Monthly water situation report: Lincolnshire and Northamptonshire Area

1 Summary - September 2024

Following a notably dry August, September saw significantly wetter conditions with exceptionally high rainfall across Lincolnshire and Northamptonshire. Totals ranged from 173% to 346% of the long-term average (LTA), classifying the rainfall as notably high to exceptionally high across the six hydrological areas. This made it the second-wettest September on record for the region. The southern part of the region received more rainfall than the north, making it the wettest September on record for the Upper Welland and Nene hydrological area.

As a result of the exceptionally high rainfall, soil moisture deficits (SMD) decreased significantly across the region, particularly in the south. River flows increased dramatically, most notably in the Welland and Nene areas, where all indicator sites recorded record-high monthly mean flows for September. Groundwater levels remained high and are expected to continue increasing in October due to the heavy rainfall seen at the end of September. Reservoir stocks have mostly risen across the area. Lastly, all transfer schemes were off by the end of the month and are likely to remain off for the foreseeable future.

1.1 Rainfall

After a notably dry August, September brought an average of 123 mm of rainfall across the area. Rainfall ranged from 173% to 346% of the LTA, classifying it as notably high to exceptionally high for the time of year. There was a north-south divide, with southern areas receiving more rainfall than those in the north, and the highest rainfall occurring towards the end of the month. This made it the second-wettest September on record (dating back to 1871) for the region overall, and the wettest ever for the Upper Welland and Nene area, surpassing previous records by over 40 mm. The three-month and six-month trends display normal to exceptionally high rainfall totals, with the highest values seen in the south. The Water Year 2023/2024 has been the wettest since 1882/1883, largely due to last winter's wet conditions; as a result, the 12-month trend continues to display its exceptionally high totals.

1.2 Soil moisture deficit and recharge

Due to the exceptionally wet September, SMD decreased significantly and ended the month at below normal to exceptionally low levels for the time of year. The highest levels of SMD were

observed in the northern areas, as a result of the lower rainfall totals. SMD remained above normal for most of September before dropping sharply at the end of the month, following the week of heavy rainfall. Cooler autumn temperatures will have further contributed to this decline in SMD. The area as a whole ended the month with an SMD of 35 mm, in comparison to 120 mm at the end of August.

1.3 River flows

The exceptionally high rainfall totals caused river flows to increase at all indicator sites, with the largest rises observed in the southern region, particularly the Wellend and Nene catchments. Monthly mean flows ranged from 62% to 1570% of the LTA, classifying river flows as normal to exceptionally high across the area. Record-breaking monthly mean flows for September were recorded at several sites, including Ashley (Welland), Barrowden/Tixover (Wellend), Geldharts Mill (Nene), Upton Mill (Nene) and Wansford (Nene).

1.4 Groundwater levels

Despite the exceptionally high levels of rainfall, most groundwater indicator sites saw levels decline through September. This is likely because the heaviest rainfall occurred late in the month, with its full impact expected to be seen in October. By the end of September, groundwater levels were classified as normal to exceptionally high for the time of year, with the highest levels being recorded at Hanthorpe, the most southernmost groundwater indicator site.

1.5 Reservoir stocks

Reservoir stocks across the area mostly increased during September following the exceptionally high rainfall. Both Pitsford and Ravensthorpe and Hollowell combined saw sharp increases and ended the month significantly above their operational targets. Rutland and Covenham remained slightly below target but are expected to rise in the coming weeks due to the high river flows.

1.6 Environmental impact

The Trent-Witham-Ancholme transfer scheme operated for most of September, transferring water from the River Trent to River Witham and River Witham to River Ancholme. However, given the end of month rainfall totals, the Trent-Witham and Witham-Ancholme transfers were turned off on 25 September and 28 September, respectively. The Gwash-Glen and Slea

Augmentation schemes remained off throughout September. It is unlikely any transfer schemes will be required for the remainder of the operational year.

No cessation notices were issued during September. There were eight flood alerts and 14 flood warnings issued.

1.7 Forward look

1.7.1 Probabilistic ensemble projections for river flows at key sites

December 2024: All sites are showing a greatly increased probability of greater than normal flows.

March 2025: Both Nene-Northampton and Nene-Wansford are showing an increased probability of greater than normal flows. North Brook is showing a slightly increased probability of below normal flows.

1.7.2 Probabilistic ensemble projections for groundwater levels in key aquifers

March 2025: All sites are showing a greatly increased probability of exceptionally high levels.

September 2025: All sites are showing a reduced probability of exceptionally low levels.

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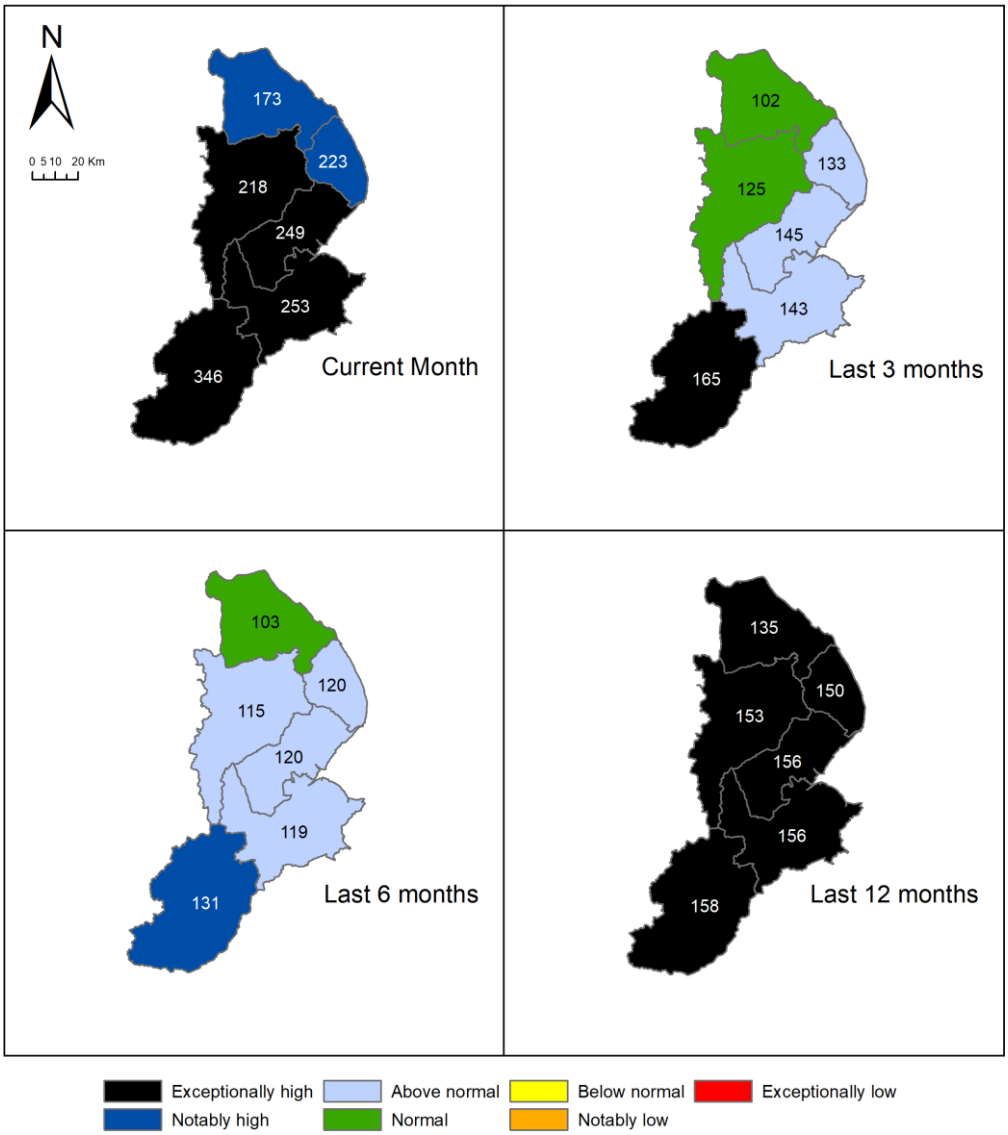
2 Rainfall

