

# Monthly water situation report: Lincolnshire and Northamptonshire Area

## 1 Summary - February 2024

Lincolnshire and Northamptonshire has seen historical records broken since enduring one of the warmest and wettest February's yet.

Following average rainfall for January, a succession of weather fronts that spread across the six hydrological area in February returned exceptionally high level of rainfall with a total average of 112 mm, which was 290% of the Long Term Average (LTA). The area experienced record high rainfall totals for the last 3, 6 and 12 months; as well as ranking as the second wettest February since 1892 when records began.

Most of the river flows returned February record highs. Most of the groundwater levels were also at February record highs. Soil moisture deficits were considered exceptionally low across all catchments. Combined Ravensthorpe and Hollowell reservoirs and Pitsford reservoir ended the month at 100% capacity, with Rutland and Covenham only slightly below their normal operating curves.

Numerous flood alerts and warnings were issued throughout February in response to the exceptionally high rainfall totals that the Lincolnshire and Northamptonshire area has been receiving in recent months.

### 1.1 Rainfall

This February has been ranked the second wettest since records began. The area received 112 mm of rain which was around 290% of the LTA, meaning all six hydrological catchments were classified as exceptionally high. Precipitation fell in a somewhat evenly distributed manner through the month; however the most notable rain was recorded between 8th and 10th February.

Due to the recent high rainfall totals, the area has seen its highest 3- (December to February), 6- (August to February), and 12- (March to February) month rainfall totals on record.

## 1.2 Soil moisture deficit and recharge

Soil moisture deficits (SMD) were not significantly impacted by the heavy rainfall totals in February given their already exceptionally low levels. The area as a whole ended the month with an SMD of 2 mm, in comparison to 2.7 mm at the end of January.

## 1.3 River flows

At all sites river flow showed a significant response to the exceptionally high rainfall totals. Monthly mean flows increased to exceptionally high across the area (217-353% LTA), with the exception of the Lud (178% LTA) which decreased from exceptionally high to notably high since January. Monitoring stations across the area, including for the river Bain, Barlings Eau, Glen, Nene and Welland, recorded record high flows for the time of year.

## 1.4 Groundwater levels

Groundwater levels for all rock types across the area were classified with exceptionally high levels for time of year. Of this, 6 of 8 monitored sites with data for February returned record high levels; visualised through the groundwater charts these sites include Aslackby, Barton Horkstow, Burnham, Dunholme Road Scothern, Grainsby and Hanthorpe.

## 1.5 Reservoir stocks

Reservoir levels across the region remained healthy, with both Pitsford and Ravensthorpe and Hollowell combined both operating at 100% capacity. Storage in Rutland and Covenham declined to slightly below target.

## 1.6 Environmental impact

All transfer schemes remained off throughout February. There were no cessation notices issued due to the high flows. There were 65 flood alerts and 12 flood warnings.

## 1.7 Forward look

### 1.7.1 Probabilistic ensemble projections for river flows at key sites

March 2024: Nene Northampton and Nene Wansford both show a greatly increased probability of higher than normal flows.

June 2024: There is an increased probability of normal and above flows at Nene Wansford and Nene Northampton.

### **1.7.2 Probabilistic ensemble projections for groundwater levels in key aquifers**

March 2024: There is a significantly increased probability of notably to exceptionally high groundwater levels at all sites. Grainsby model suggests a 100% chance of exceptionally high levels for end of March 2024.

September 2024: All sites are showing an increased probability of groundwater levels being normal or higher with none of modelled rainfall scenarios showing notably or exceptionally low levels.

Author: Pan Hydrology Team, [Hydrology-EAN-and-LNA@environment-agency.gov.uk](mailto:Hydrology-EAN-and-LNA@environment-agency.gov.uk)

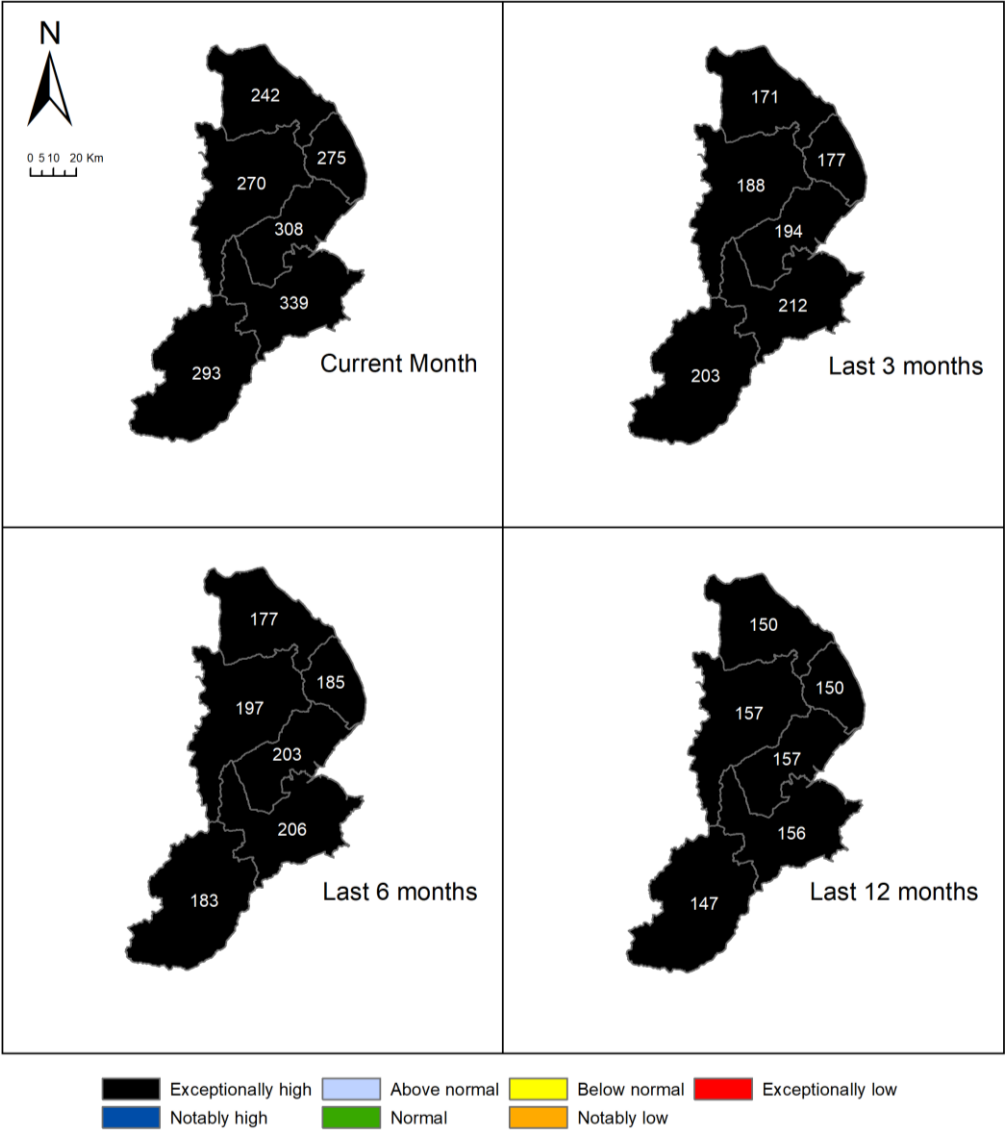
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Contact Details: 03708 506 506

