Monthly water situation report: East Anglia

1 Summary - January 2024

Following a significantly wetter than average December, January saw rainfall totals closer to the normal for the time of year, though remaining above average across almost all hydrological areas. Soils have seen little change this month, remaining at or near field capacity. Rivers started January continuing high flows resulting from the high December rainfall, but fell throughout the month as the reduction in rainfall could not maintain the high discharge. Groundwater levels continue to rise following healthy recharge in recent months, though some boreholes have begun to see levels dropping slightly.

1.1 Rainfall

January 2024 was a slightly above average month in regards to rainfall with almost all hydrological areas having totals ranging from 100% to 130% of the long term average [LTA] for December. South Essex is the only exception which was slightly below average with 88% of the LTA. This rainfall across all regions was predominantly at the start of the month, with 40-50mm in the first 4 days and 10-15mm during the remainder of the month. The 6 and 12 month rainfall totals for much of the region are within the exceptionally high category, while the 3 month total values ranged from above normal to notably high.

1.2 Soil moisture deficit and recharge

Regional soil moisture deficit [SMD] ended January at an exceptionally low 4mm, changing almost negligibly from last month's regional SMD of 2mm. With little evapotranspiration and continued rainfall, soils have continued to remain close to maximum capacity.

1.3 River flows

As the high rainfall occurring in December faded through January, most river flows reflected these changing conditions and fell back to normal levels. With such wet antecedent conditions however and the initially high flows, monthly averages for all sites are above normal or higher with most being notably high and some being exceptionally high. Notably, Burham Overy Town on the River Burn is the only site which has not returned to normal flows in January and continues to persist at an exceptionally high flow rate, though it has started to see flows begin to drop.

1.4 Groundwater levels

Groundwater levels have increased at most sites between December and January which is expected following on from the healthy recharge received the wet months prior. Levels at two sites, Fringford and Bury St Edmunds, did not continue to increase and have instead started to fall slightly. This can be attributed to the high amounts of discharge to nearby watercourses and the reduction in rainfall which failed to balance it out. All sites were above normal or higher with the exception of Fringford which had flows normal for the time of year.

1.5 Reservoir stocks

Reservoir stocks remain high and have experienced generally little change. Ardleigh experienced the most significant change, increasing from 81% in December to 89%.

1.6 Forward look

1.6.1 Probabilistic ensemble projections for river flows at key sites

The river flow projections indicate a very high likelihood of normal or higher flows for March 2024 and June 2024. This is to be expected with the healthy recharge season to date.

1.6.2 Probabilistic ensemble projections for groundwater levels in key aquifers

The groundwater level projections indicate that all groundwater levels will almost certainly be above normal or higher for March 2024 and normal or higher for September 2024. Notably, Kenninghall, Therfield Rectory and Smeetham have a very high probability for being above normal or higher in September.

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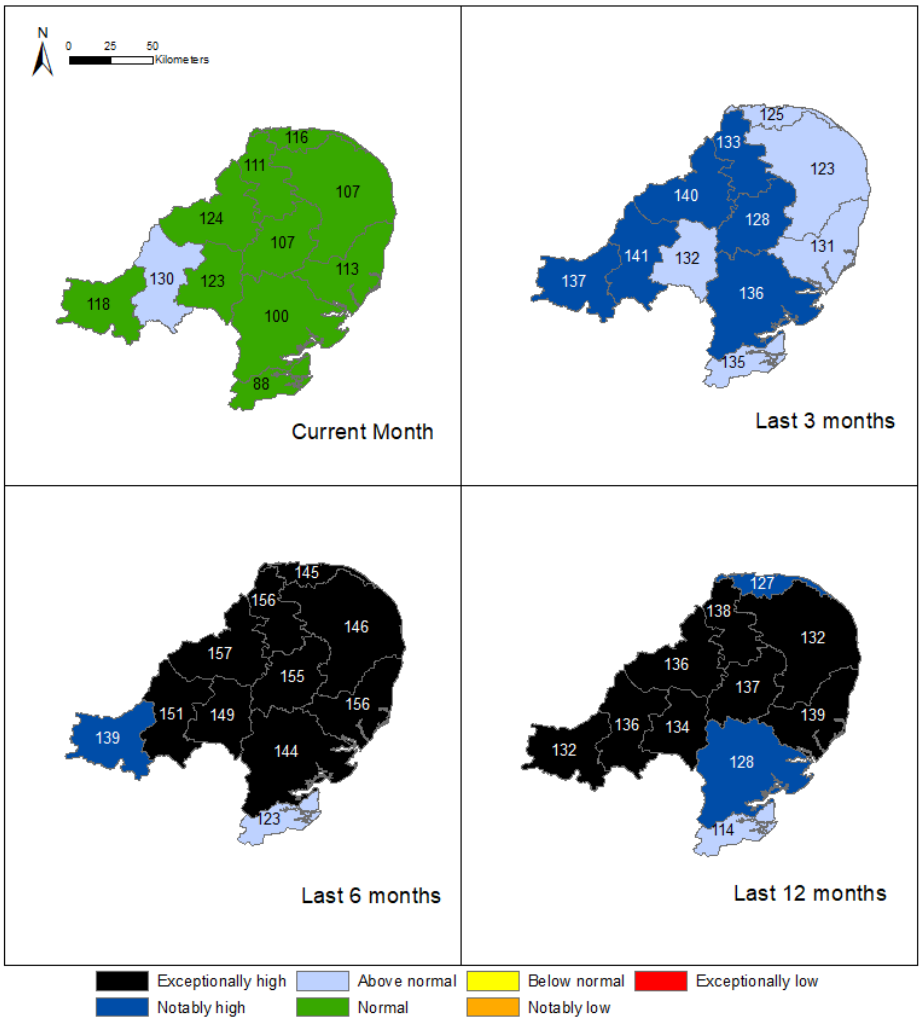
*[SMD]: soil moisture deficits