2.1 Rainfall map

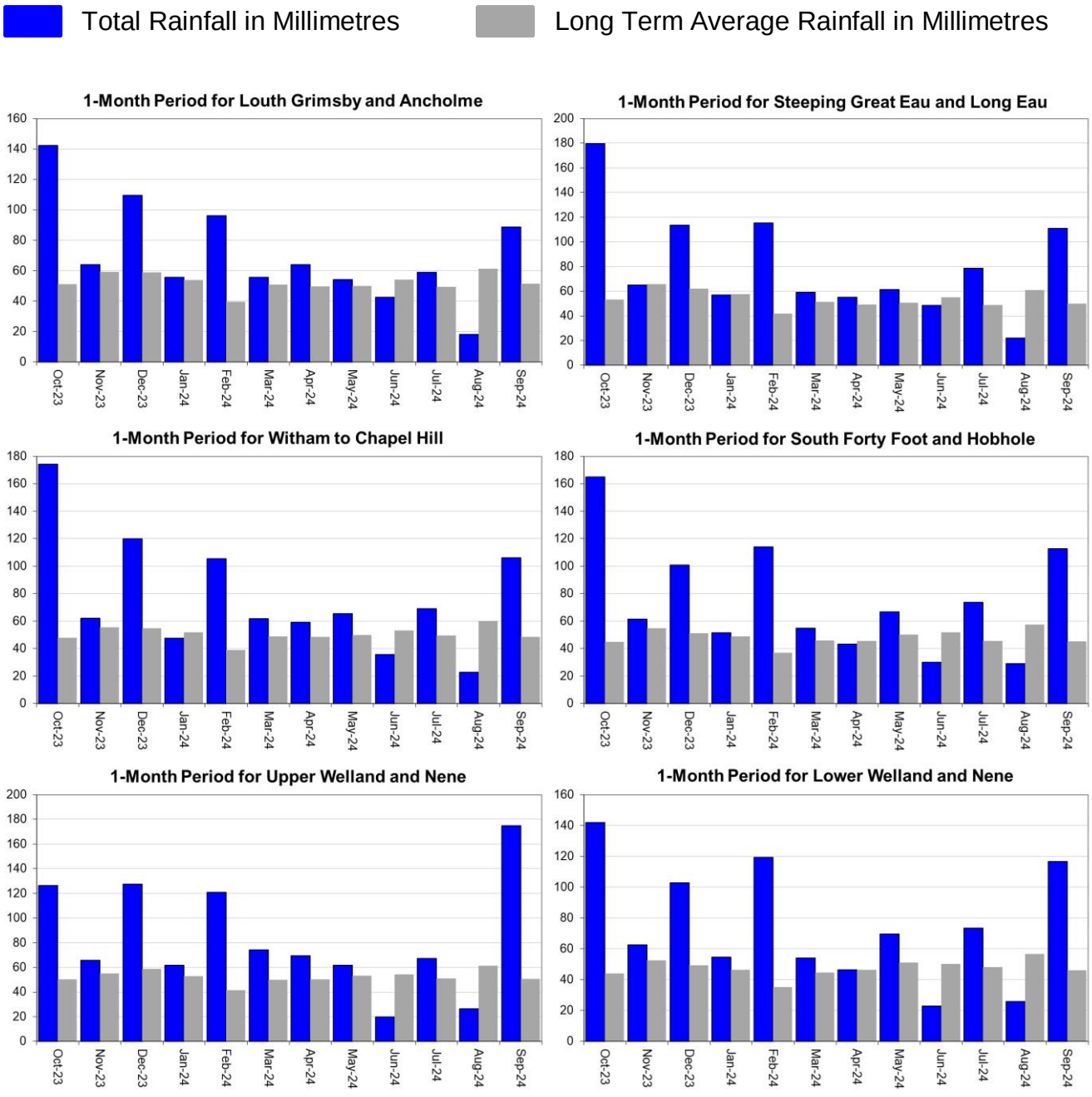
Figure 2.1: Total rainfall for hydrological areas across Lincolnshire and Northamptonshire, expressed as a percentage of long term average rainfall for the current month (up to 30 September 2024), the last 3 months, the last 6 months, and the last 12 months. Category classes are based on an analysis 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 12 months as a percentage of the 1961 to 1990 long term average for each region and for England.

