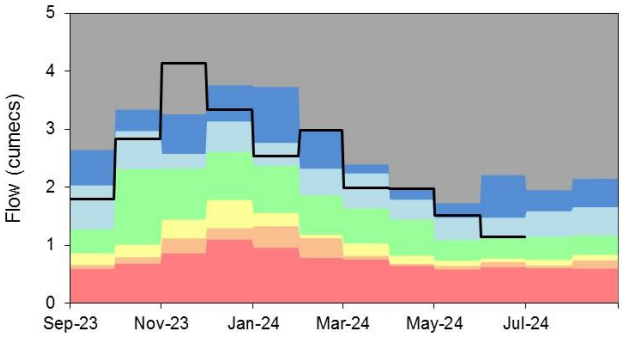
Hodder Place, HODDER
Ranking derived from data for the period Jan-1976 to Dec-2022



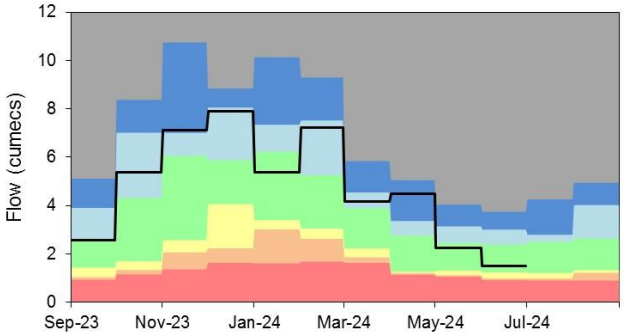
Kirkby Stephen, EDEN (NW)
Ranking derived from data for the period Oct-1971 to Dec-2022



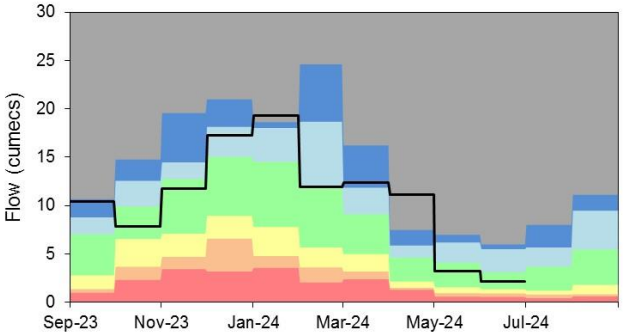
Kirkby, ALT
Ranking derived from data for the period Oct-1977 to Dec-2022



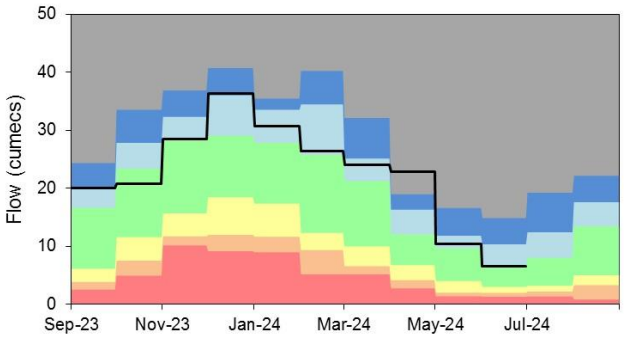
Little Woolden Hall Ultrasonic, GLAZE
Ranking derived from data for the period Jul-1995 to Dec-2022



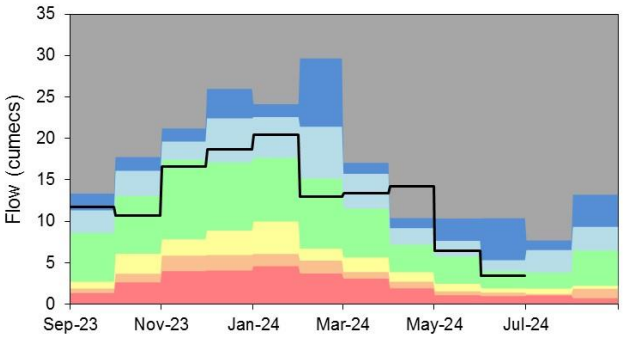
Lunes Bridge, LUNE
Ranking derived from data for the period Dec-1979 to Dec-2022