*[LTA]: long term average

2 Rainfall

2.1 Rainfall map

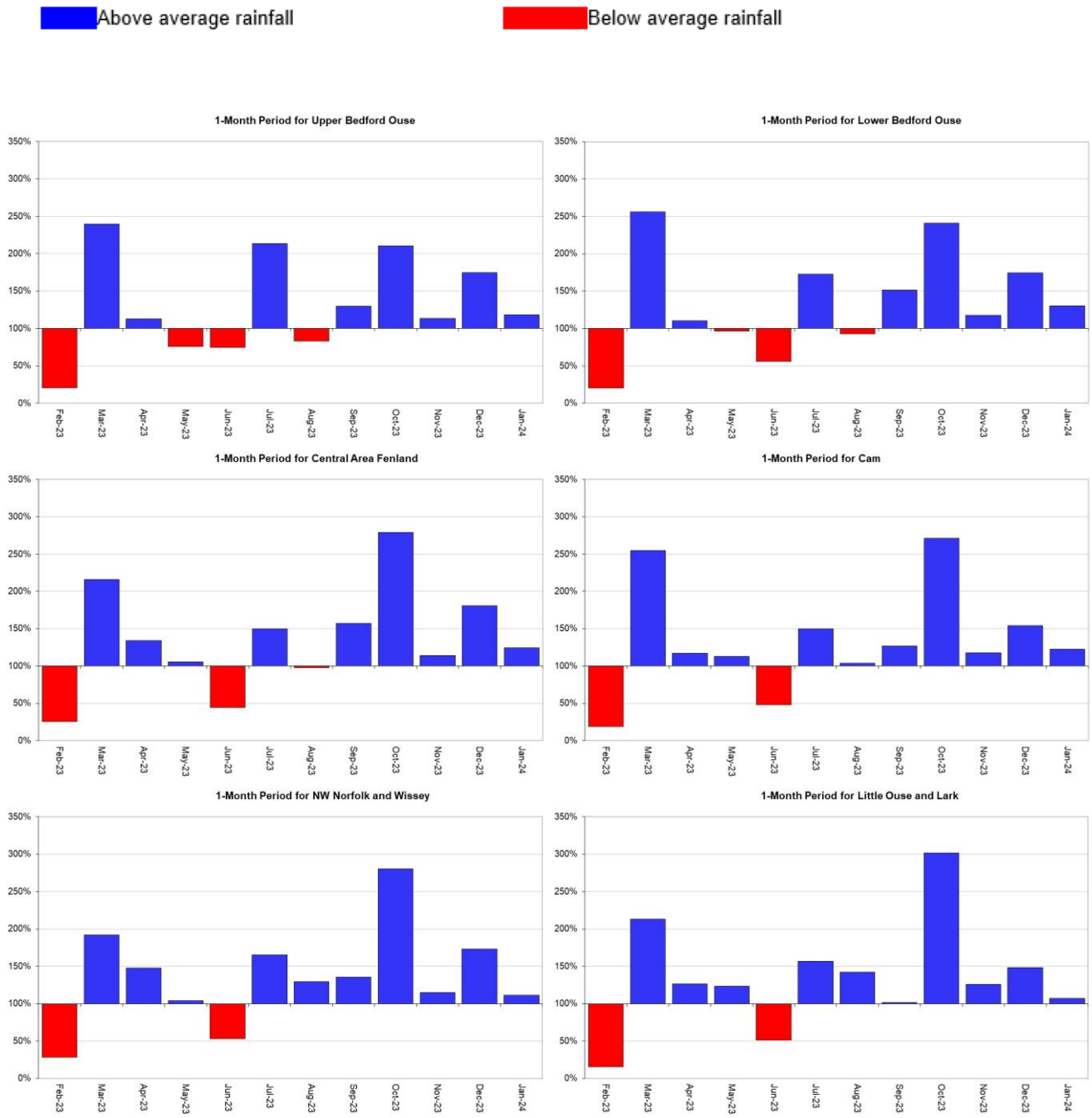
Figure 2.1: Total rainfall for hydrological areas across East Anglia, expressed as a percentage of long term average rainfall for the current month (up to 31 January 2024), the last 3 months, the last 6 months, and the last 12 months. Category classes are based on an analysis of respective historic totals. Table available in the appendices with detailed information.

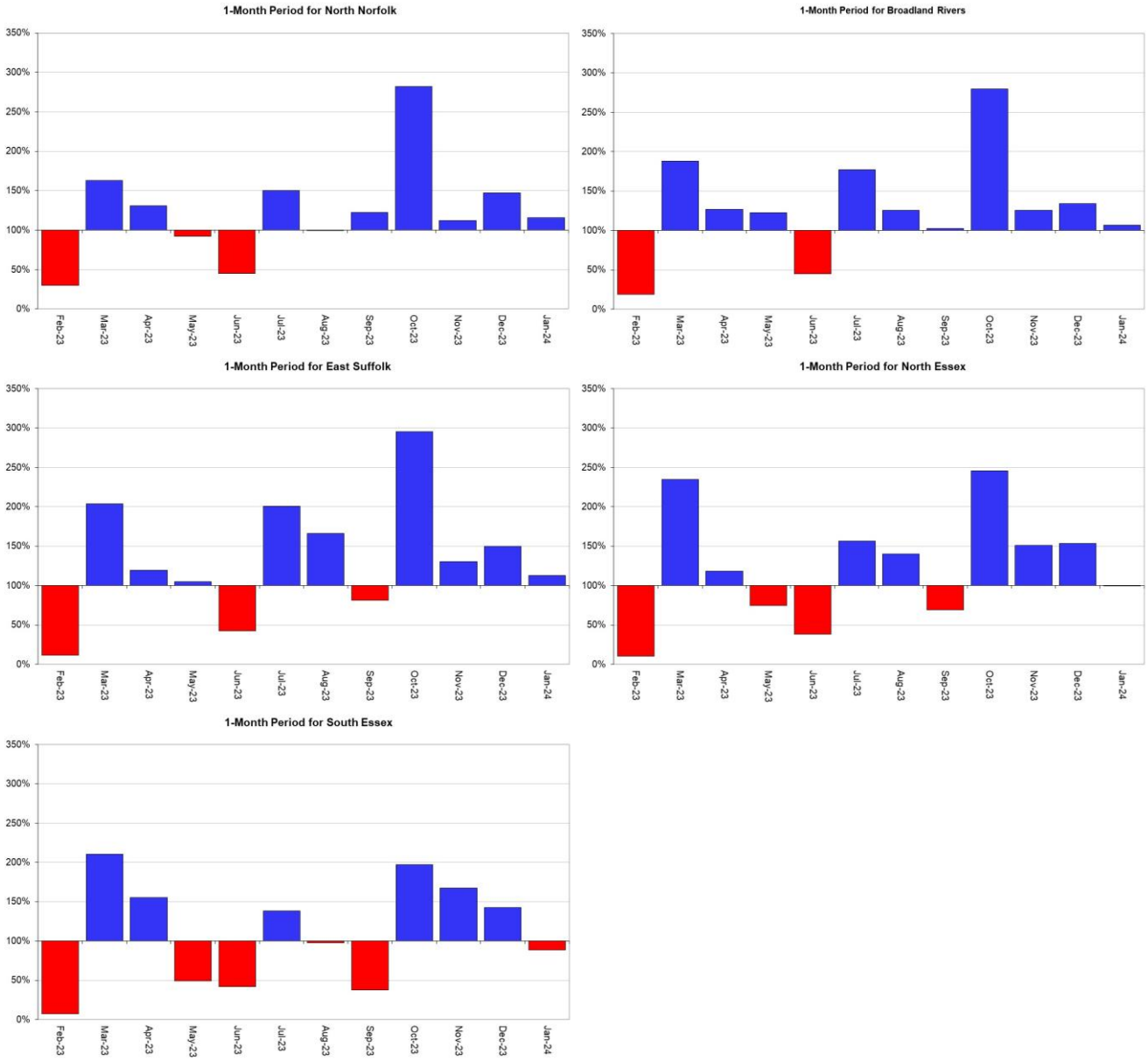


HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office. Crown copyright, 2024). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved.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