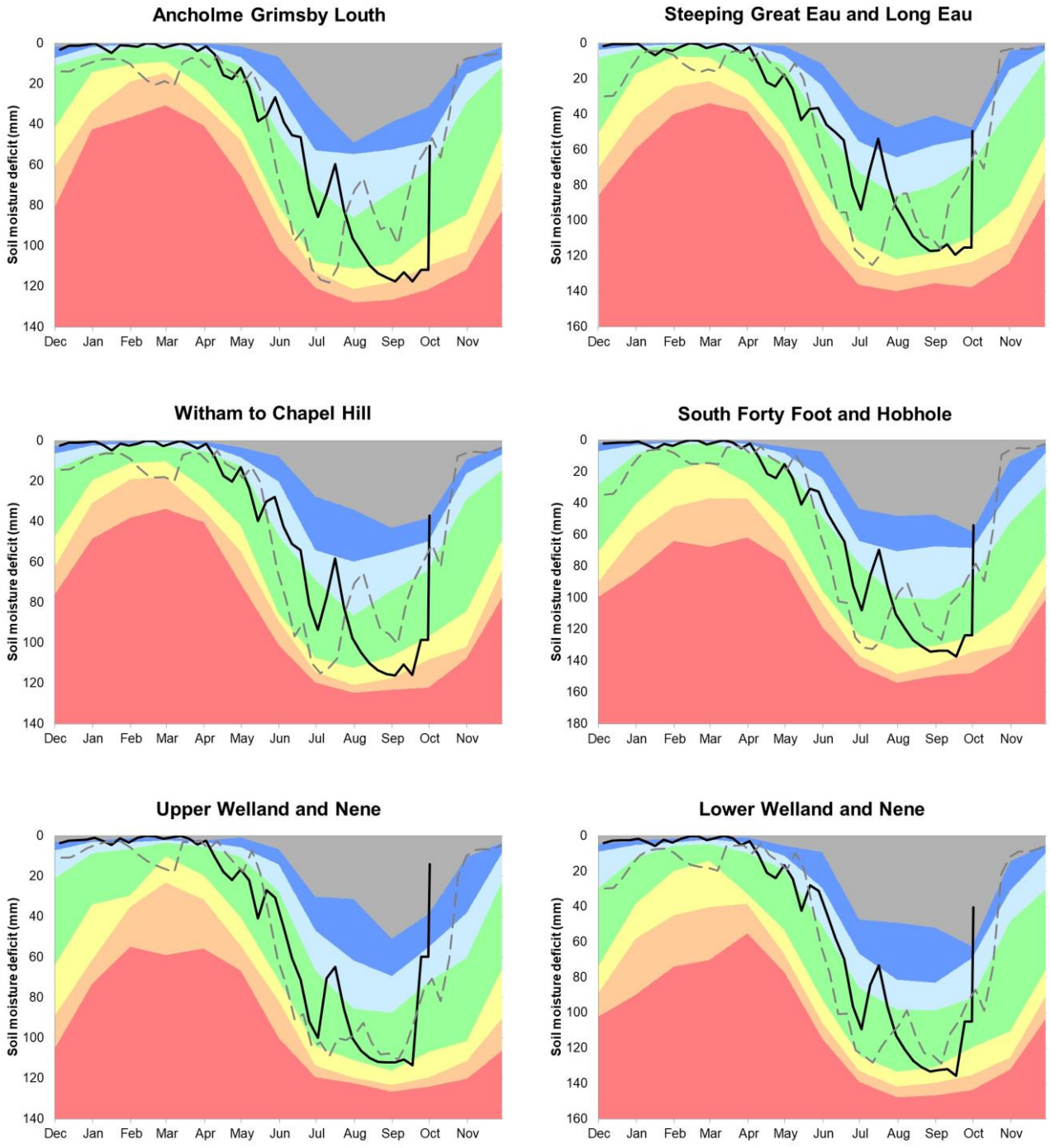


HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

3 Soil moisture deficit

3.1 Soil moisture deficit charts

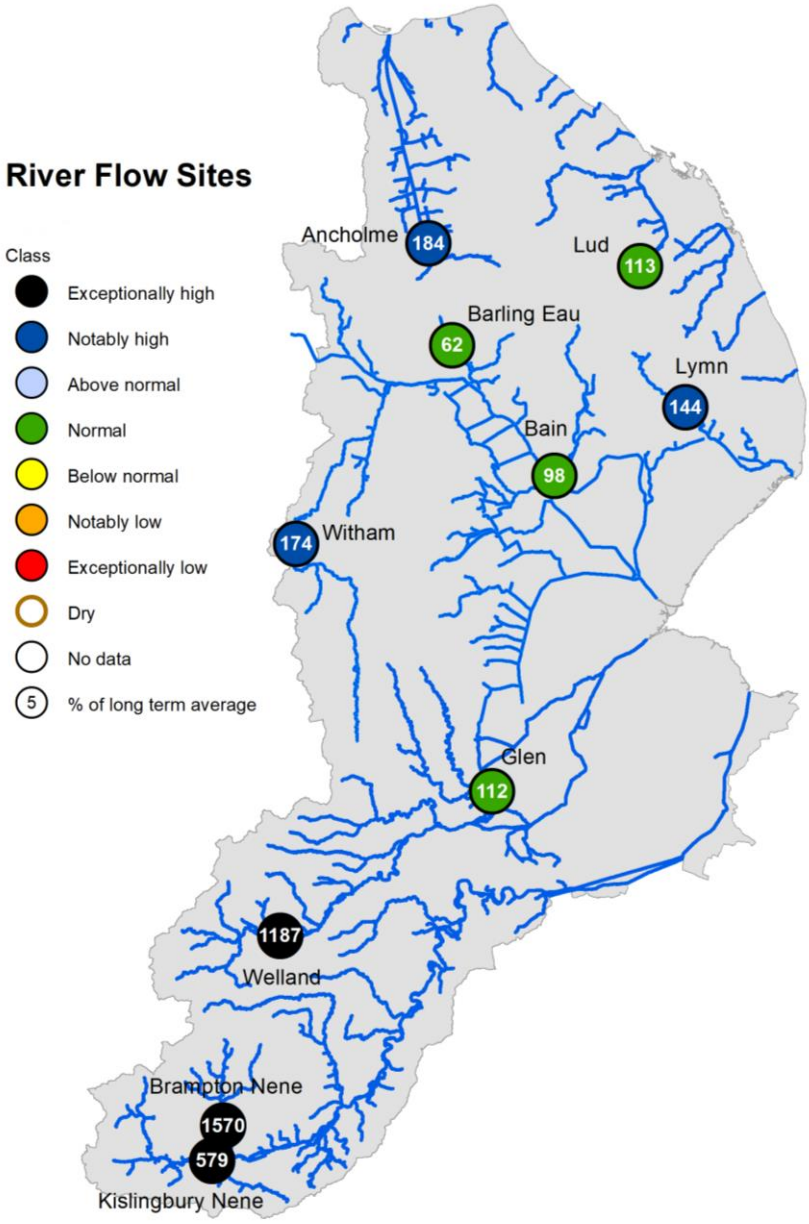
Figure 3.1: Latest soil moisture deficit compared to an analysis of historic 1961 to 1990 long term data set. Weekly MORECS data for real land use.