## 2 Rainfall

### 2.1 Rainfall map

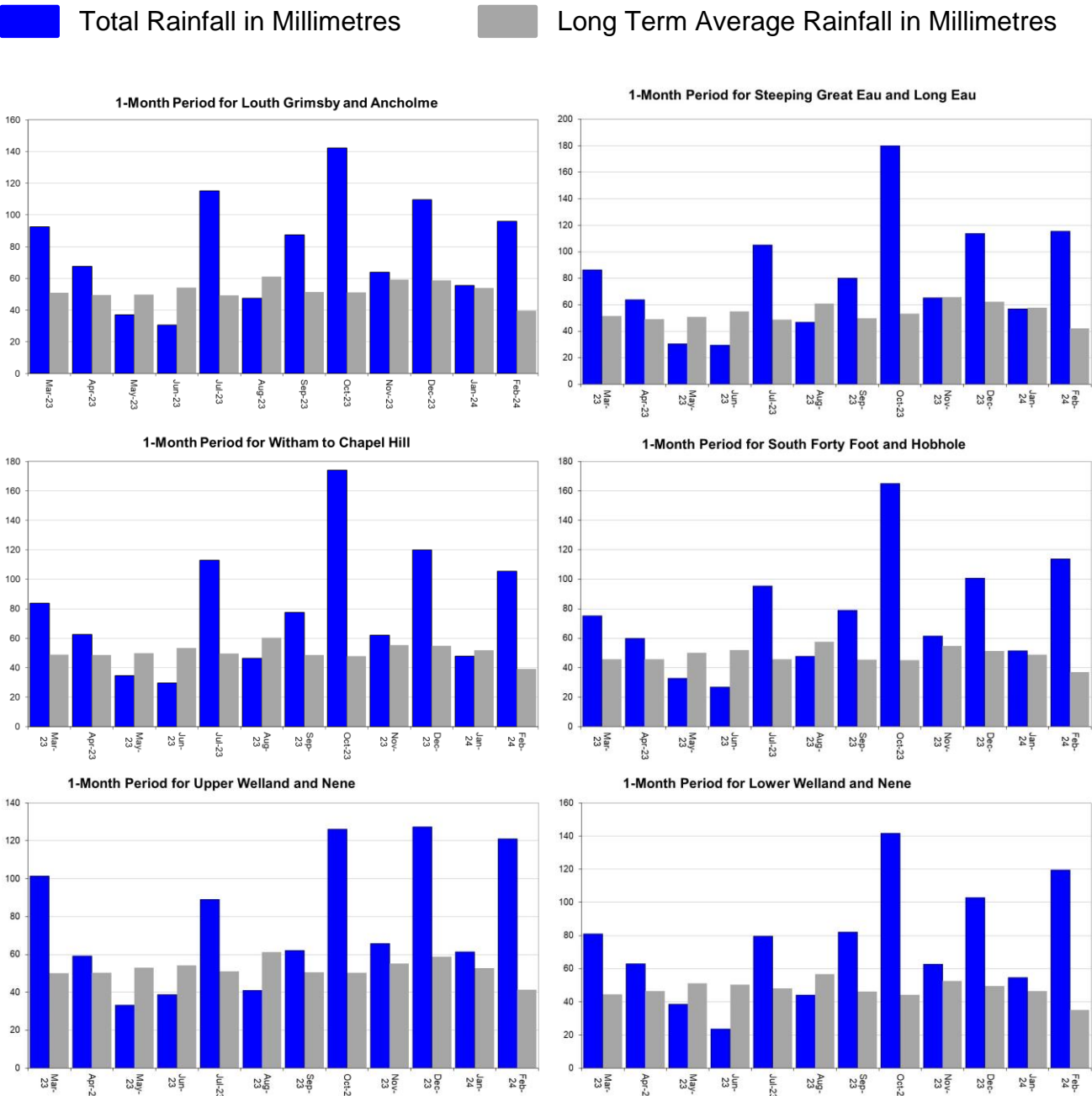
Figure 2.1: Total rainfall for hydrological areas across Lincolnshire and Northamptonshire, expressed as a percentage of long term average rainfall for the current month (up to 29 February 2024), the last 3 months, the last 6 months, and the last 12 months. Category classes are based on an analysis of 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.