2.2 Rainfall charts

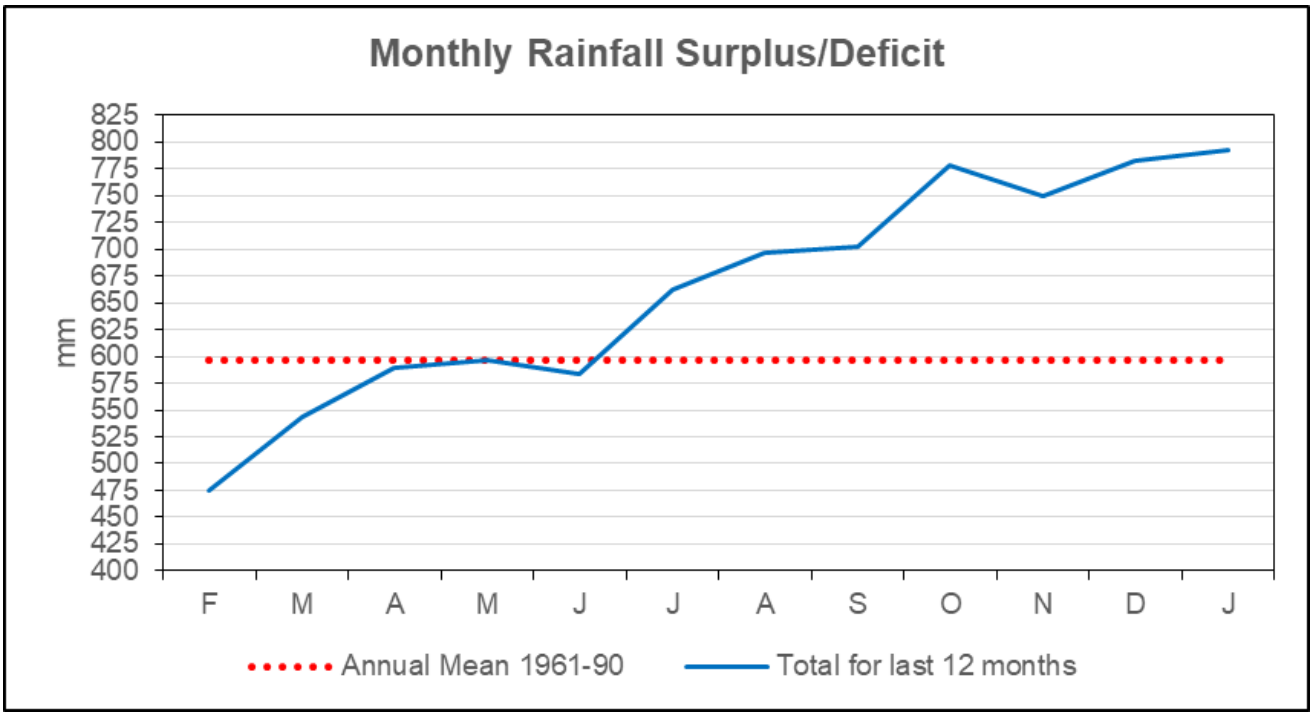
Figure 2.2: Monthly rainfall totals for the past 12 months as a percentage of the 1961 to 1990 long term average for each region and for England.