4 River flows

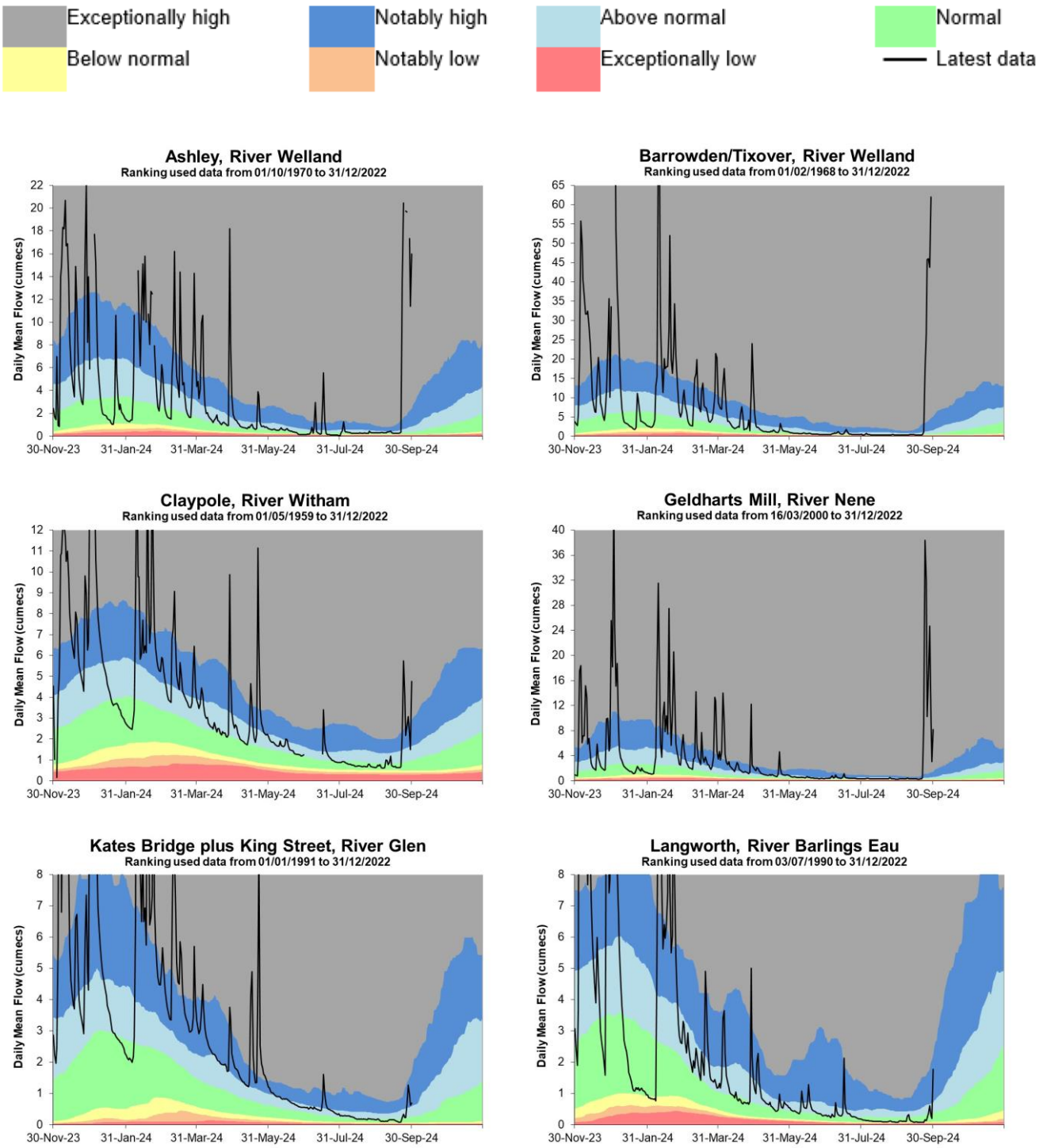
4.1 River flows map

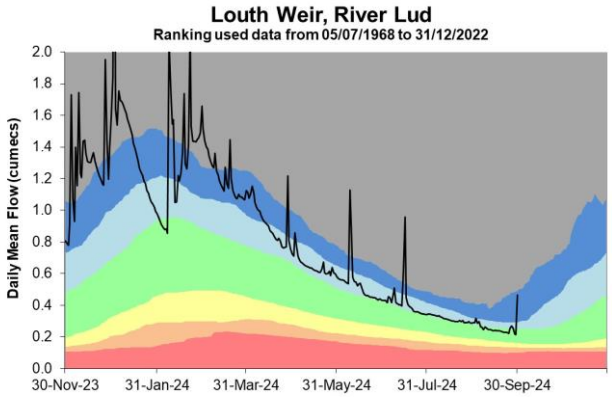
Figure 4.1: Monthly mean river flow for indicator sites for September 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic September monthly means Table available in the appendices with detailed information.

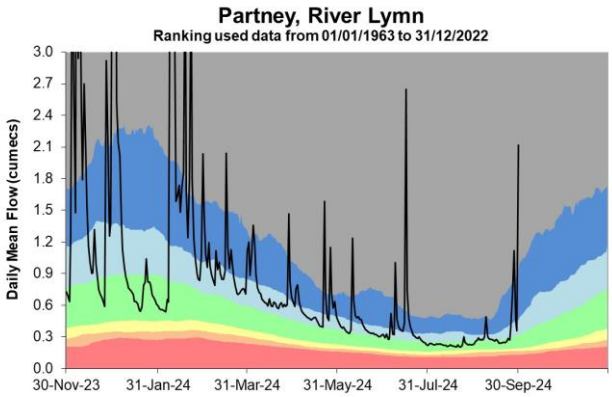


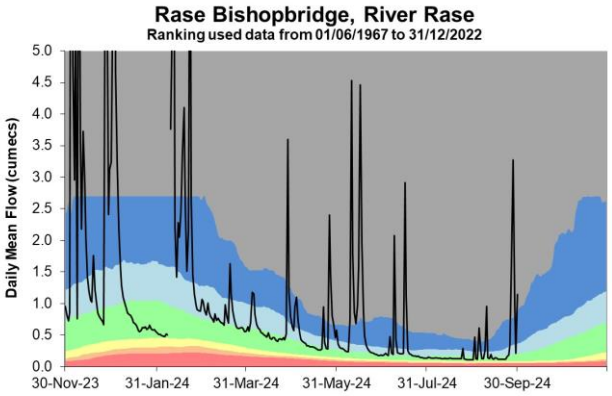
4.2 River flow charts

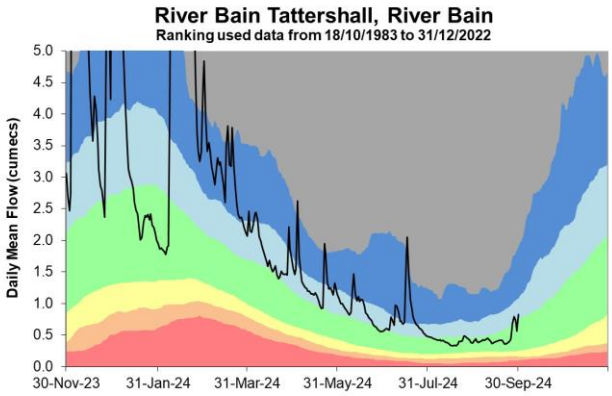
Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows, and long term maximum and minimum flows.