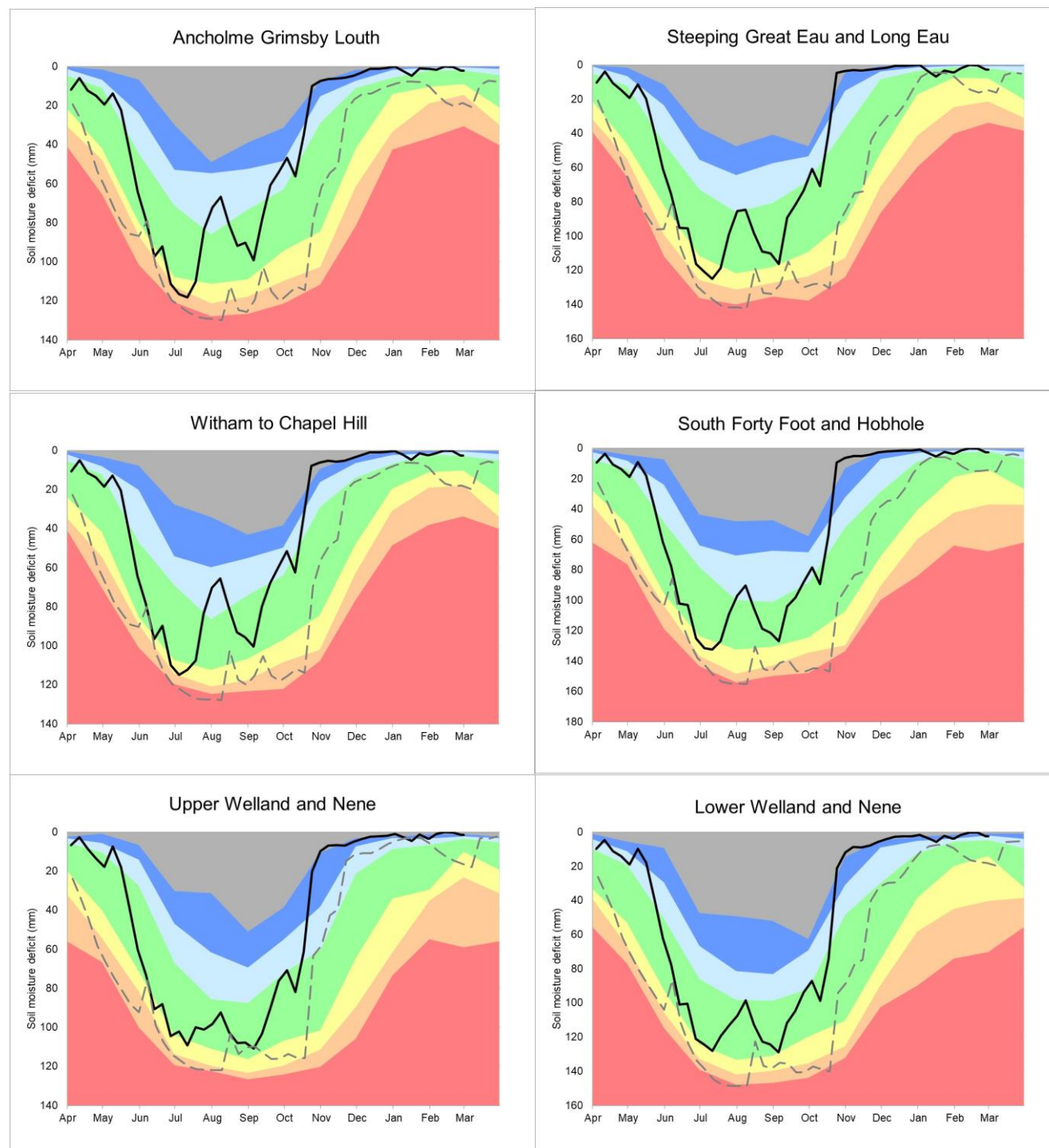


HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

## 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.

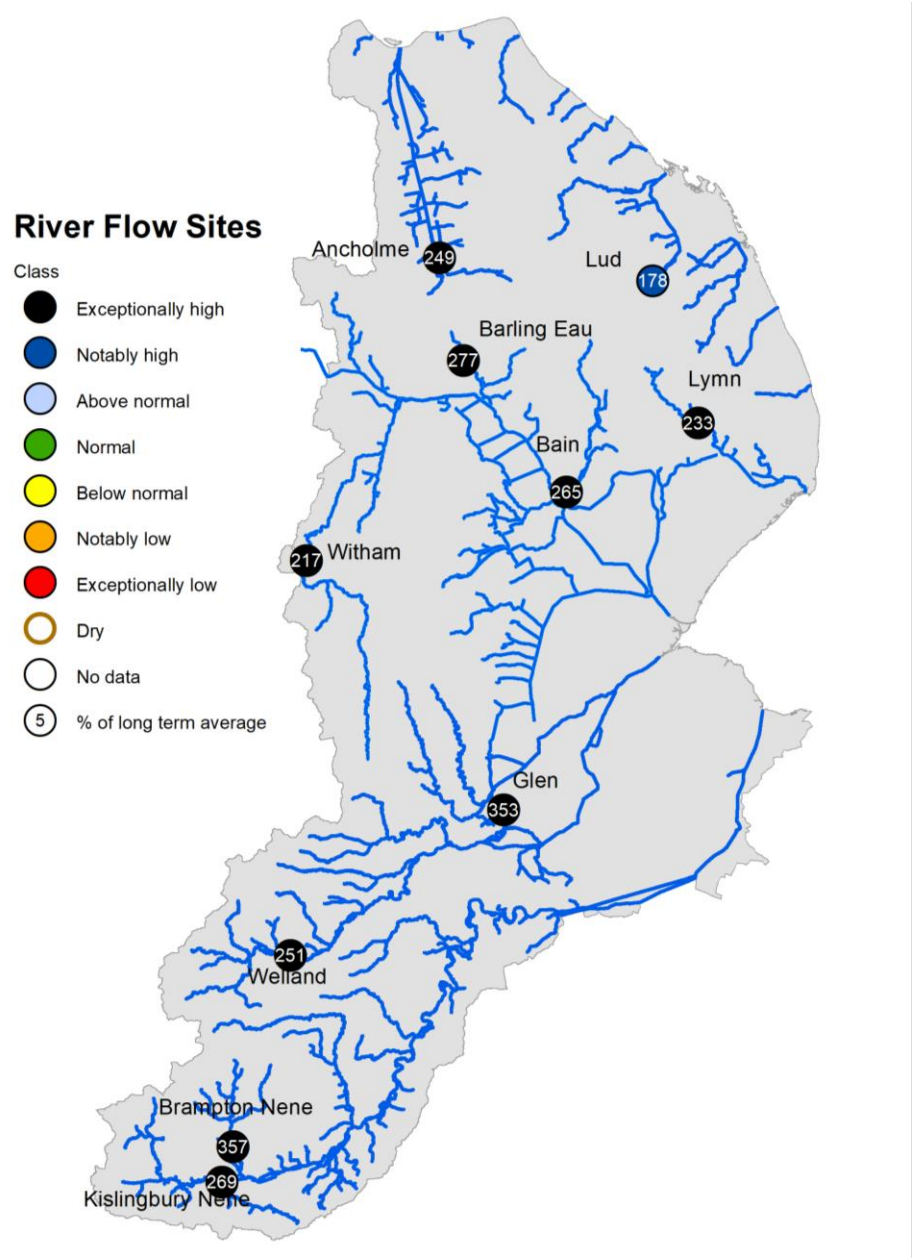


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# 4 River flows

## 4.1 River flows map

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

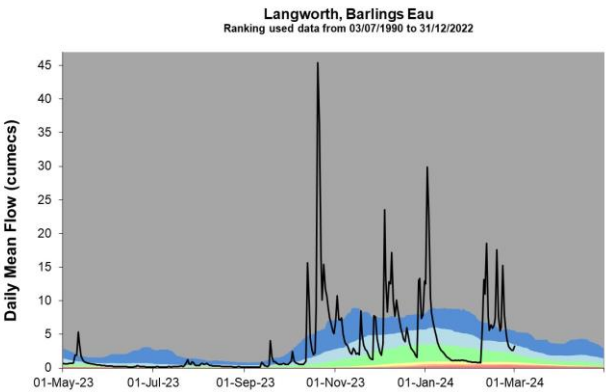
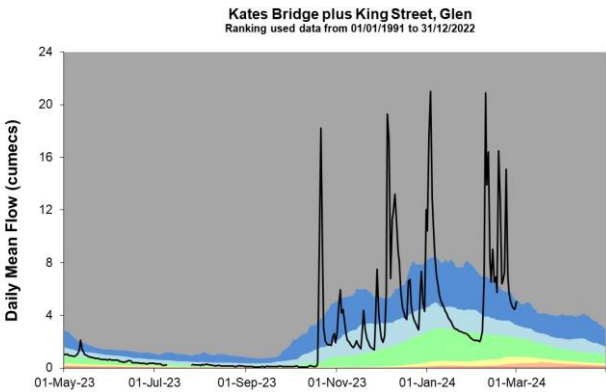
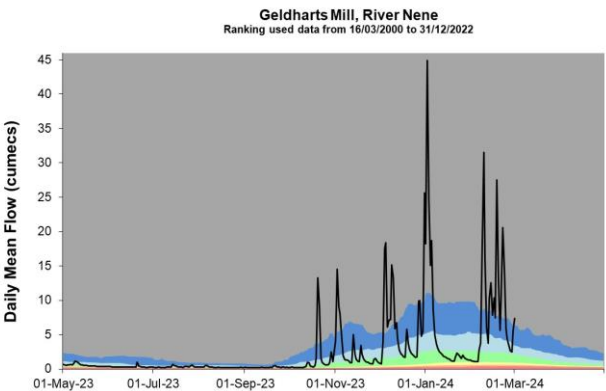
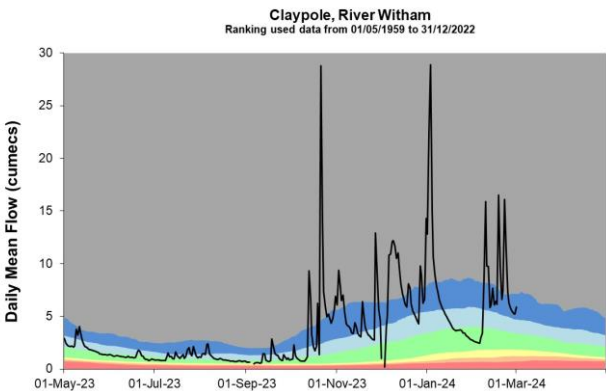
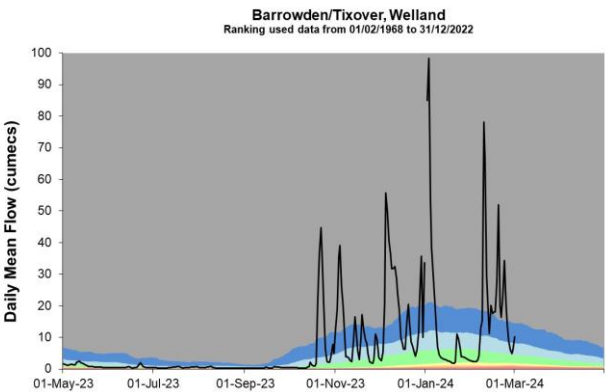
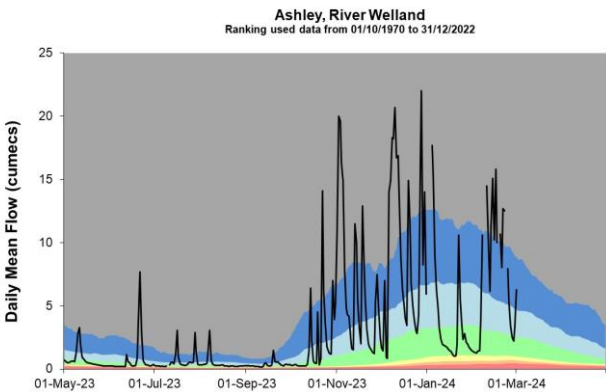
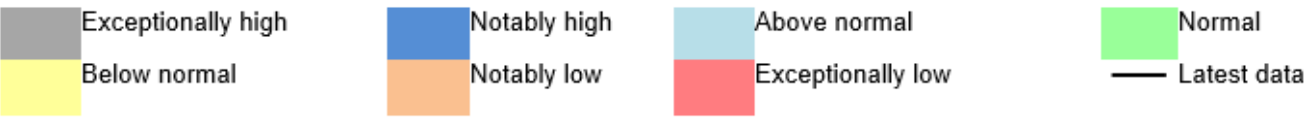