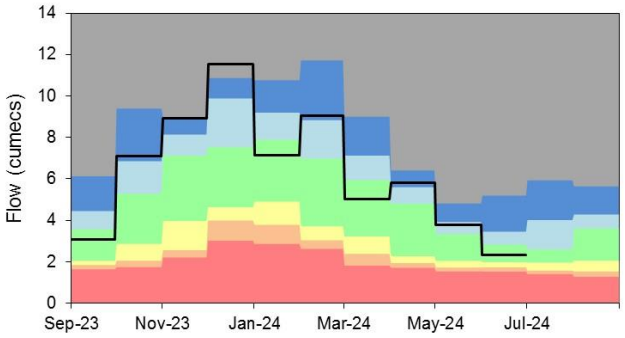
Newby Bridge FMS, LEVEN (NW)
Ranking derived from data for the period Jan-1972 to Dec-2022



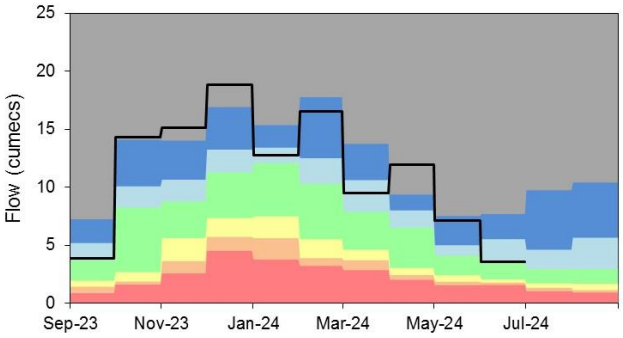
Pooley Bridge, EAMONT
Ranking derived from data for the period Jul-1970 to Dec-2022



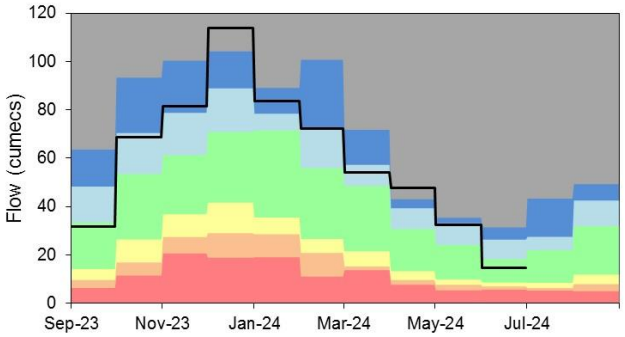
Portwood, TAME
Ranking derived from data for the period Jan-1976 to Dec-2022



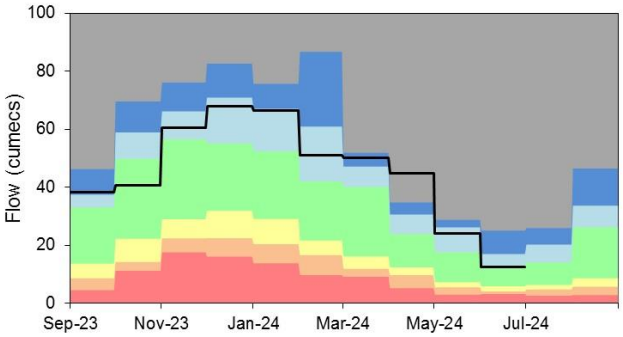
Rudheath, DANE
Ranking derived from data for the period Jan-1976 to Dec-2022

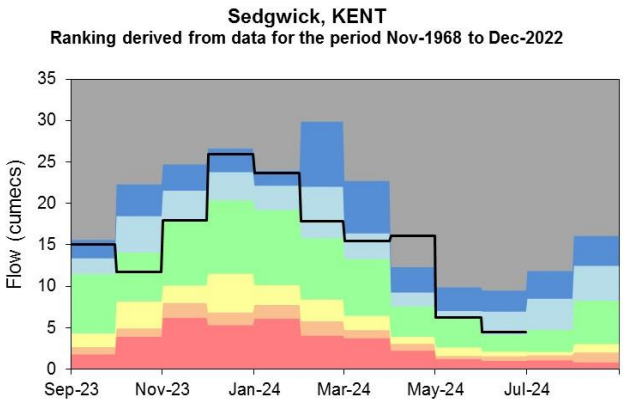


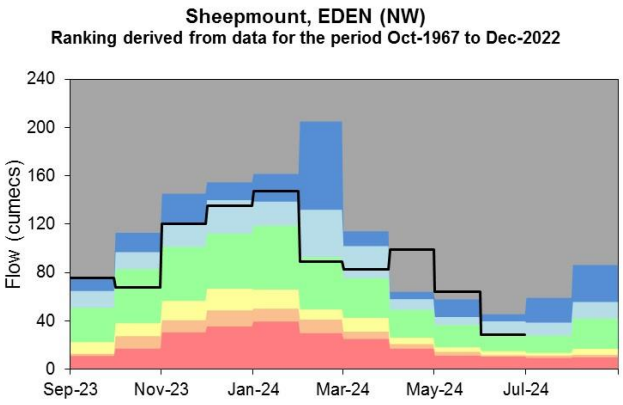
Samlesbury Pgs, RIBBLE (NW)
Ranking derived from data for the period May-1960 to Dec-2022