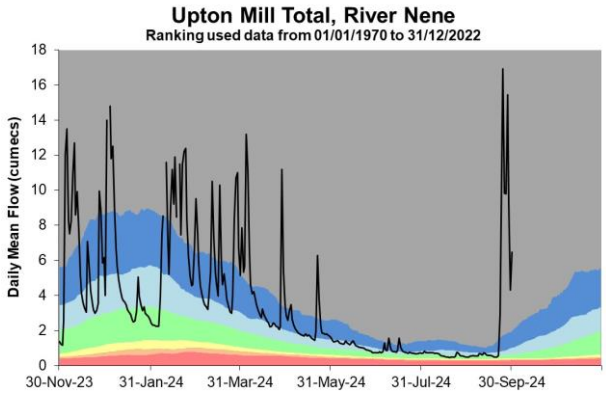


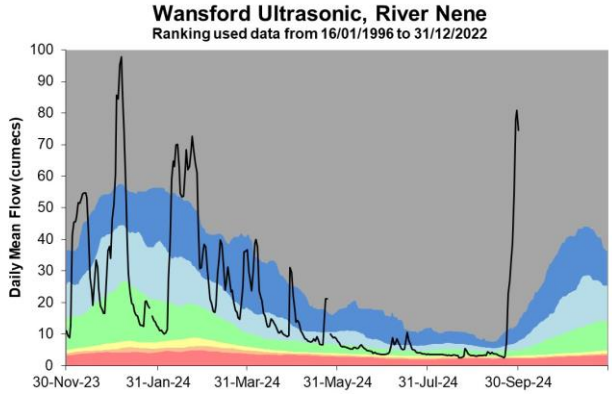










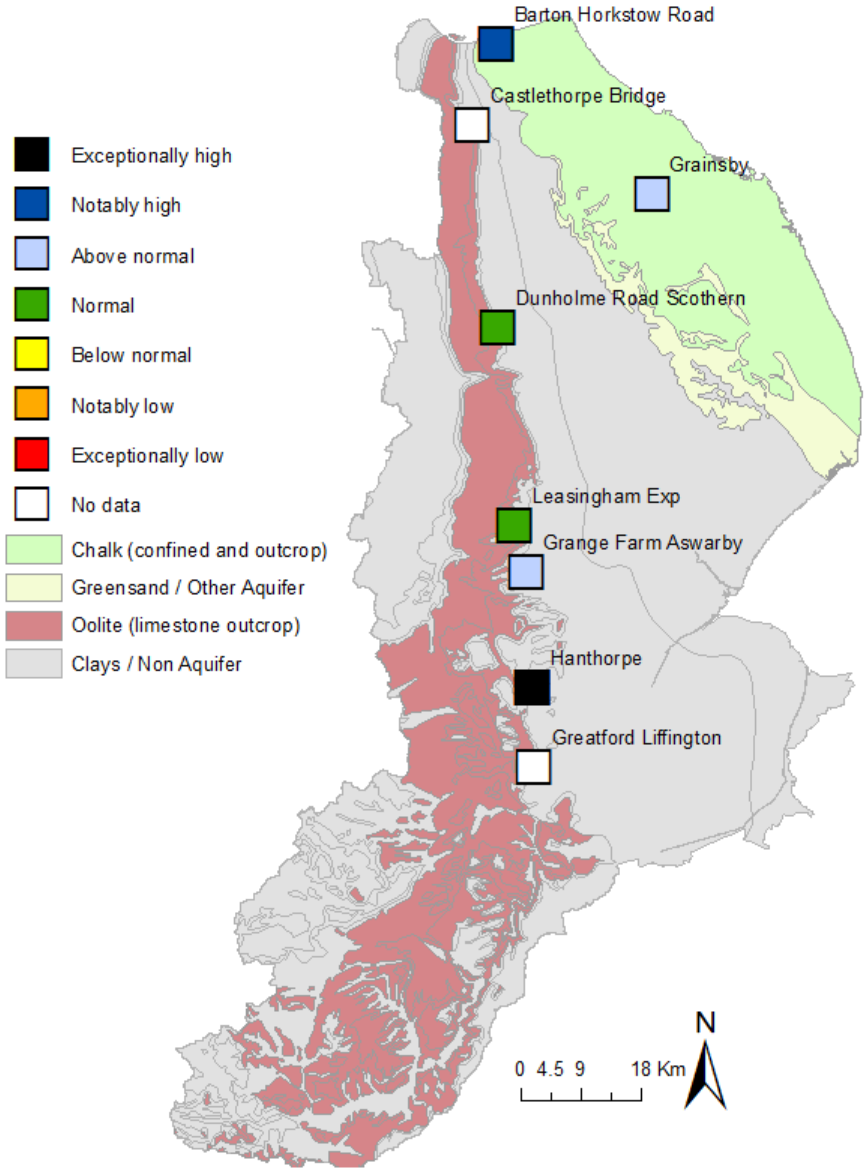


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

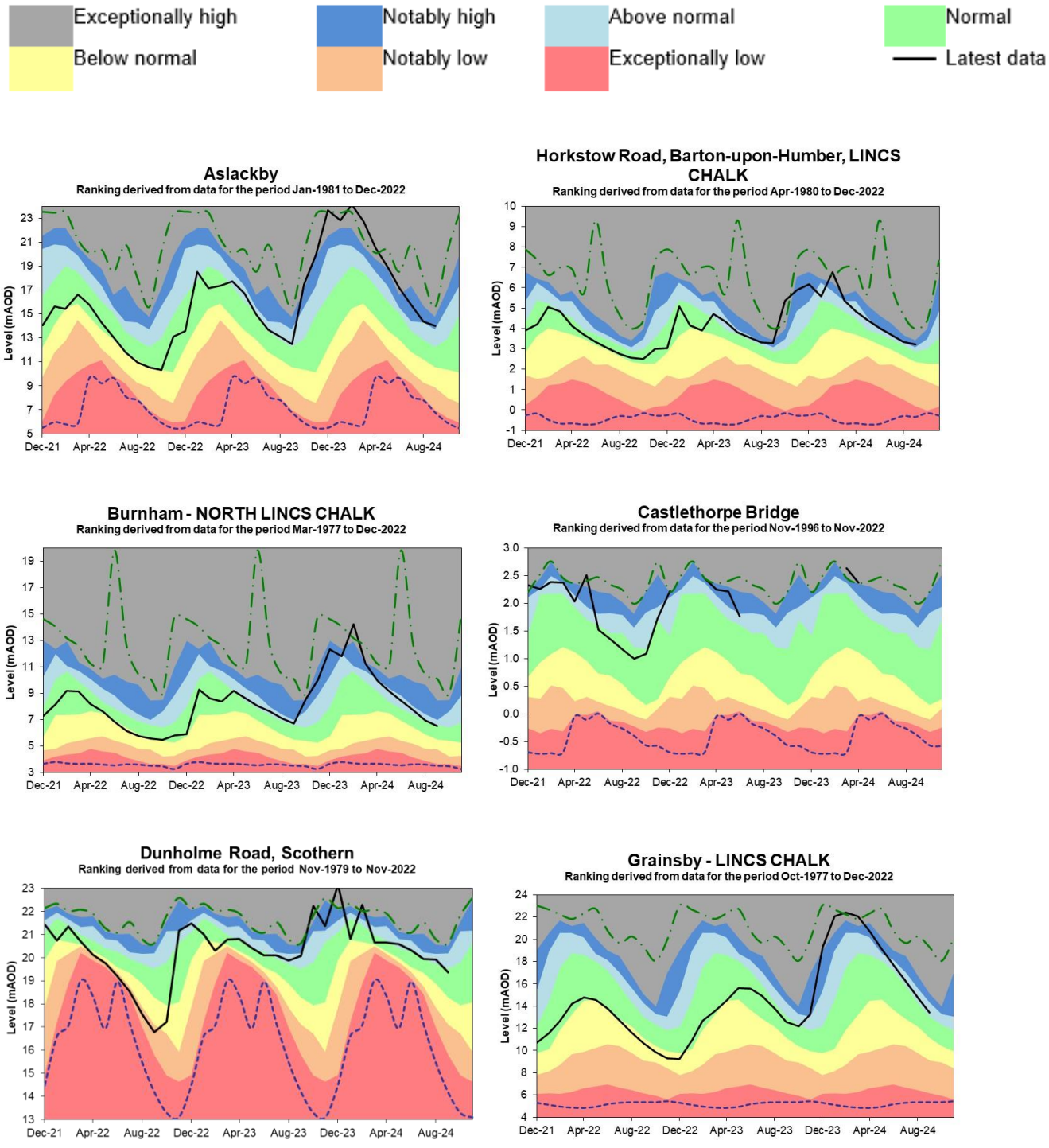
Figure 5.1: Groundwater levels for indicator sites at the end of September 2024, classed relative to an analysis of respective historic September levels. Table available in the appendices with detailed information.