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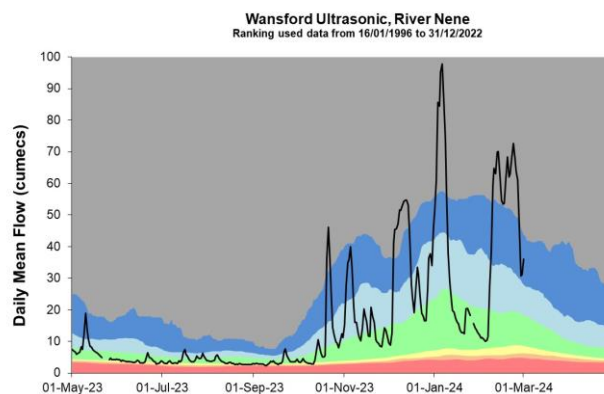
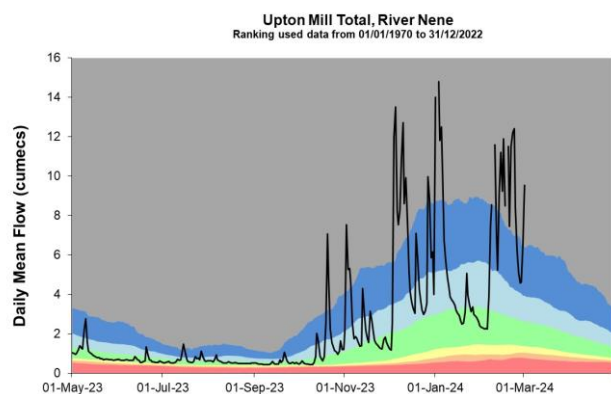
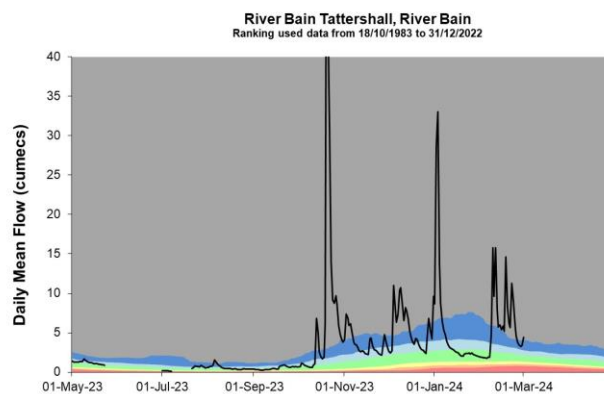
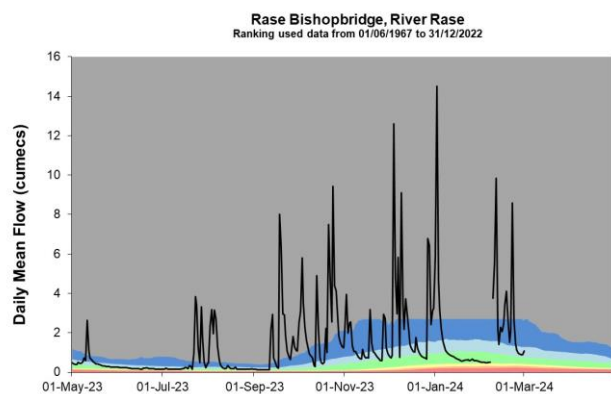
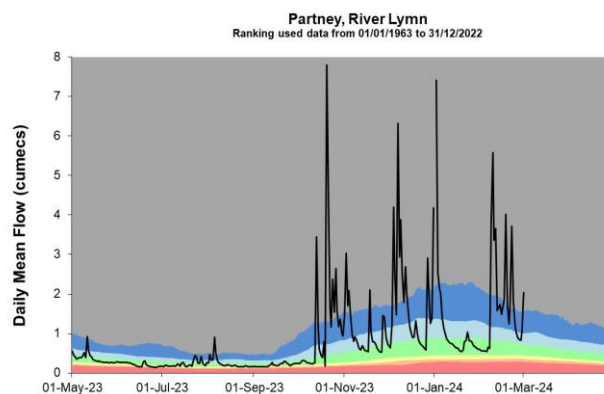
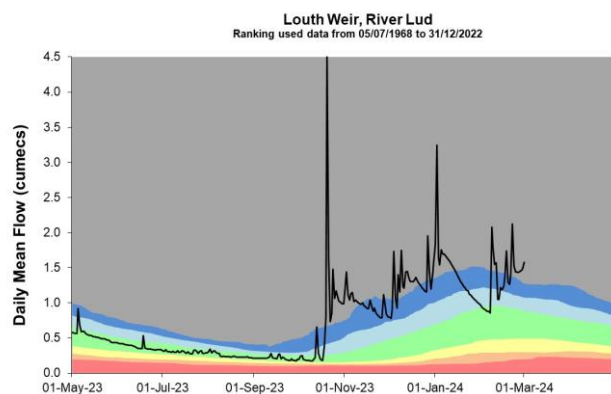


4.2 River flow charts

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.