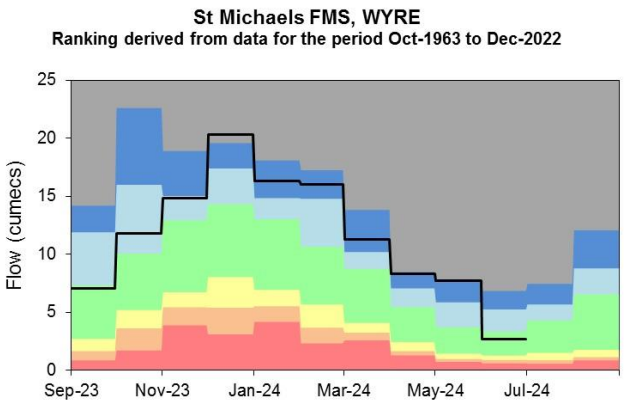


Seaton Mill, DERWENT (NW)
Ranking derived from data for the period Sep-1960 to Dec-2022







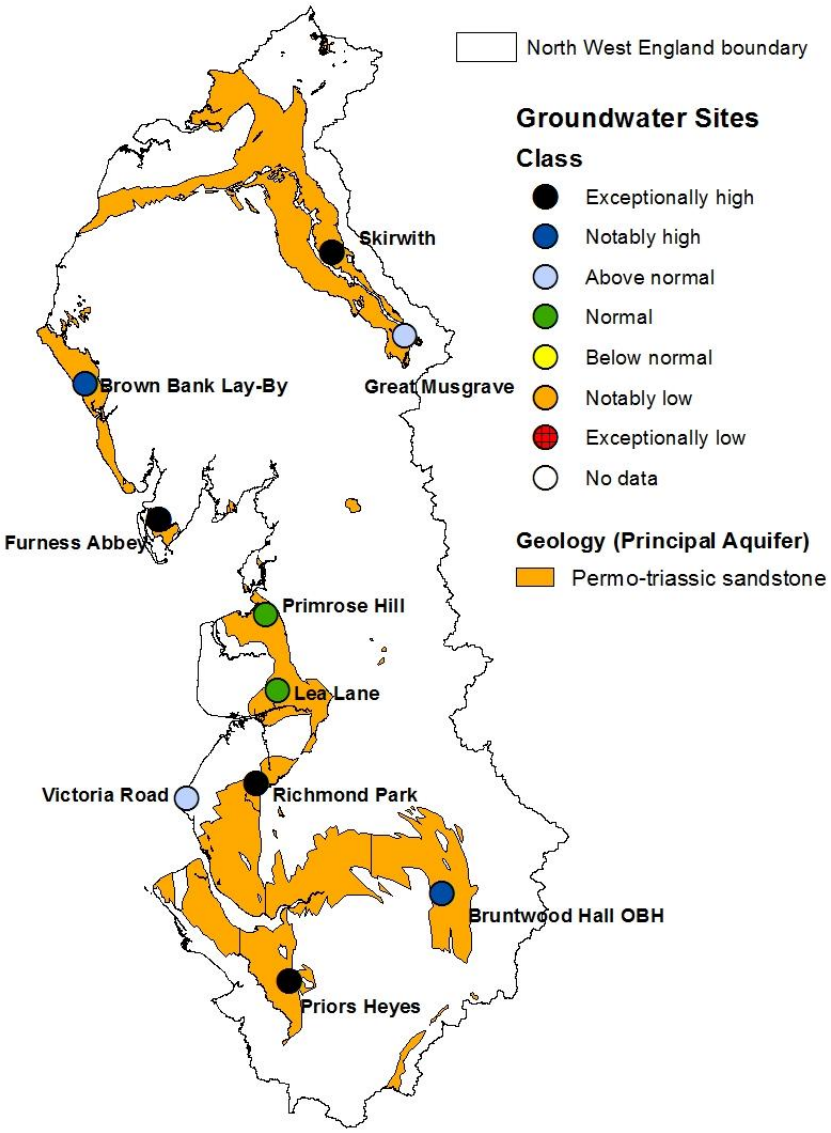


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

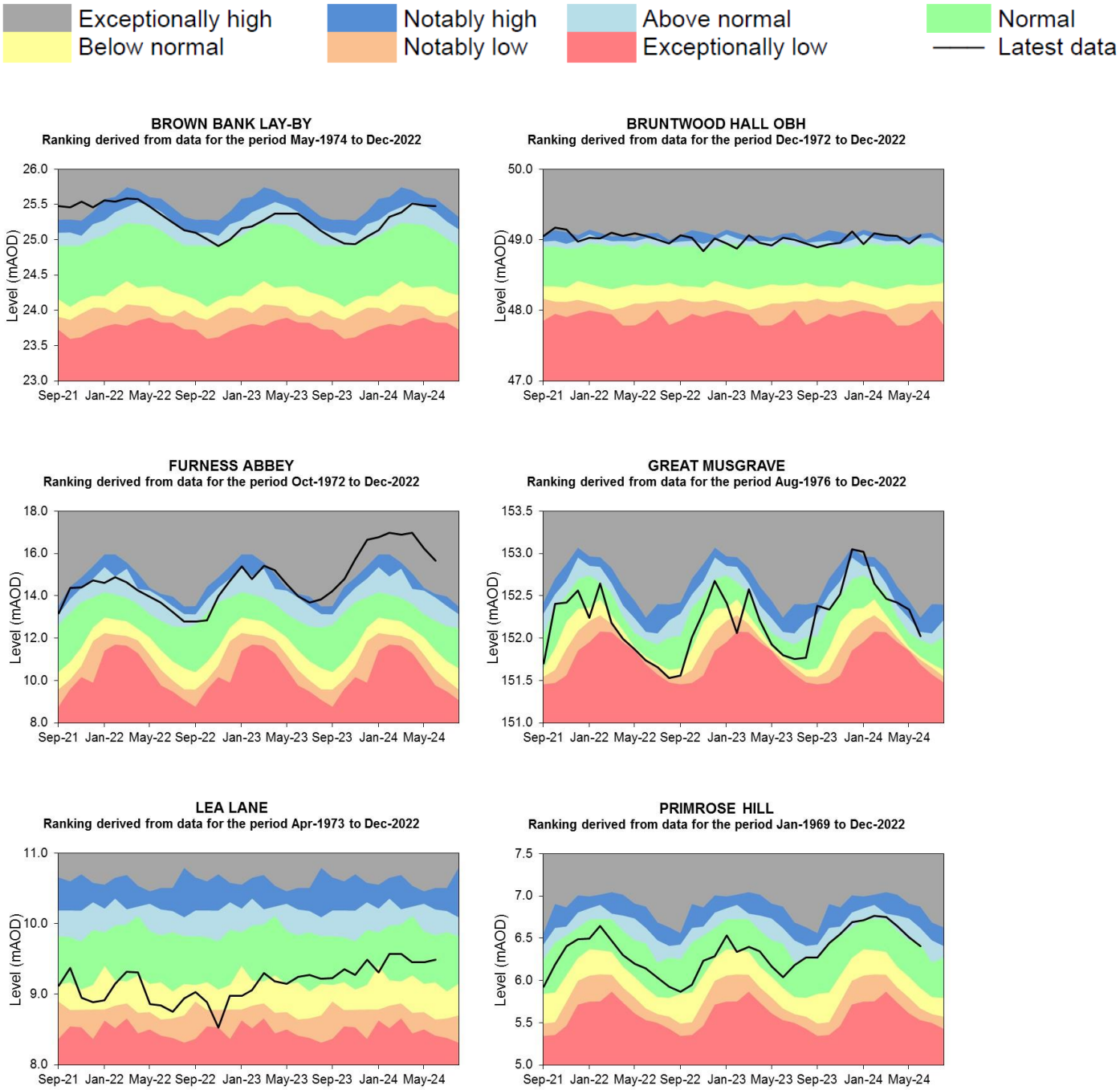
Figure 5.1: Groundwater levels for indicator sites at the end of June 2024, classed relative to an analysis of respective historic June levels. Table available in the appendices with detailed information. Please note Victoria Road Borehole sits within a superficial deposit as opposed to a bedrock aquifer. This is why the geology type is not marked on the map.