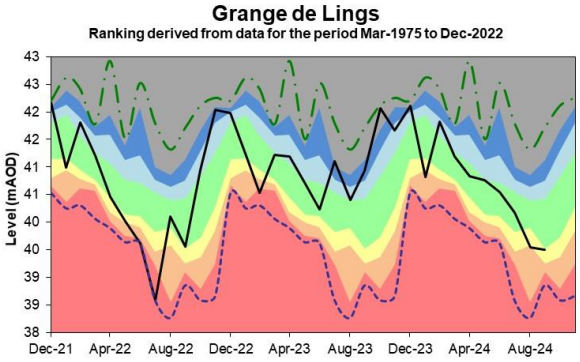


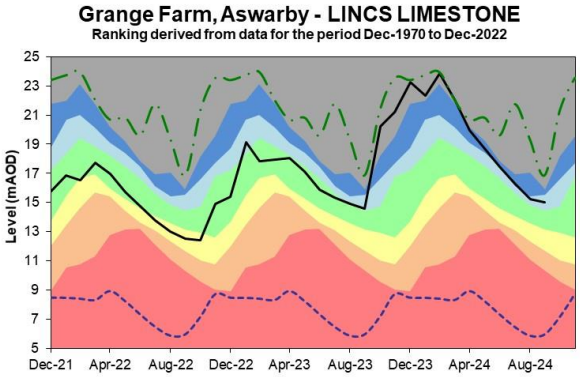
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

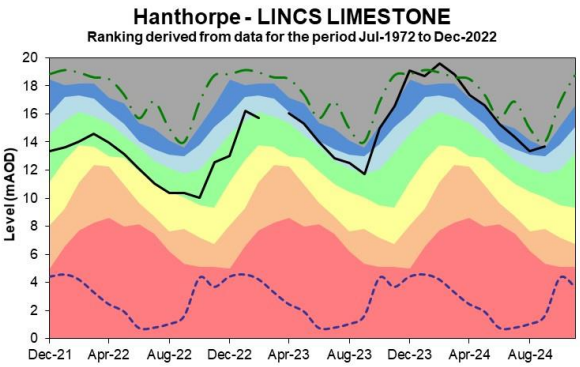
5.2 Groundwater level charts

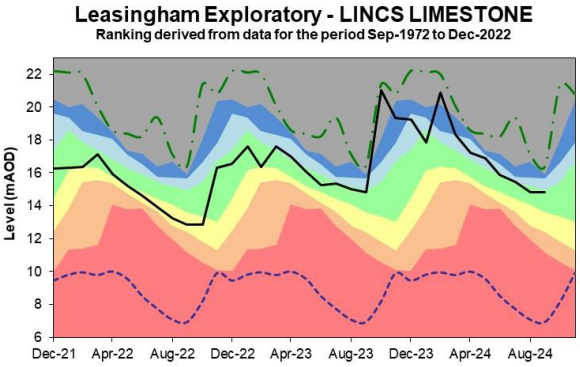
Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 22 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.







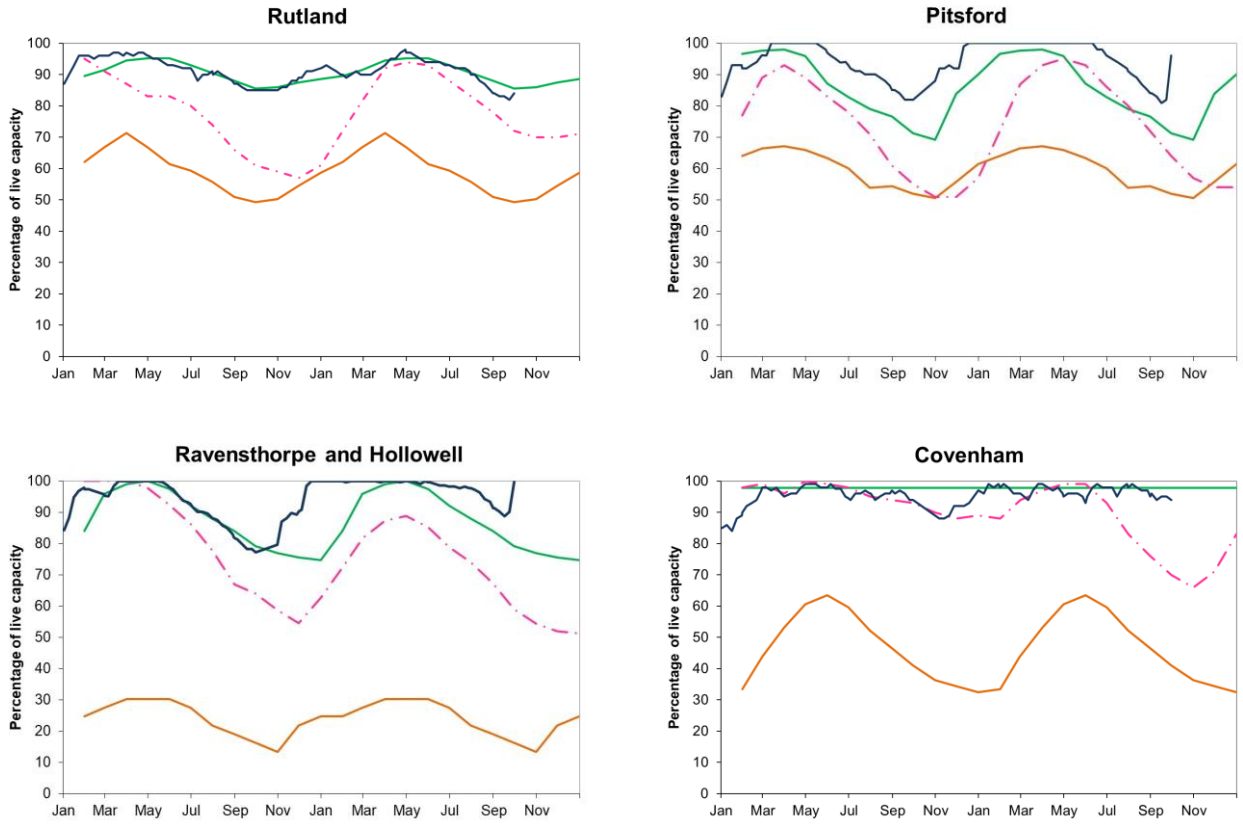




Source: Environment Agency, 2024.