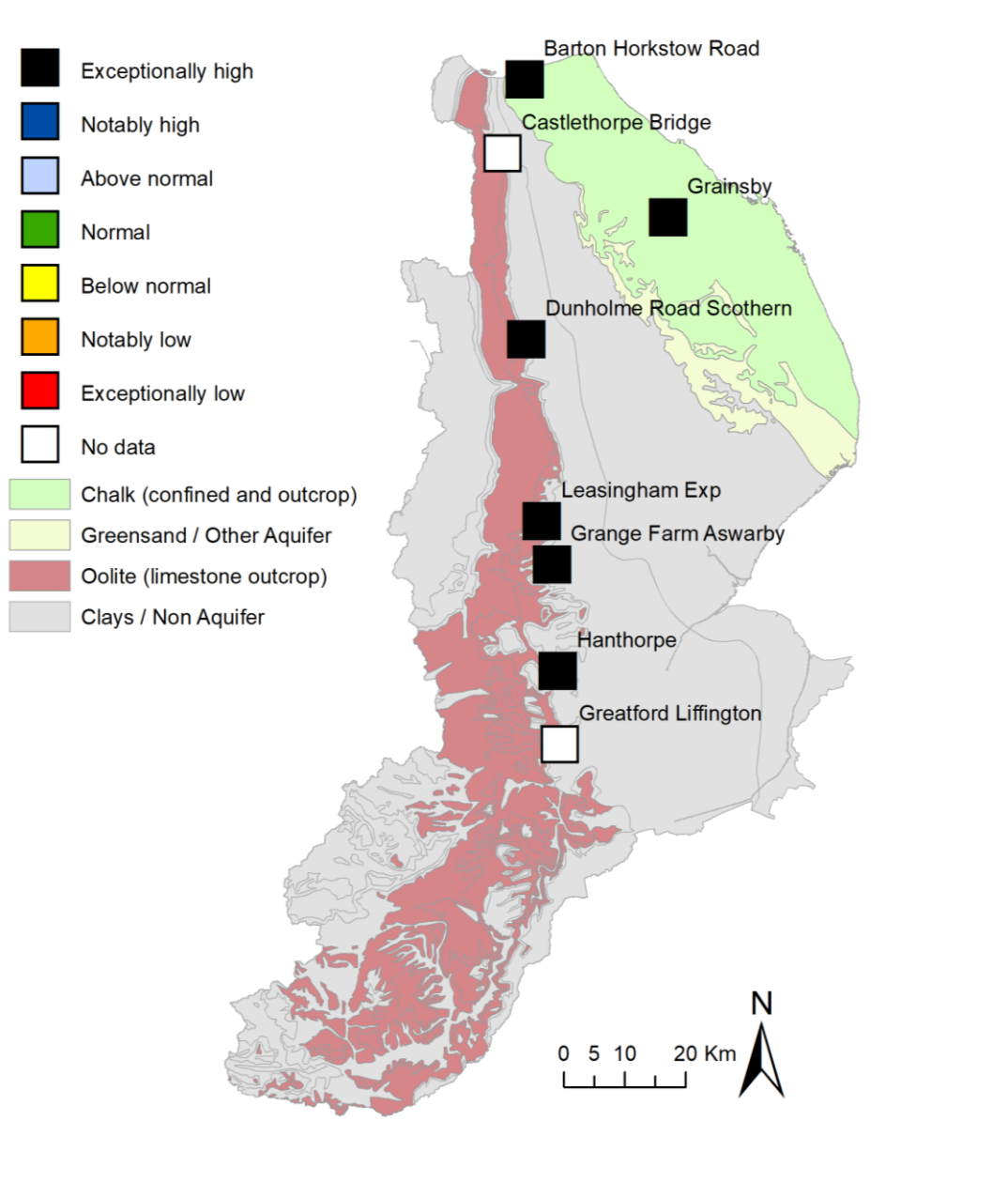


Source: Environment Agency.

# 5 Groundwater levels

## 5.1 Groundwater levels map

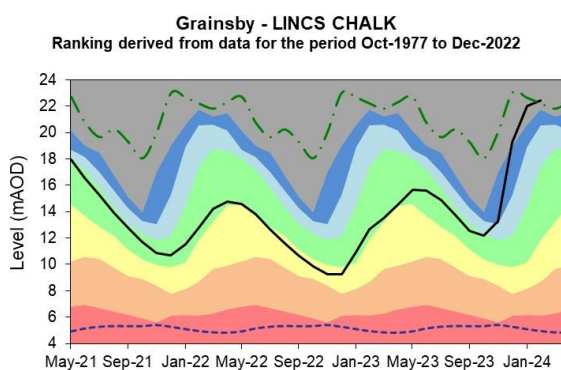
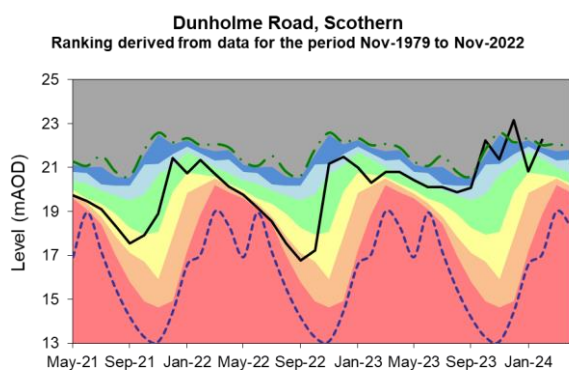
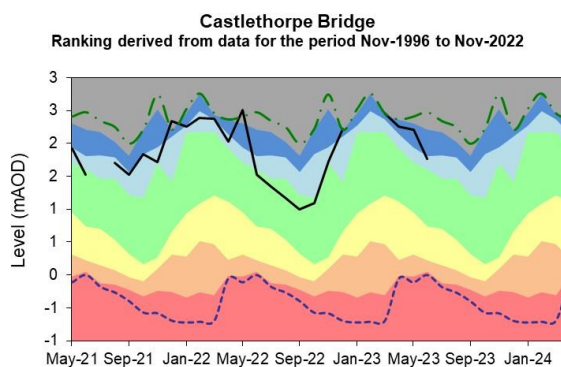
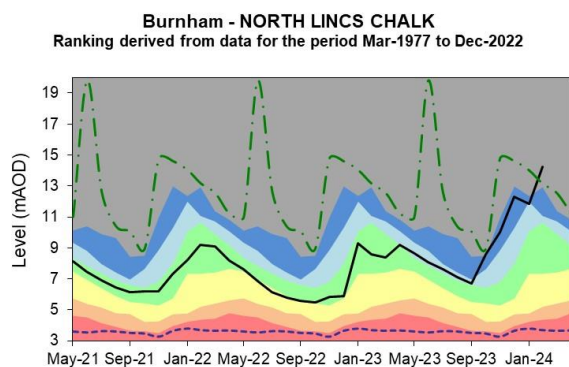
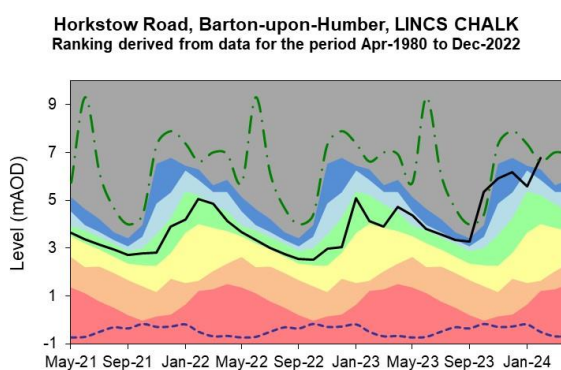
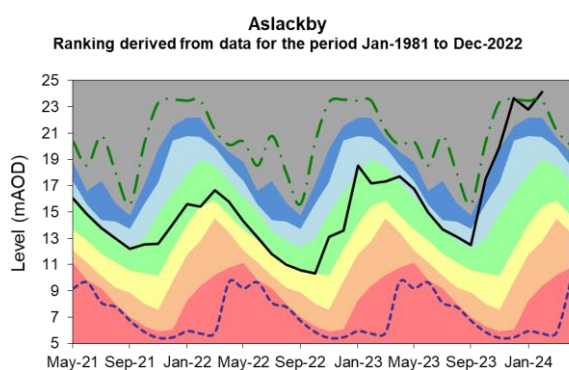
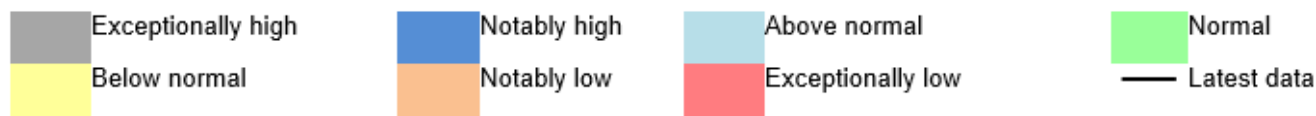
Figure 5.1: Groundwater levels for indicator sites at the end of February 2024, classed relative to an analysis of respective historic February levels. Table available in the appendices with detailed information.