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

2.3 Monthly rainfall surplus deficit chart

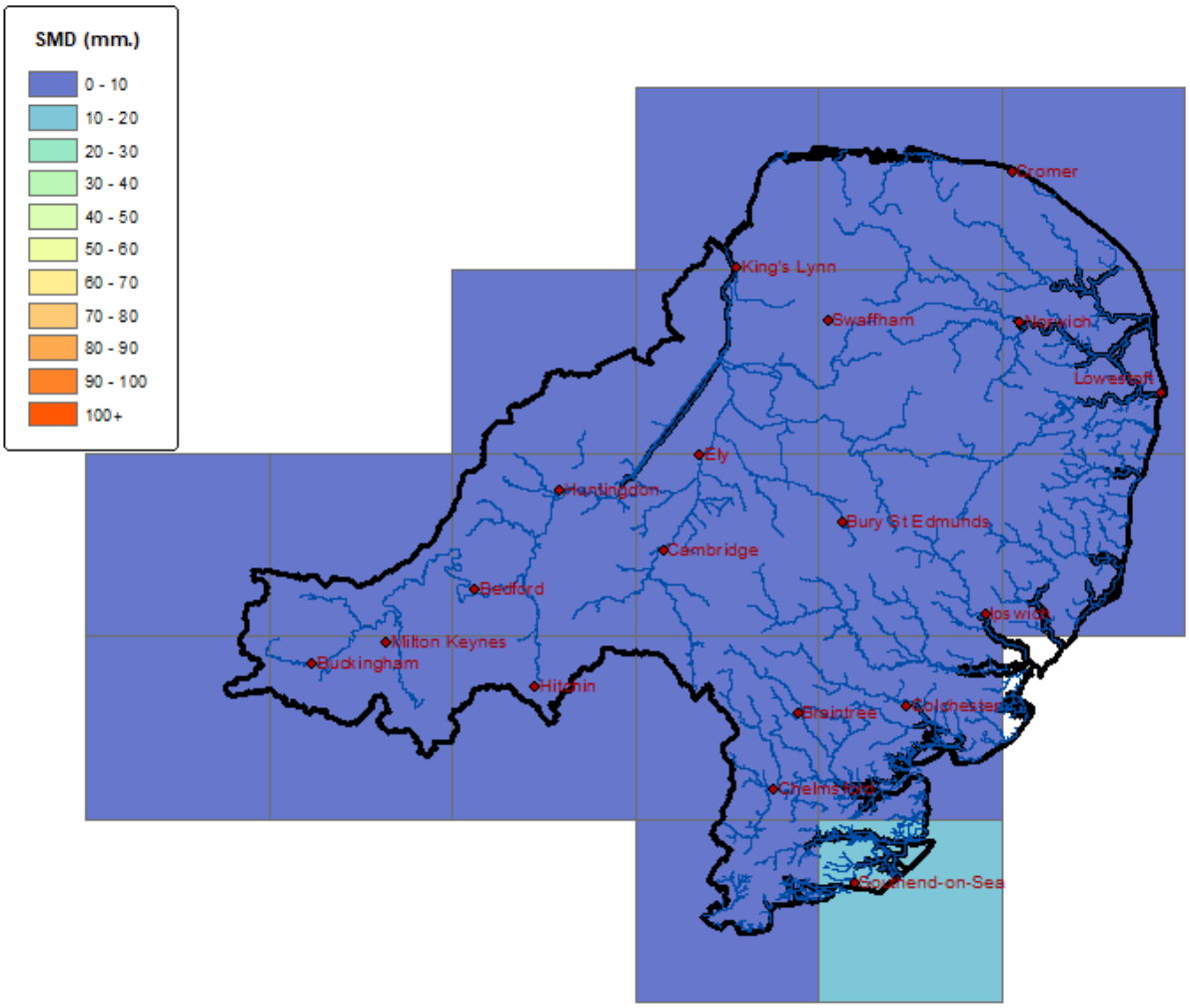


HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

3 Soil moisture deficit

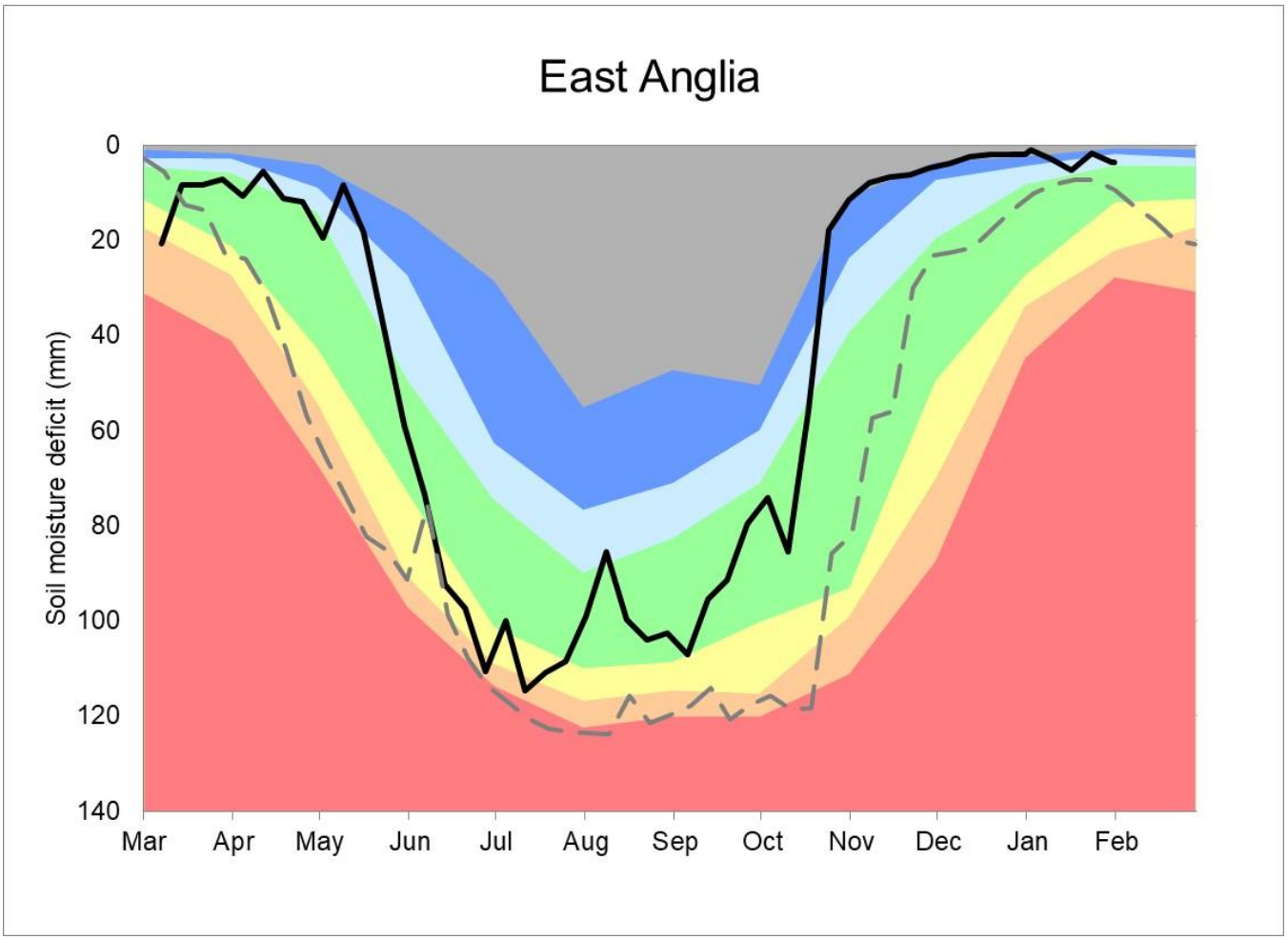
3.1 Soil moisture deficit map

Figure 3.1: Soil moisture deficit values for 31 January 2024. Values based on the weekly MORECS data for real land use.



3.2 Soil moisture deficit charts

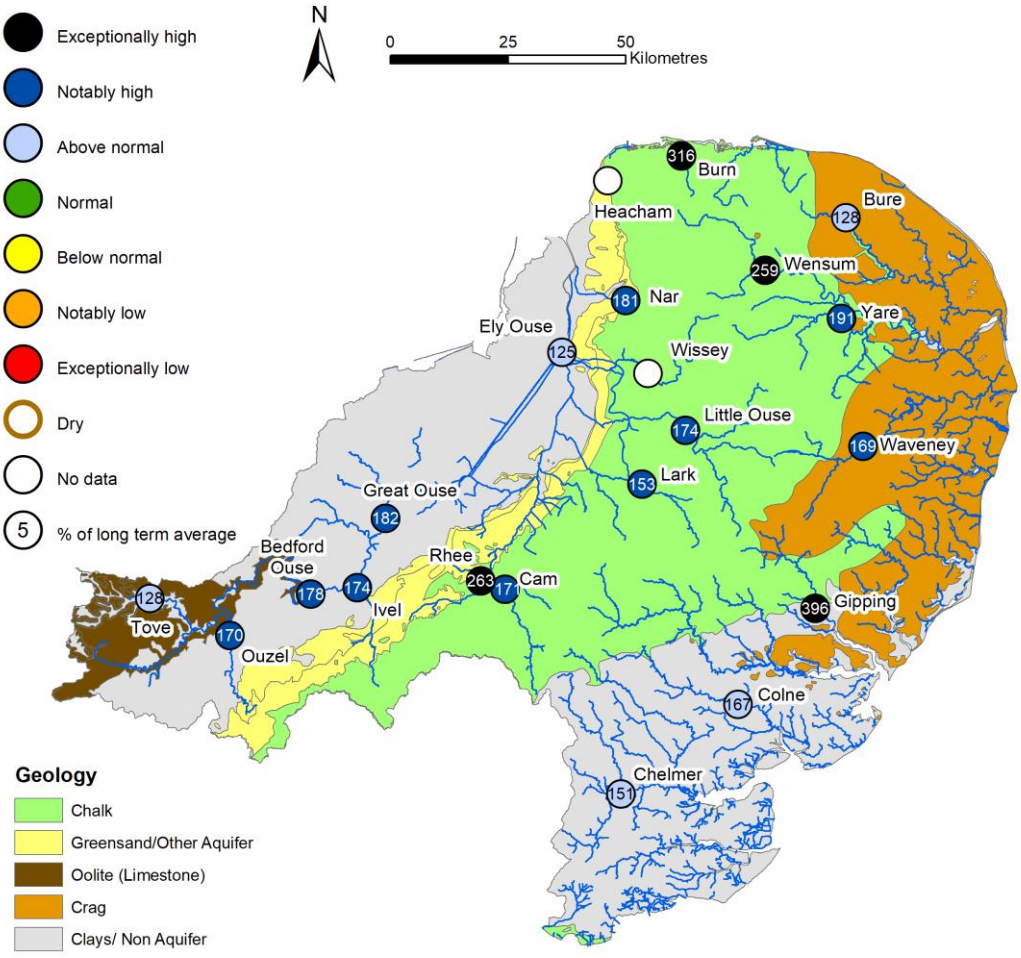
Figure 3.2: Latest soil moisture deficit compared to an analysis of historic 1961 to 1990 long term data set. Weekly MORECS data for real land use.