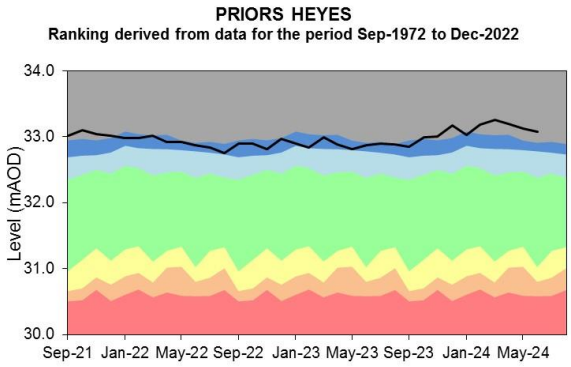


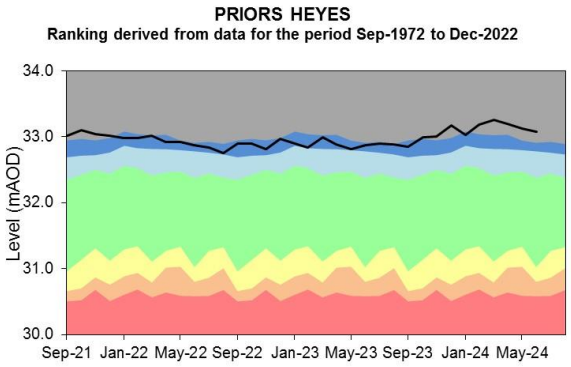
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

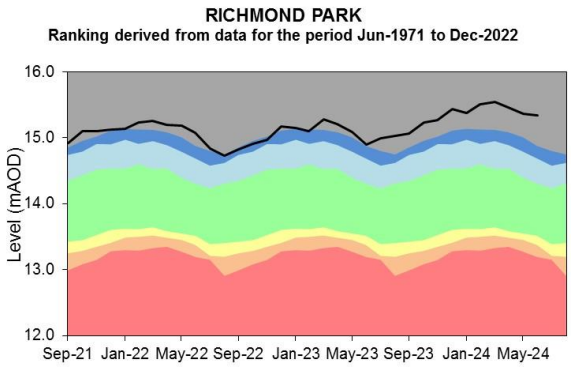
5.2 Groundwater level charts

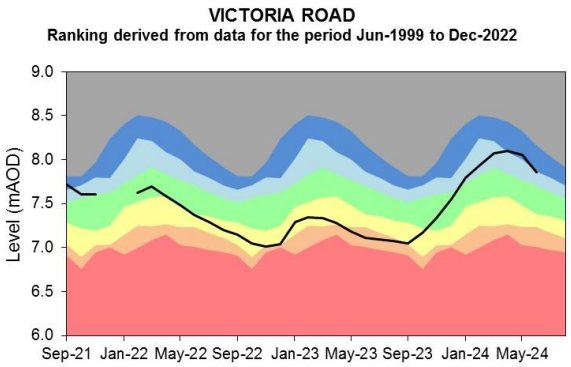
Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 34 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.











Source: Environment Agency, 2024.

6 Reservoir storage

Figure 6.1: The location of reservoirs that comprise the supply districts across North-west England and selected individual reservoirs.