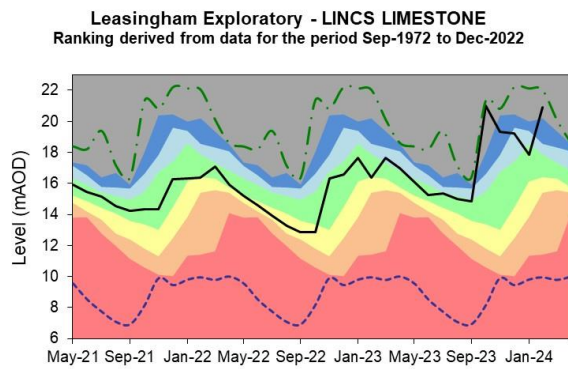
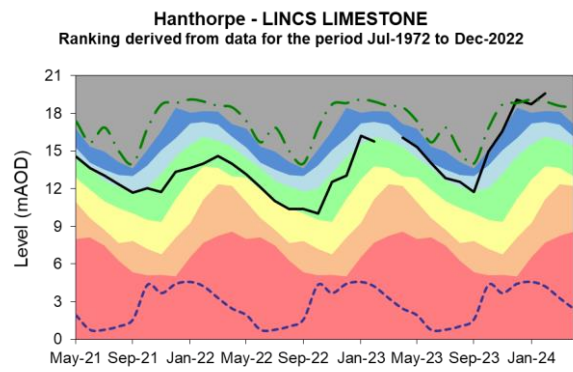
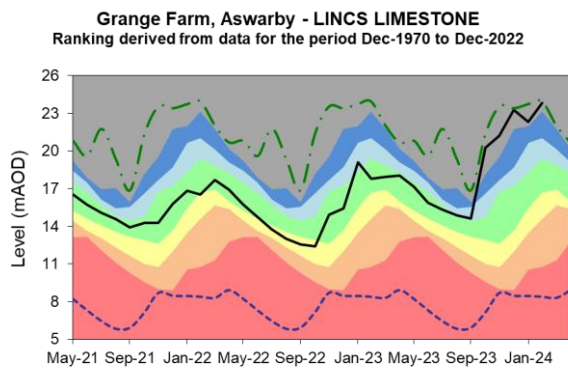


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## 5.2 Groundwater level charts

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.

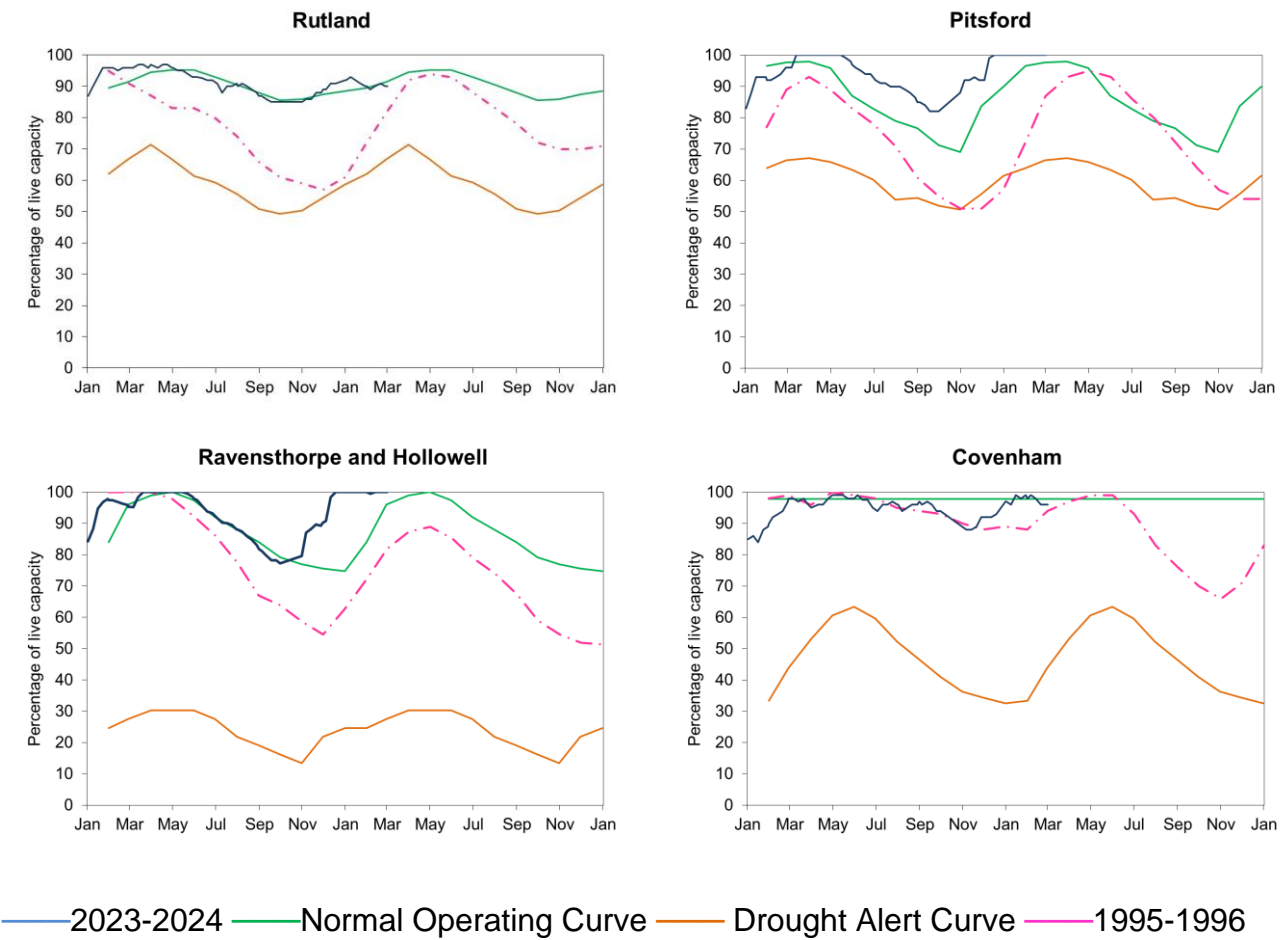




Source: Environment Agency, 2024.