4 River flows

4.1 River flows map

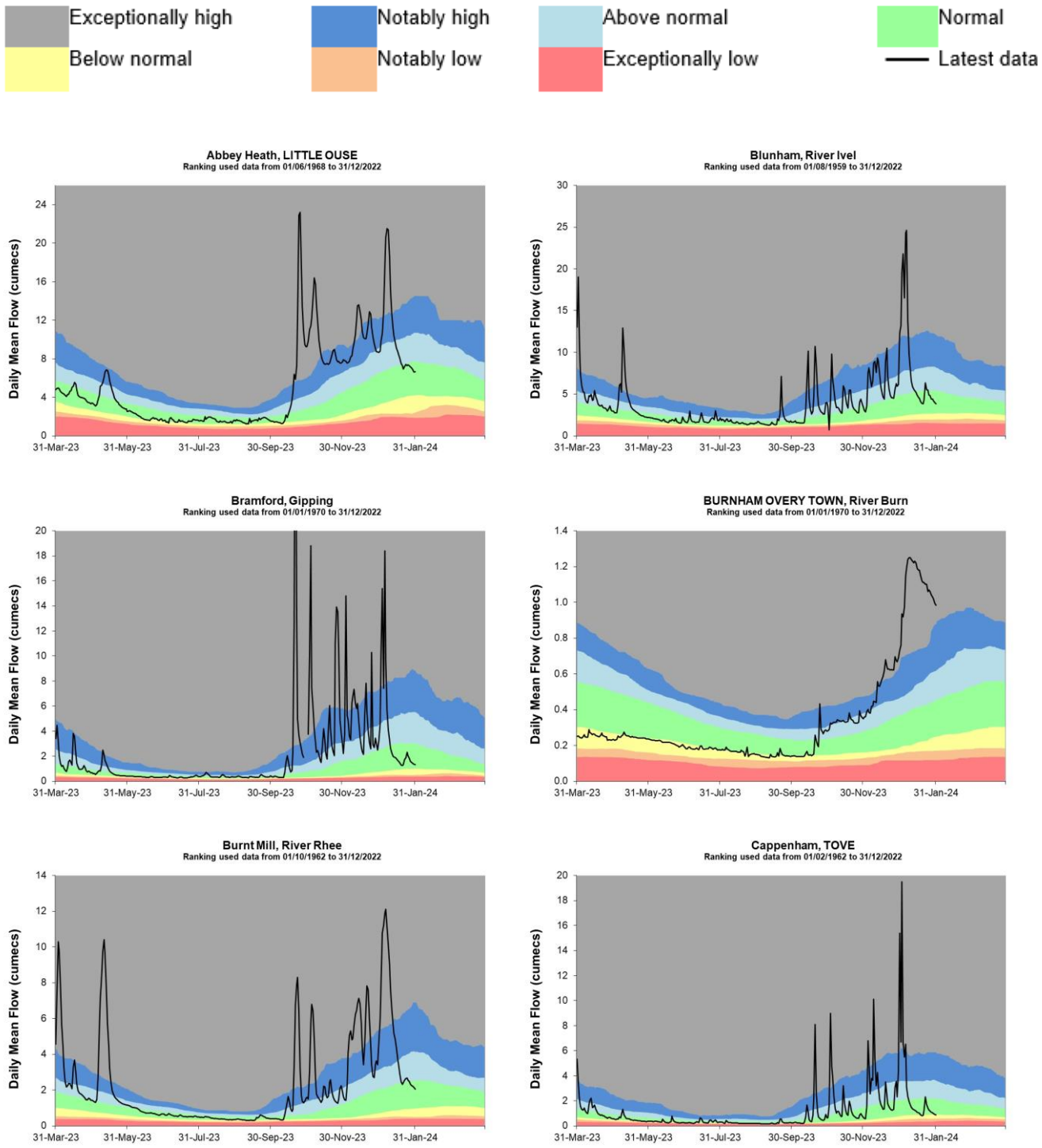
Figure 4.1: Monthly mean river flow for indicator sites for January 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic January monthly means Table available in the appendices with detailed information.



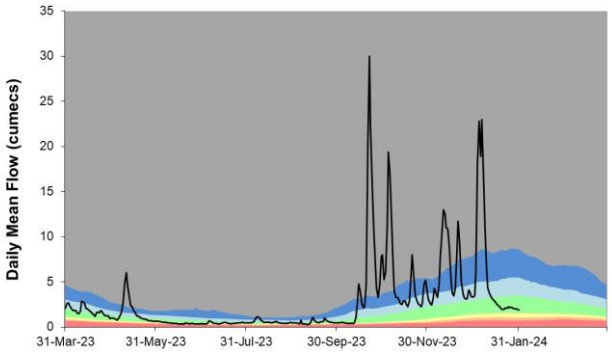
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

4.2 River flow charts

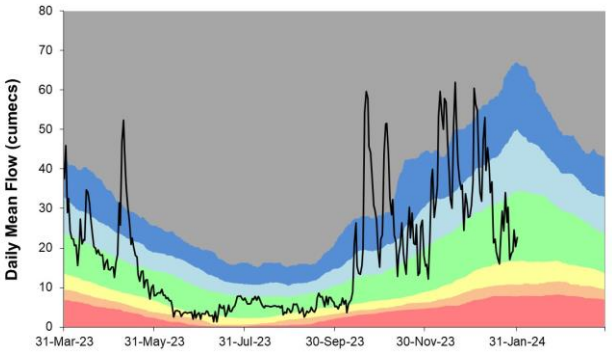
Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows, and long term maximum and minimum flows.



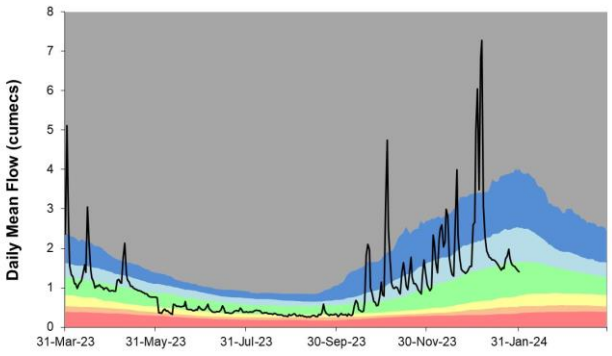
COLNEY, River Yare
Ranking used data from 01/01/1970 to 31/12/2022



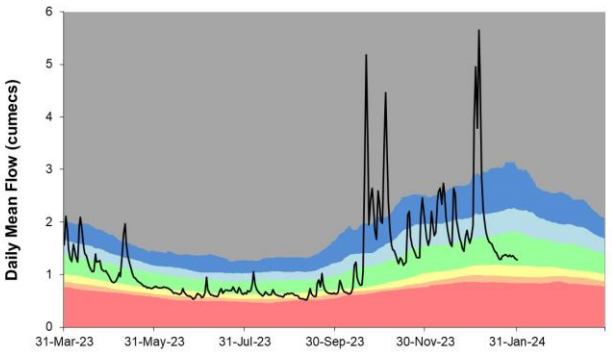
Denver, ELY OUSE
Ranking used data from 01/11/1971 to 31/12/2022



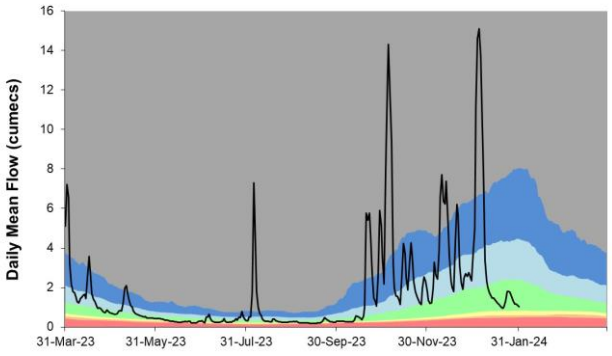
Dernford, CAM
Ranking used data from 21/02/1949 to 23/12/2022



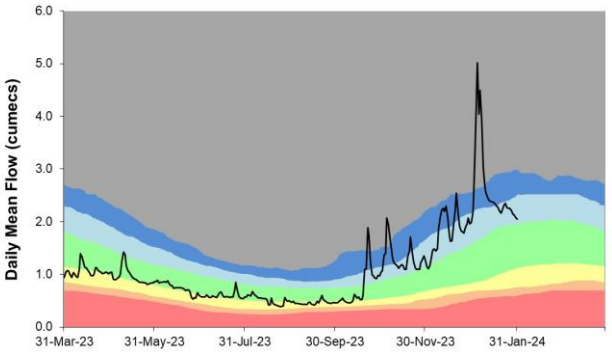
Ingworth, Bure
Ranking used data from 01/01/1970 to 31/12/2022