6 Reservoir stocks

Figure 6.1: End of month regional reservoir stocks compared to the normal operating curve, drought curve and dry 1995-1996 stocks. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in length

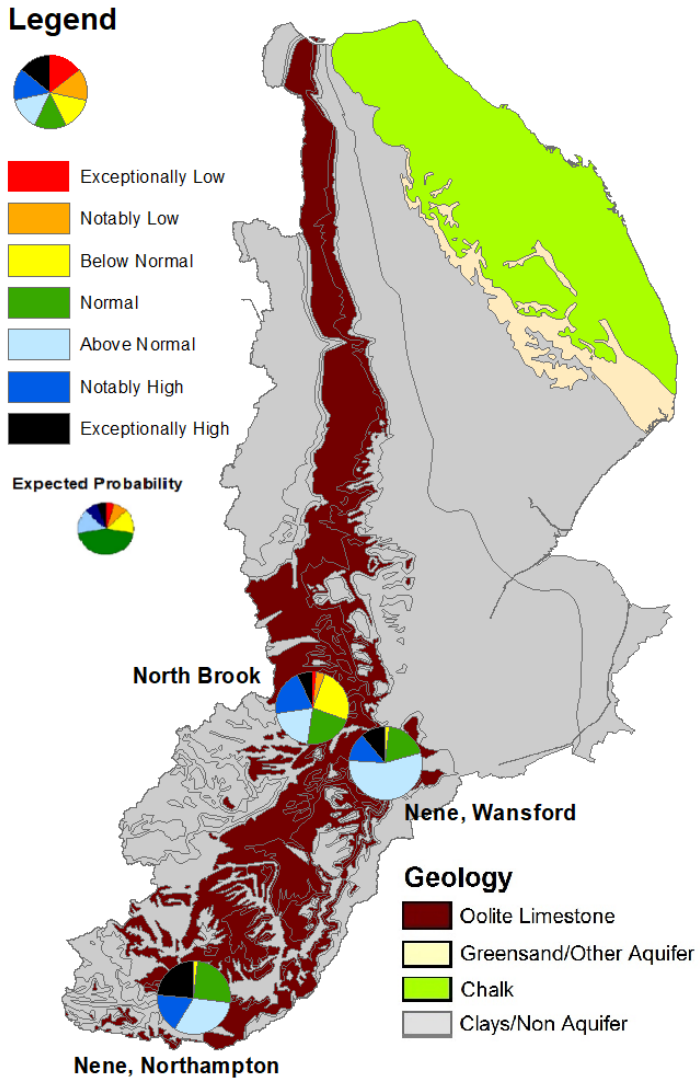


(Source: water companies).

7 Forward Look

7.1 Probabilistic ensemble projection of river flows at key sites in December 2024

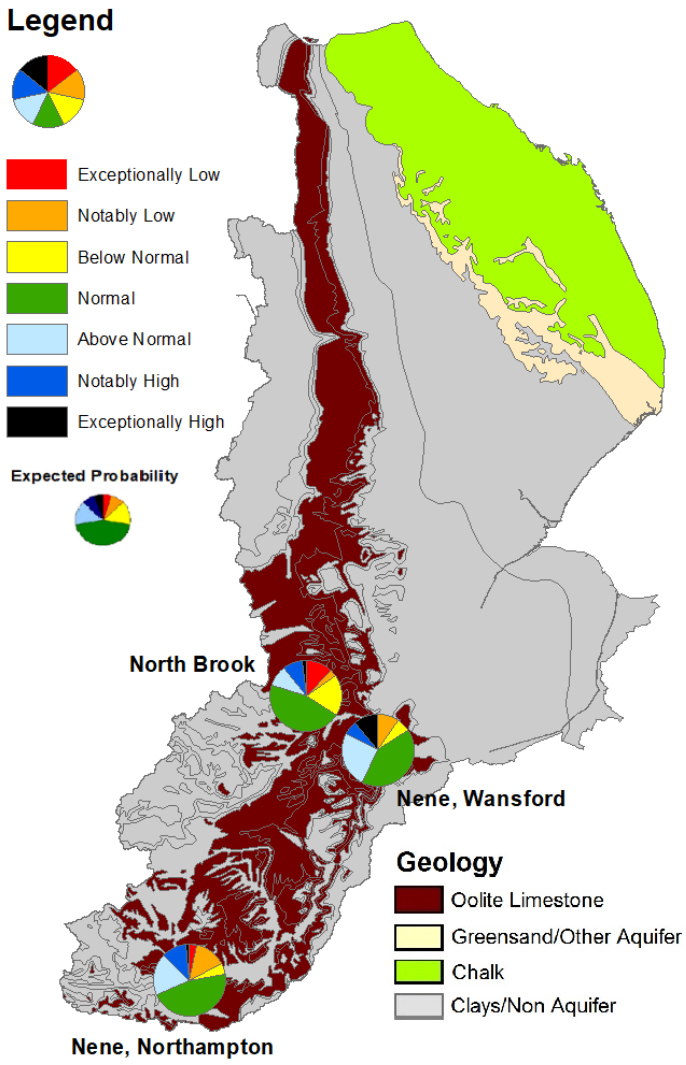
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.



Pie charts indicate probability, based on climatology, of the surface water flow at each site being, for example, exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024.

7.2 Probabilistic ensemble projection of river flows at key sites in March 2025

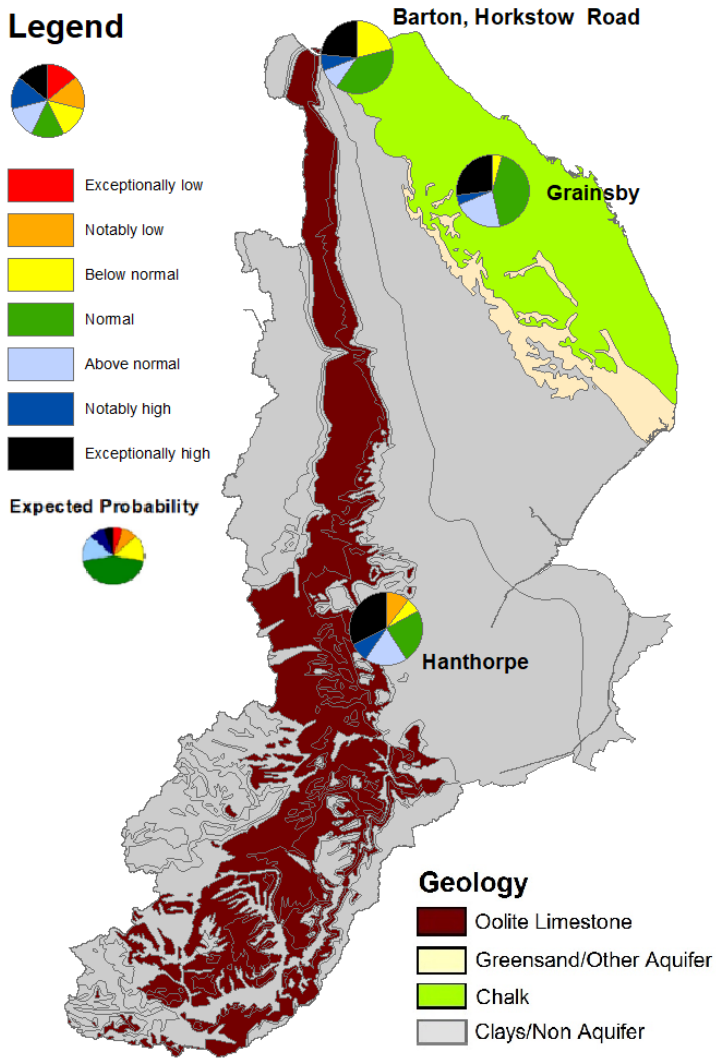
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.