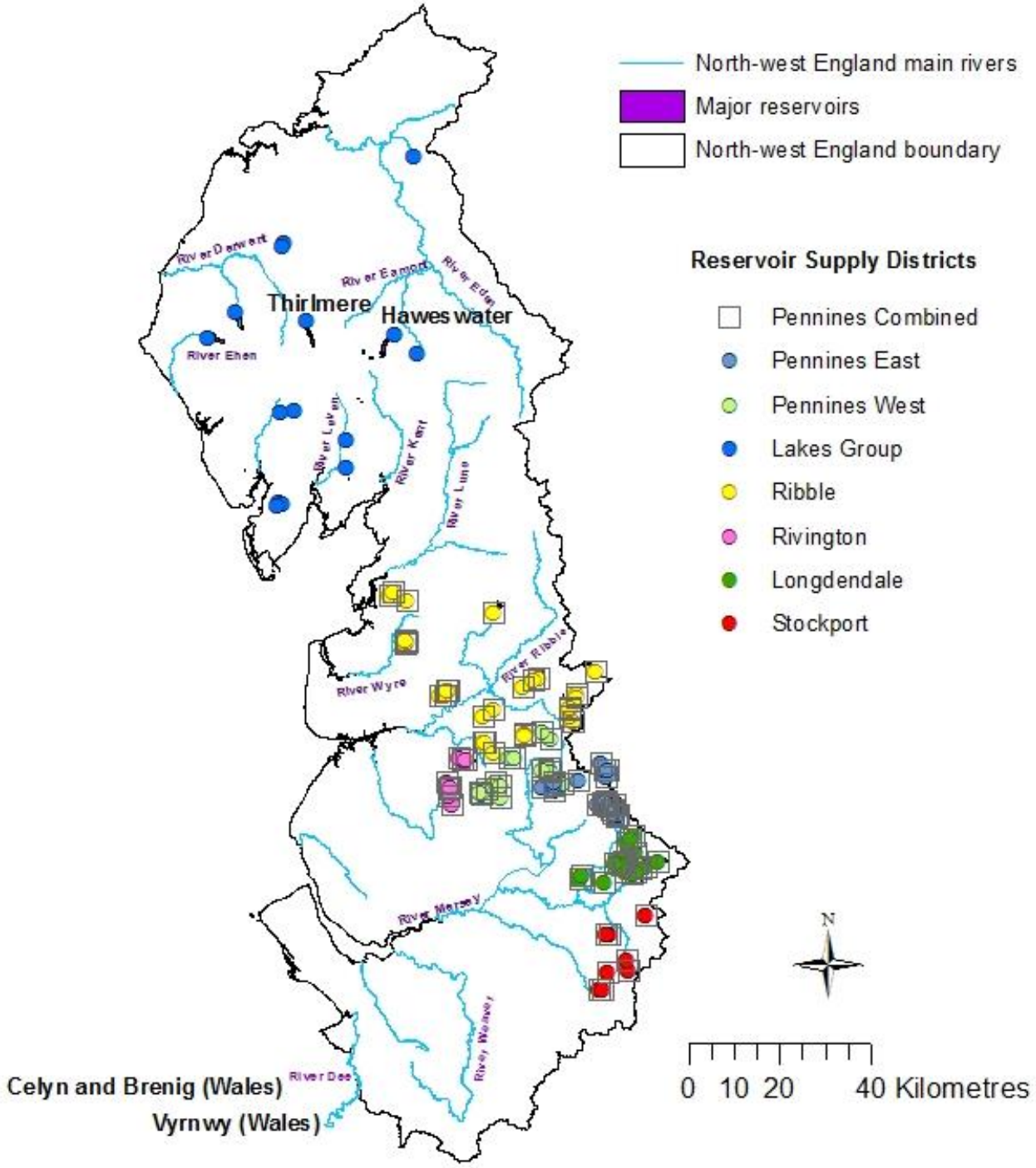
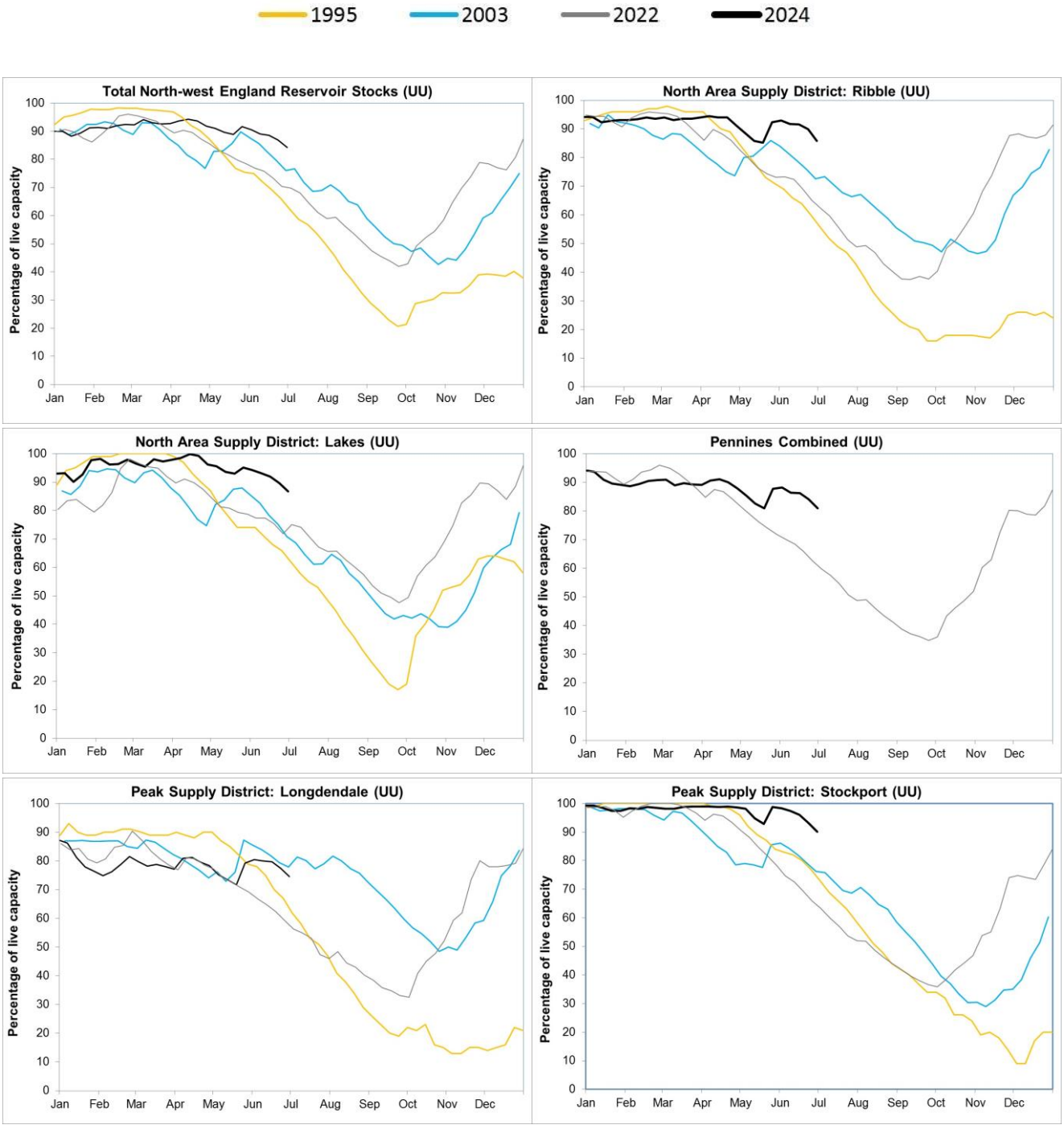