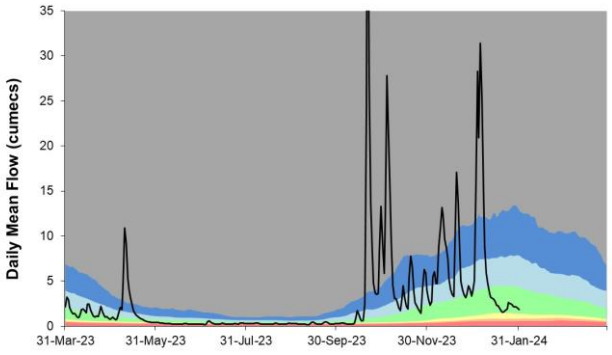
Lexden, Colne
Ranking used data from 01/01/1970 to 31/12/2022



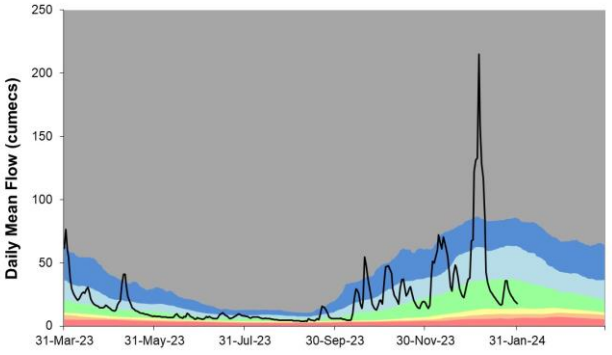
Marham, River Nar
Ranking used data from 01/09/1953 to 31/12/2022

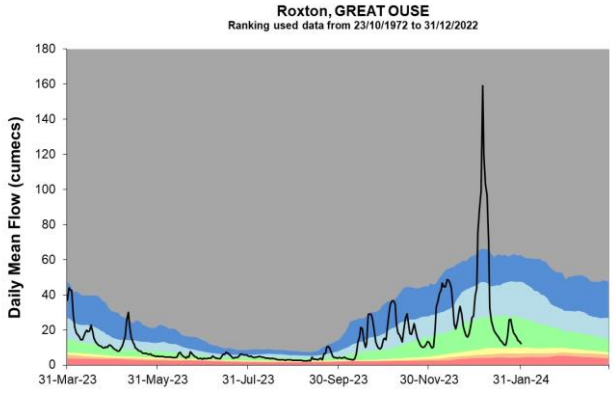


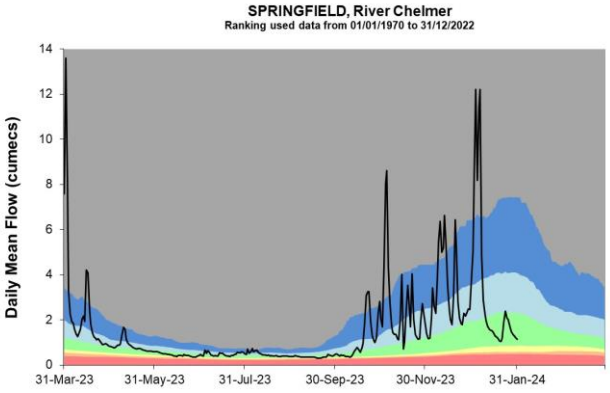
Needham Weir Total, Waveney
Ranking used data from 01/01/1970 to 31/12/2022

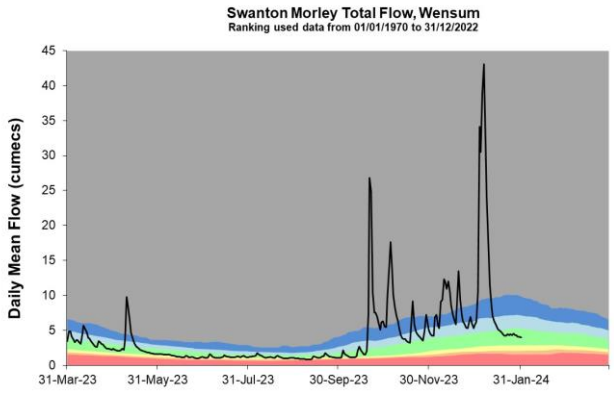


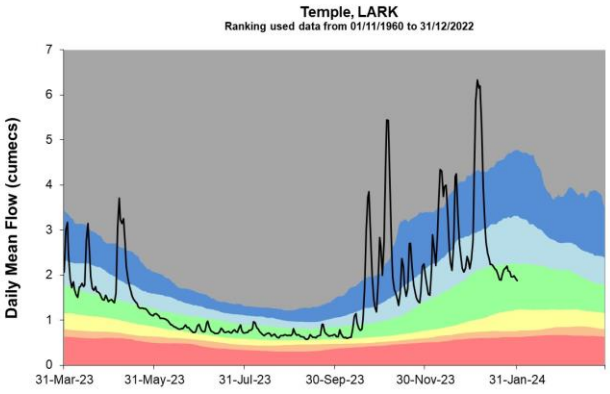
Offord (Gross flows), GREAT OUSE
Ranking used data from 05/03/1970 to 31/12/2022