Pie charts indicate probability, based on climatology, of the surface water flow at each site being, for example, exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

7.3 Probabilistic ensemble projection of groundwater levels at key sites in March 2025

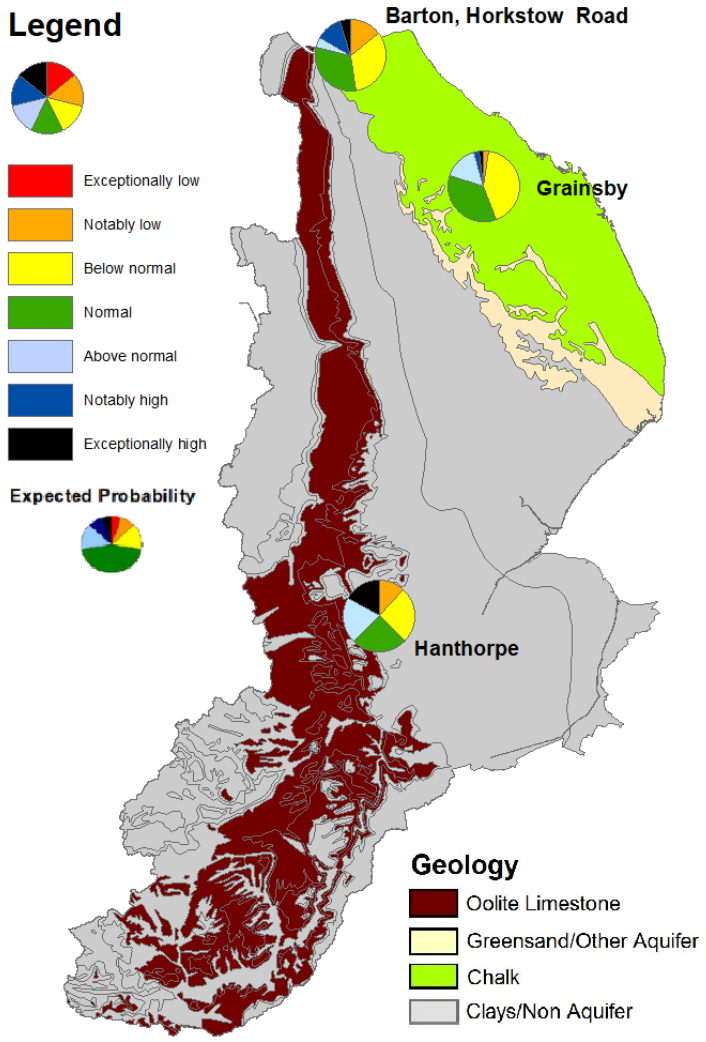
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.



Pie charts indicate probability, based on climatology, of the groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

7.4 Probabilistic ensemble projection of groundwater levels at key sites in September 2025

Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.



Pie charts indicate probability, based on climatology, of the groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

8 Glossary

8.1 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).

8.2 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.

9 Appendices

9.1 Rainfall table

Hydrological area	Sep 2024 rainfall % of long term average 1961 to 1990	Sep 2024 band	Jul 2024 to September cumulative band	Apr 2024 to September cumulative band	Oct 2023 to September cumulative band
Louth Grimsby And Ancholme	173	Notably High	Normal	Normal	Exceptionally high
Lower Welland And Nene	253	Exceptionally High	Above normal	Above normal	Exceptionally high
South Forty Foot And Hobhole	249	Exceptionally High	Above normal	Above normal	Exceptionally high
Steeping Great Eau And Long Eau	223	Notably High	Above normal	Above normal	Exceptionally high
Upper Welland And Nene	346	Exceptionally High	Exceptionally high	Notably high	Exceptionally high
Witham To Chapel Hill	218	Exceptionally High	Normal	Above normal	Exceptionally high

9.2 River flows table

Site name	River	Catchment	Sep 2024 band	Aug 2024 band
Ashley	Welland Mkt.harb-rockinghm	Welland Rockingham	Exceptionally high	Normal
Barrowden/tixover	Welland (rockingham To Stamford)	Welland Stamford	Exceptionally high	Below normal
Claypole	Upper Witham	Witham Bargate Upper	Notably high	Normal
Geldharts Mill	Nene (brampton Branch)	Nene Brampton Bridge	Exceptionally high	Normal
Kates Bridge Plus King Street	Glen (an)	Welland and Glen	Normal	Above normal
Langworth	Barlings Eau	Barlings Eau	Normal	Normal
Louth Weir	Lud	Louth Canal	Normal	Normal
Partney	Lymn & Steeping	Lymn Steeping	Notably high	Normal
Rase Bishopbridge	Ancholme	Ancholme W Mid	Notably high	Normal
Upton Mill Total	Nene (kislingbury Branch)	Nene Kislingbry Bridge	Exceptionally high	Normal

Wansford Combined	Nene (wollaston To Wansford)	Nene Wansford	Exceptionally high	Below normal

9.3 Groundwater table

Site name	Aquifer	End of Sep 2024 band	End of Aug 2024 band
Barton-upon-humber	Grimsby Ancholme Louth Chalk	Notably high	Notably high
Castlethorpe Bridge	Grimsby Ancholme Louth Limestone	No data	Notably high
Dunholme Road, Scothern	Grimsby Ancholme Louth Limestone	Normal	Above normal
Grainsby	Grimsby Ancholme Louth Chalk	Above normal	Above normal
Grange Farm, Aswarby	Central Lincs Limestone?	Above normal	Above normal
Hanthorpe	Cornbrash (south)	Exceptionally high	Notably high
Leasingham Exploratory	Blisworth Limestone Rutland Formation (south)?	Normal	Normal

9.4 Ensemble projections tables

9.4.1 Probabilistic ensemble projection of river flows at key sites in December 2024

Percentage of pie chart for each band

Site	Nene Nton	Nene Wansford	North Brook
Exceptionally low	0.0	0.0	1.4
Notably low	0.0	0.0	4.1
Below normal	1.6	1.6	24.7
Normal	25.4	19.0	21.9
Above normal	31.7	55.6	20.5
Notably high	17.5	12.7	20.5
Exceptionally high	23.8	11.1	6.8

9.4.2 Probabilistic ensemble projection of river flows at key sites in March 2025

Percentage of pie chart for each band

Site	Nene Nton	Nene Wansford	North Brook
Exceptionally low	3.2	0.0	12.3
Notably low	14.3	9.5	3.1
Below normal	4.8	6.3	18.5
Normal	46.0	41.3	46.2
Above normal	19.0	25.4	9.2
Notably high	11.1	6.3	9.2
Exceptionally high	1.6	11.1	1.5

9.4.3 Probabilistic ensemble projection of groundwater levels at key sites in March 2025

Percentage of pie chart for each band

Site	Grainsby	Hanthorpe	Horkstow
Exceptionally low	0.0	0.0	0.0
Notably low	0.0	10.2	0.0
Below normal	4.4	6.8	21.4
Normal	42.2	23.7	38.1
Above normal	22.2	18.6	9.5
Notably high	4.4	8.5	7.1
Exceptionally high	26.7	32.2	23.8

9.4.4 Probabilistic ensemble projection of groundwater levels at key sites in September 2025

Percentage of pie chart for each band

Site	Grainsby	Hanthorpe	Horkstow
Exceptionally low	0.0	0.0	0.0
Notably low	2.2	11.9	14.3
Below normal	42.2	25.4	33.3
Normal	35.6	25.4	31.0
Above normal	15.6	20.3	4.8
Notably high	2.2	0.0	11.9
Exceptionally high	2.2	16.9	4.8