## 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.

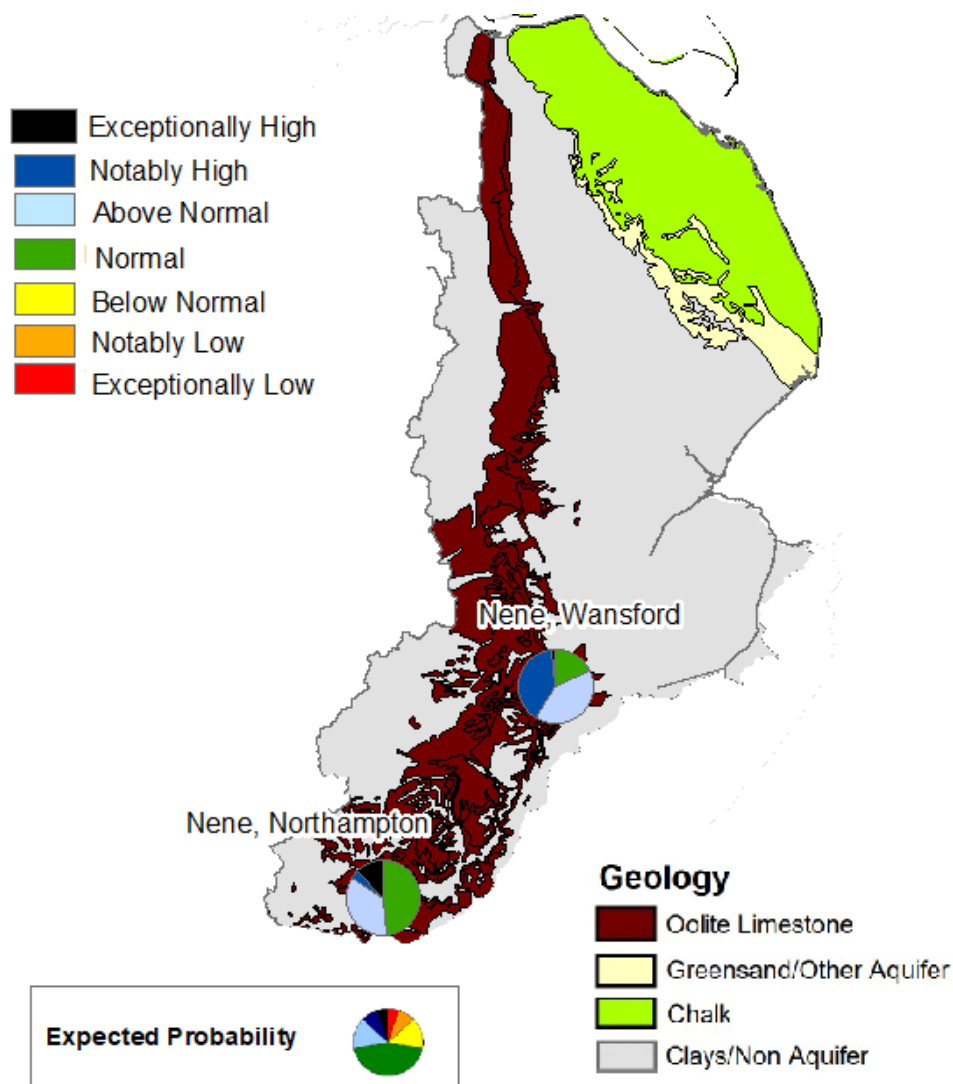


(Source: water companies).

## 7 Forward Look

### 7.1 Probabilistic ensemble projection of river flows at key sites in March 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.

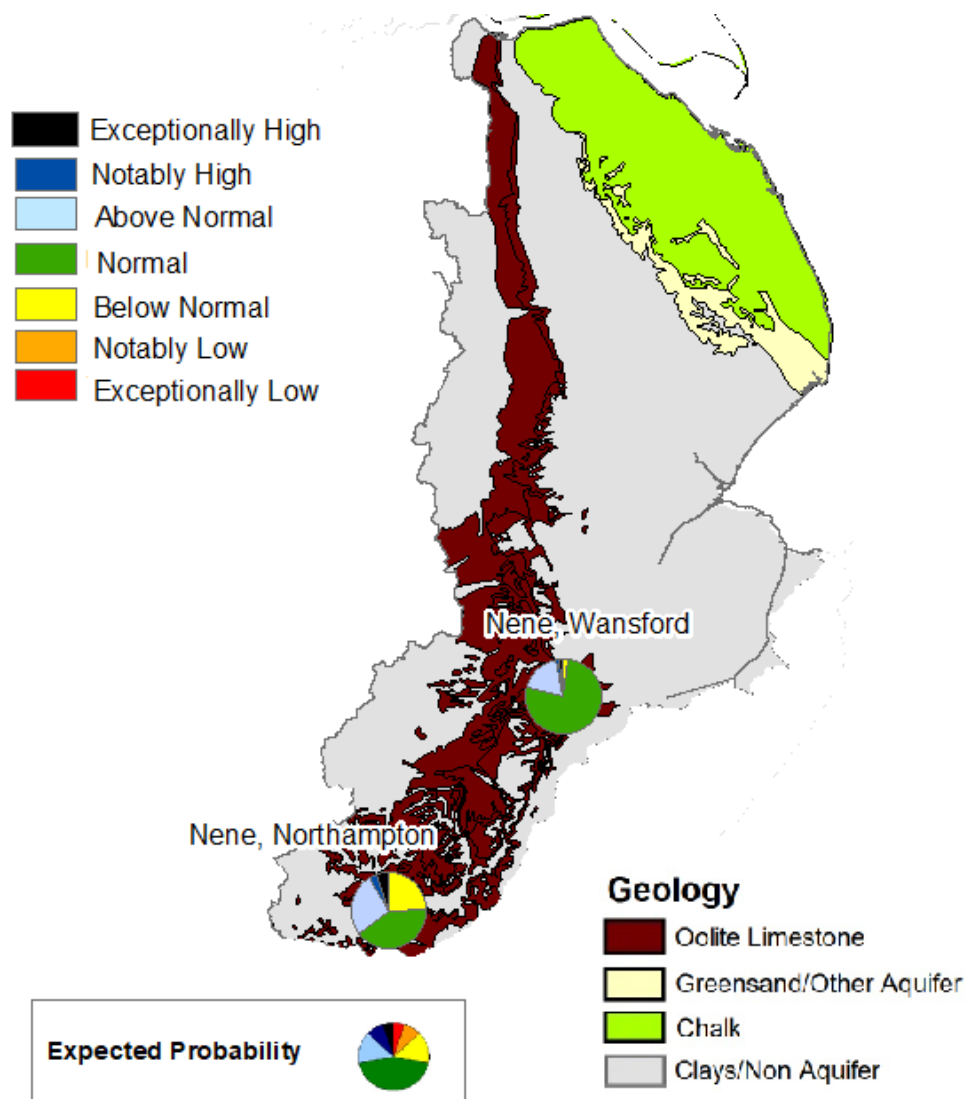


Pie charts indicate probability, based on climatology, of the surface water flow at each site being, for example, exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC.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



## 7.2 Probabilistic ensemble projection of river flows at key sites in June 2024

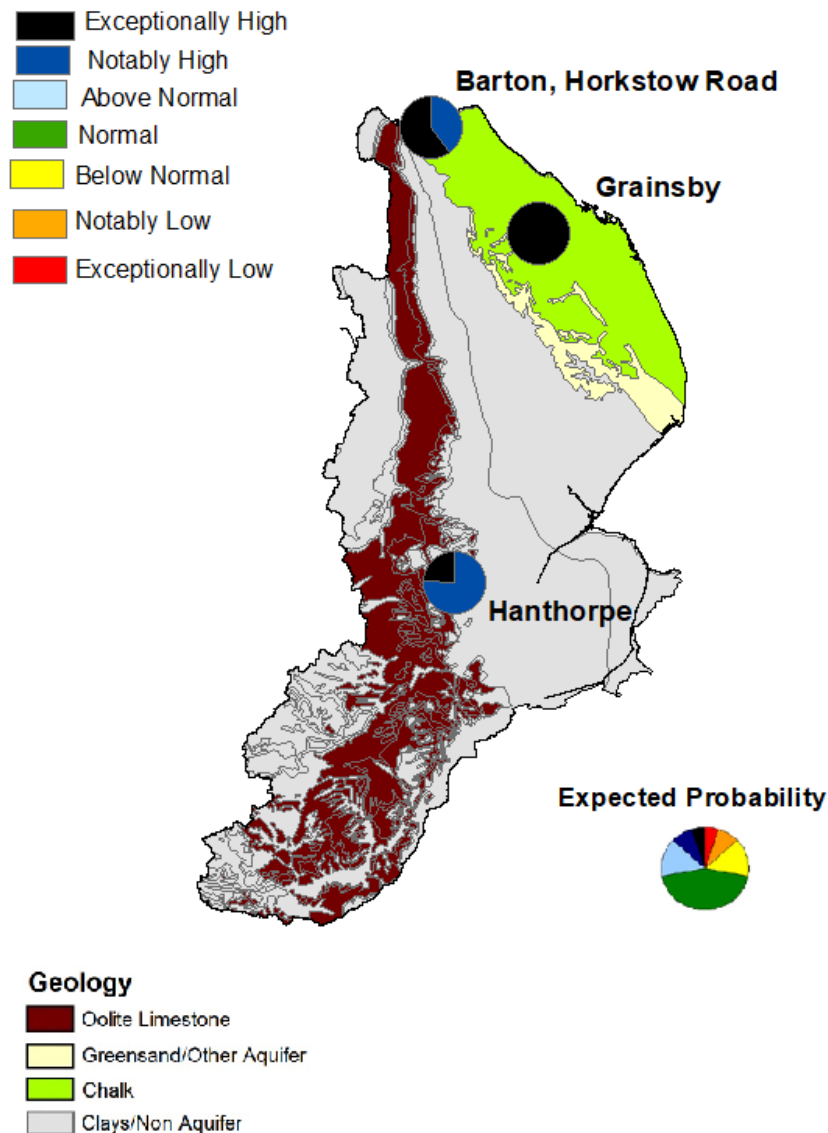
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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