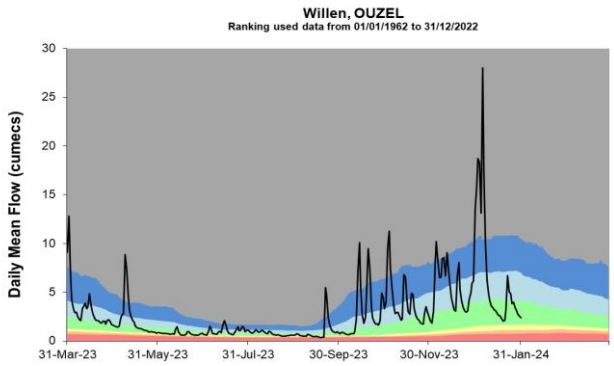










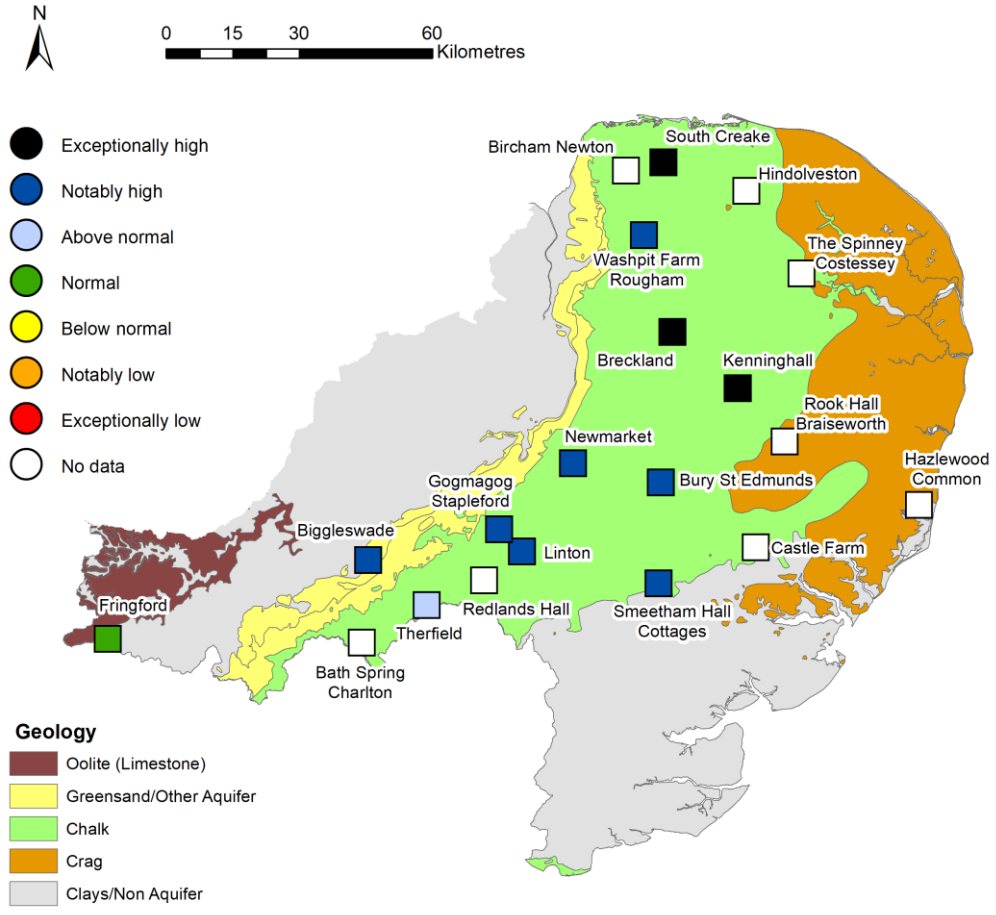


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

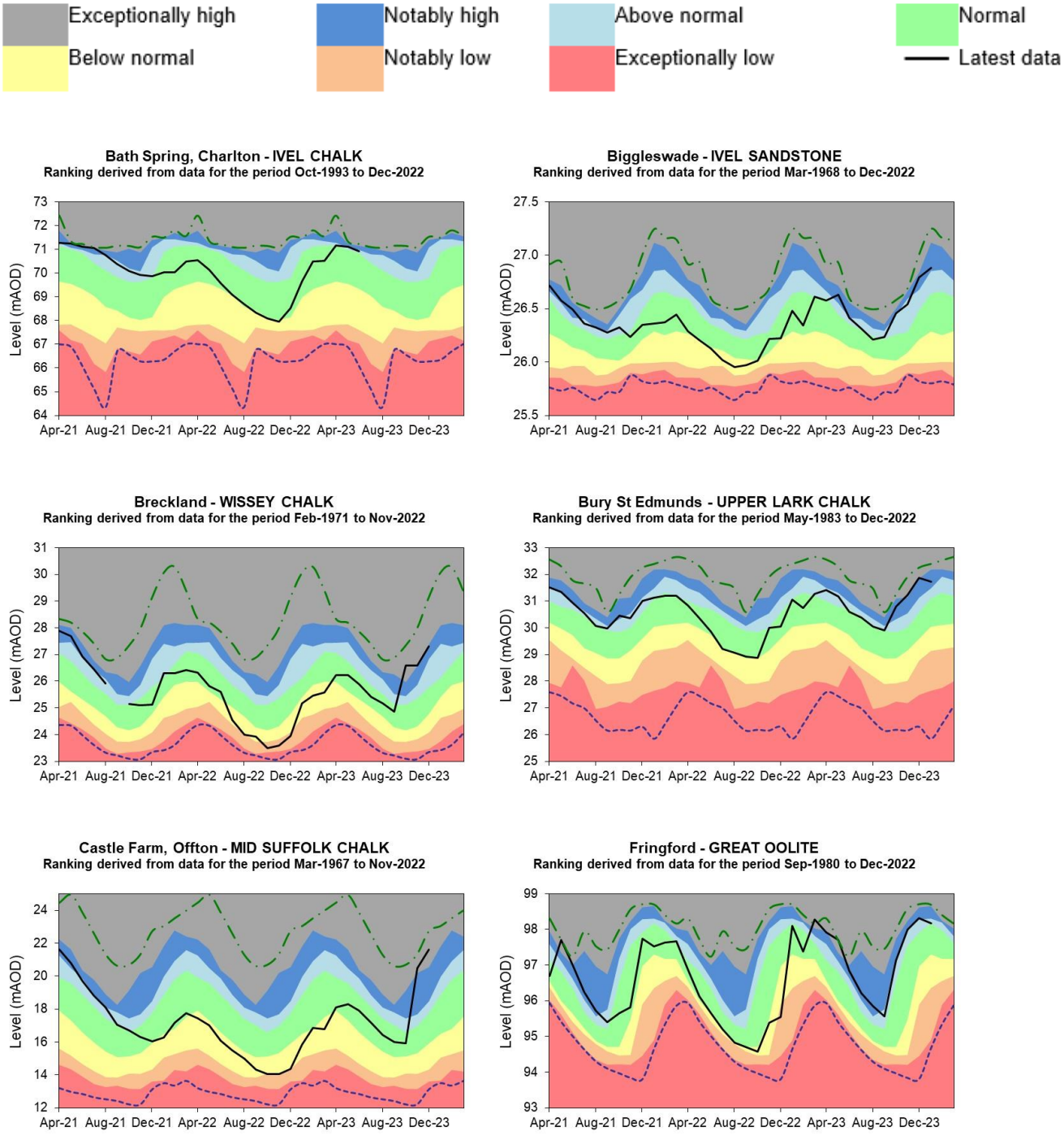
Figure 5.1: Groundwater levels for indicator sites at the end of January 2024, classed relative to an analysis of respective historic January levels. Table available in the appendices with detailed information.



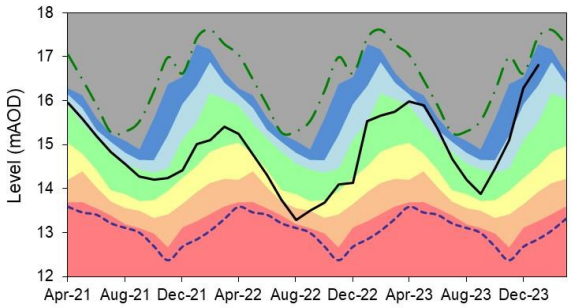
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

5.2 Groundwater level charts

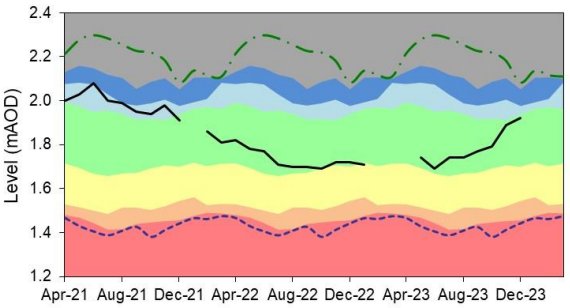
Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 22 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.