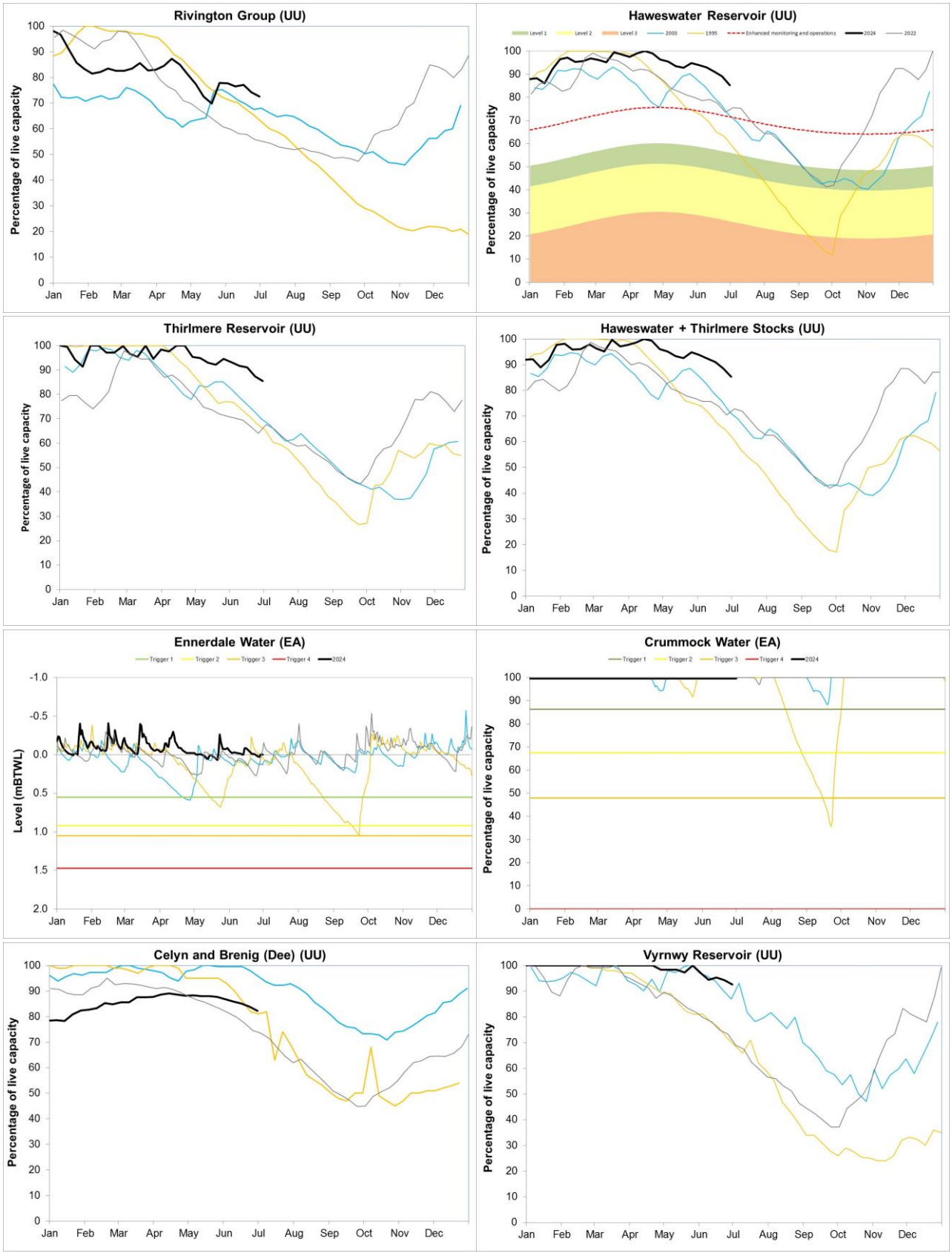