### 7.3 Probabilistic ensemble projection of groundwater levels at key sites in March 2024

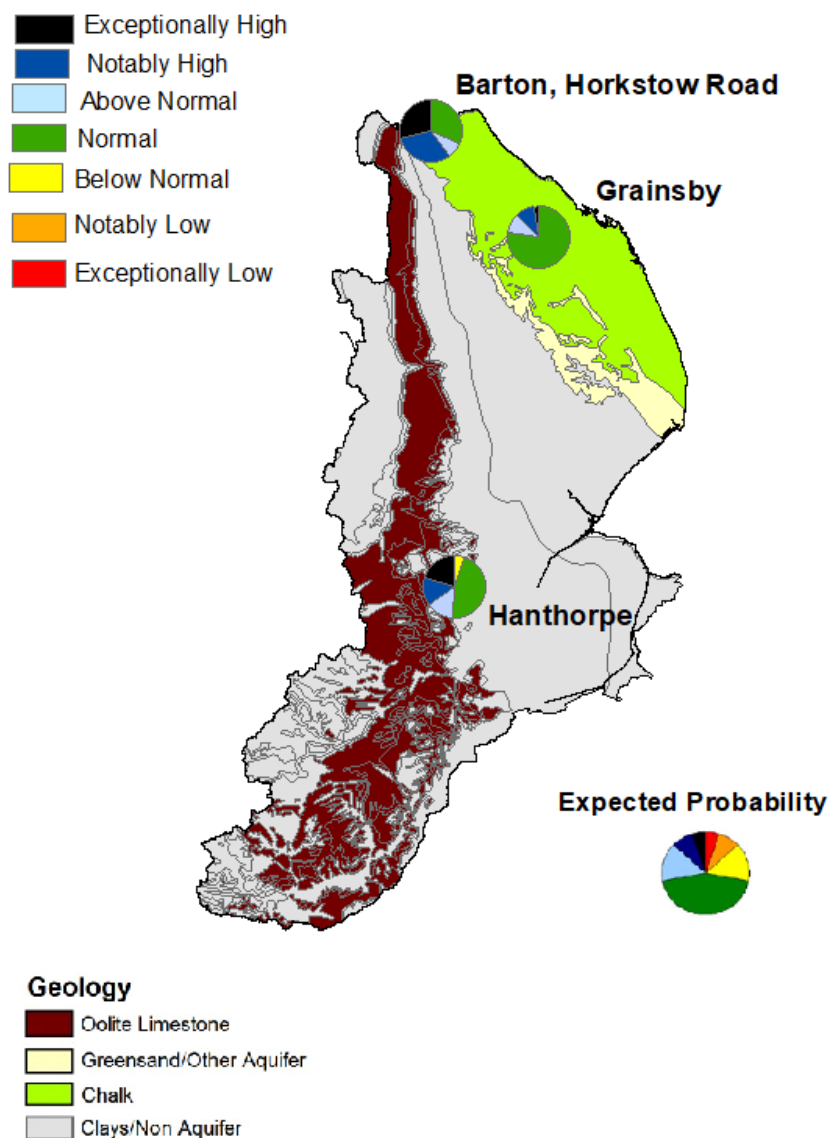
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those 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 groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency)  
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## 7.4 Probabilistic ensemble projection of groundwater levels at key sites in September 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 groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency)  
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## 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 ( $\text{m}^3\text{s}^{-1}$ ).

#### **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	Feb 2024 rainfall % of long term average 1961 to 1990	Feb 2024 band	Dec 2023 to February cumulative band	Sep 2023 to February cumulative band	Mar 2023 to February cumulative band
Louth Grimsby And Ancholme	242	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high
Lower Welland And Nene	339	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high
South Forty Foot And Hobhole	308	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high
Steeping Great Eau And Long Eau	275	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high
Upper Welland And Nene	293	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high
Witham To Chapel Hill	270	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high

## 9.2 River flows table

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

Upton Mill Total	Nene (kislingbury Branch)	Nene Kislingbry Bridge	Exceptionally high	Exceptionally high
Wansford Combined	Nene (wollaston To Wansford)	Nene Wansford	Exceptionally high	Above normal

### 9.3 Groundwater table

Site name	Aquifer	End of Feb 2024 band	End of Jan 2024 band
Barton-upon-humber	Grimsby Ancholme Louth Chalk	Exceptionally high	Above normal
Castlethorpe Bridge	Grimsby Ancholme Louth Limestone		
Dunholme Road, Scothern	Grimsby Ancholme Louth Limestone	Exceptionally high	Normal
Grainsby	Grimsby Ancholme Louth Chalk	Exceptionally high	Exceptionally high
Grange Farm, Aswarby	Central Lincs Limestone	Exceptionally high	Exceptionally high
Hanthorpe	Cornbrash (south)	Exceptionally high	Exceptionally high
Leasingham Exploratory	Blisworth Limestone Rutland Formation (south)	Exceptionally high	Normal

9.4 Ensemble projections tables

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

Percentage of pie chart for each band

Site	Nene Nton	Nene Wansford
Exceptionally low	0.0	0.0
Notably low	0.0	0.0
Below normal	0.0	0.0
Normal	48.2	17.9
Above normal	35.7	41.1
Notably high	3.6	39.3
Exceptionally high	12.5	1.8

9.4.2 Probabilistic ensemble projection of river flows at key sites in June 2024

Percentage of pie chart for each band

Site	Nene Nton	Nene Wansford
Exceptionally low	0.0	0.0
Notably low	0.0	0.0
Below normal	25.0	1.8
Normal	39.3	76.8
Above normal	26.8	17.9
Notably high	3.6	1.8
Exceptionally high	5.4	1.8



9.4.3 Probabilistic ensemble projection of groundwater levels at key sites in March 2024

Percentage of pie chart for each band

Site	Grainsby	Hanthorpe	Horkstow
Exceptionally low	0.0	0.0	0.0
Notably low	0.0	0.0	0.0
Below normal	0.0	0.0	0.0
Normal	0.0	0.0	0.0
Above normal	0.0	0.0	0.0
Notably high	0.0	76.4	39.5
Exceptionally high	100.0	23.6	60.5

9.4.4 Probabilistic ensemble projection of groundwater levels at key sites in September 2024

Percentage of pie chart for each band

Site	Grainsby	Hanthorpe	Horkstow
Exceptionally low	0.0	0.0	0.0
Notably low	0.0	0.0	0.0
Below normal	0.0	5.5	0.0
Normal	78.0	45.5	31.6
Above normal	9.8	14.5	7.9
Notably high	9.8	14.5	31.6
Exceptionally high	2.4	20.0	28.9