Figure 6.2: End of month reservoir storage for supply districts across North-west England and selected individual reservoirs for current year (2024) and representative years: 1995, 2003 and 2022. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in length.





Source: (UU) United Utilities, (EA) The Environment Agency.

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	Jun 2024 rainfall % of long term average 1961 to 1990	Jun 2024 band	Apr 2024 to June cumulative band	Jan 2024 to June cumulative band	Jul 2023 to June cumulative band
Cheshire Rivers Group	68	Below Normal	Notably high	Exceptionally high	Exceptionally high
Derwent (North West)	101	Normal	Exceptionally high	Exceptionally high	Exceptionally high
Douglas	92	Normal	Exceptionally high	Exceptionally high	Exceptionally high
Eden	95	Normal	Exceptionally high	Exceptionally high	Exceptionally high
Esk (Cumbria)	91	Normal	Exceptionally high	Exceptionally high	Exceptionally high
Esk (Dumfries)	90	Normal	Above normal	Above normal	Above normal
Kent	102	Normal	Exceptionally high	Exceptionally high	Exceptionally high
Mersey And Irwell	73	Normal	Notably high	Exceptionally high	Exceptionally high
Ribble	86	Normal	Exceptionally high	Exceptionally high	Exceptionally high

Wyre And Lune	89	Normal	Exceptionally high	Exceptionally high	Exceptionally high
North West	86	Normal	Exceptionally high	Exceptionally high	Exceptionally high

8.2 River flows table

Site name	River	Catchment	Jun 2024 band	May 2024 band
Adelphi Weir Upstream	Irwell	Irwell (Croal to Irk)	Normal	Above normal
Ashbrook	Weaver (North West)	Weaver Upper	Above normal	Notably high
Ashton Weir	Mersey	Mersey Non Tidal	Normal	Notably high
Bollington Mill	Bollin	Bollin	Above normal	Above normal
Brinksway	Mersey	Mersey Non Tidal	Above normal	Notably high
Bullgill	Ellen	Ellen Lower	Above normal	Exceptionally high
Caton	Lune	Lune Lower Tidal	Normal	Above normal
Causey Bridges	Sankey	Mersey Non Tidal	Normal	Above normal
Cropple How	Esk (North West)	Esk (South West Lakes)	Normal	Above normal
Croston	Yarrow	Yarrow Lower	Above normal	Exceptionally high
Duddon Hall	Duddon	Duddon	Normal	Above normal
Hodder Place	Hodder	Hodder Lower	Normal	Above normal
Kirkby	Alt	Alt	Above normal	Notably high
Kirkby Stephen	Eden (North West)	Eden Cumbria Upper	Normal	Above normal

Little Woolden Hall Ultrasonic	Glaze	Glaze	Normal	Normal
Lunes Bridge	Lune	Lune Upper	Normal	Normal
Newby Bridge FMS	Leven (North West)	Leven Cumbria	Normal	Above normal
Pooley Bridge	Eamont	Eamont	Normal	Above normal
Portwood	Tame	Tame	Normal	Above normal
Rudheath	Dane	Dane	Normal	Notably high
Samlesbury PGS	Ribble (North West)	Ribble Lower	Normal	Above normal
Seaton Mill	Derwent (North West)	Derwent Cumbria Lower	Normal	Above normal
Sedgwick	Kent	Levens Bridge	Above normal	Above normal
Sheepmount	Eden (North West)	Eden Cumbria Lower	Above normal	Exceptionally high
St Michaels Fms	Wyre	Brock	Normal	Notably high

8.3 Groundwater table

Site name	Aquifer	End of Jun 2024 band	End of May 2024 band
Brown Bank Lay-by	West Cumbria Permo-triassic Sandstone	Notably high	Notably high
Bruntwood Hall Obh	East Cheshire Permo-triassic Sandstone	Notably high	Above normal
Furness Abbey	Furness Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Great Musgrave	Eden Valley And Carlisle Basin Permo-triassic Sandstone	Above normal	Notably high
Lea Lane	Fylde Permo-triassic Sandstone	Normal	Normal
Priors Heyes	West Cheshire Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Primrose Hill	Fylde Permo-triassic Sandstone	Normal	Above normal
Richmond Park	Rufford Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Skirwith	Eden Valley And Carlisle Basin Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Victoria Road Entrance	West Lancashire Quaternary Sand And Gravel Superficial Deposits	Above normal	Notably high