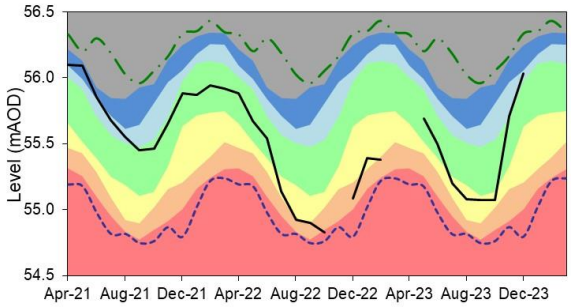
Gog Magog, Stapleford - CAM CHALK
Ranking derived from data for the period Jan-1980 to Dec-2022



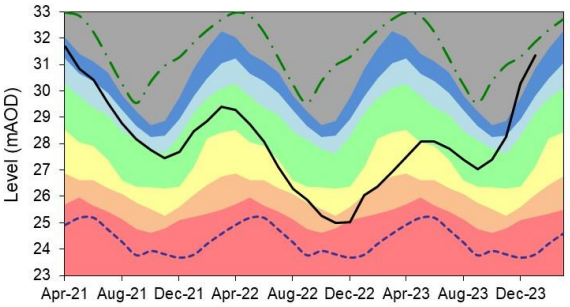
Hazlewood Common - SUFFOLK CRAG
Ranking derived from data for the period Oct-1988 to Nov-2022



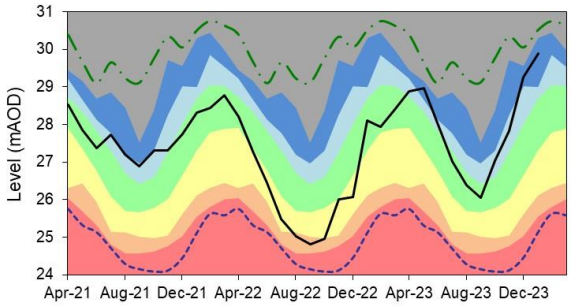
Hindolveston - NORFOLK CHALK
Ranking derived from data for the period Sep-1984 to Nov-2022



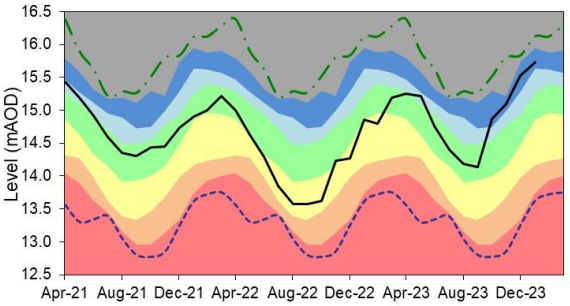
Kenninghall - LITTLE OUSE CHALK
Ranking derived from data for the period Aug-1973 to Dec-2022



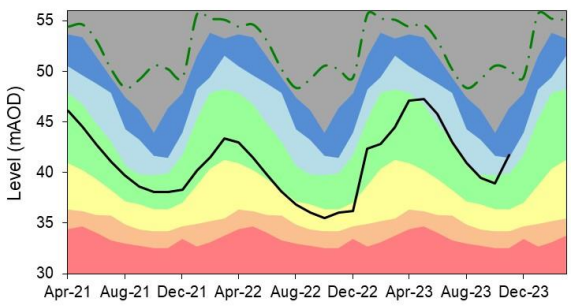
Linton- CAM CHALK
Ranking derived from data for the period Jan-1980 to Dec-2022



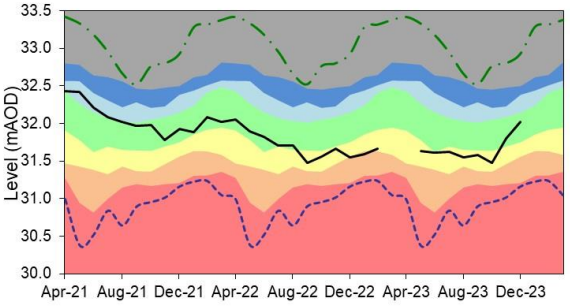
Newmarket - SNAIL CHALK
Ranking derived from data for the period Feb-1983 to Dec-2022

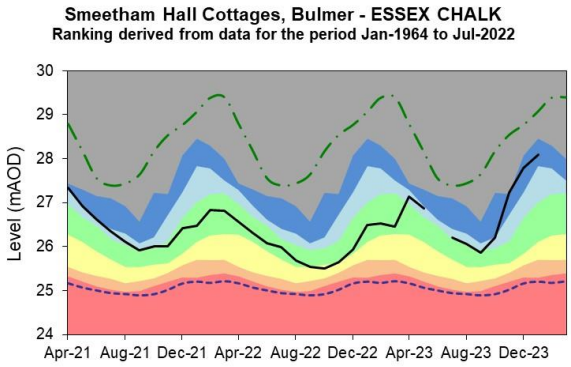


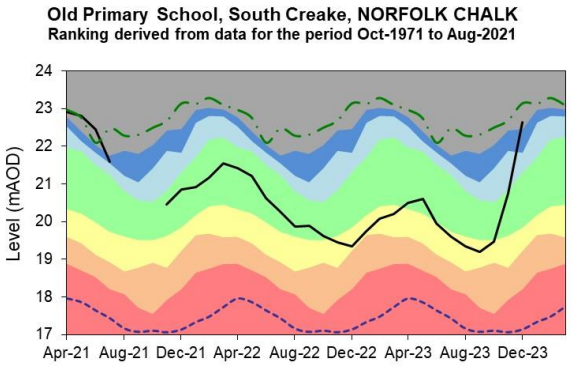
Redlands Hall, Ickleton - CAM CHALK
Ranking derived from data for the period Aug-1963 to Dec-2022

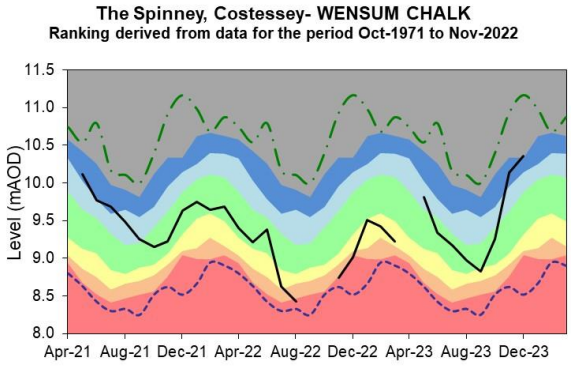


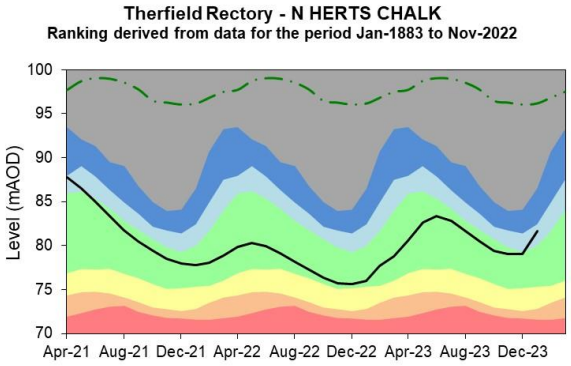
Rook Hall, Braiseworth- SUFFOLK CHALK
Ranking derived from data for the period Jan-1980 to Nov-2022

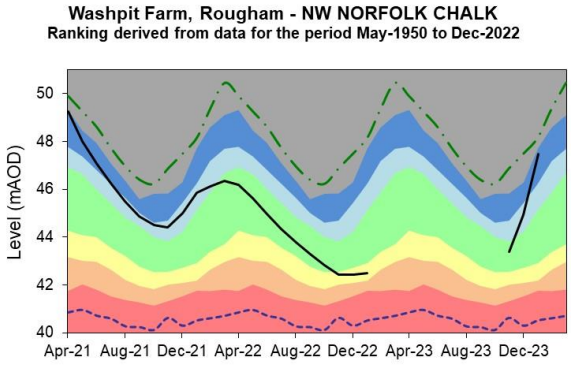








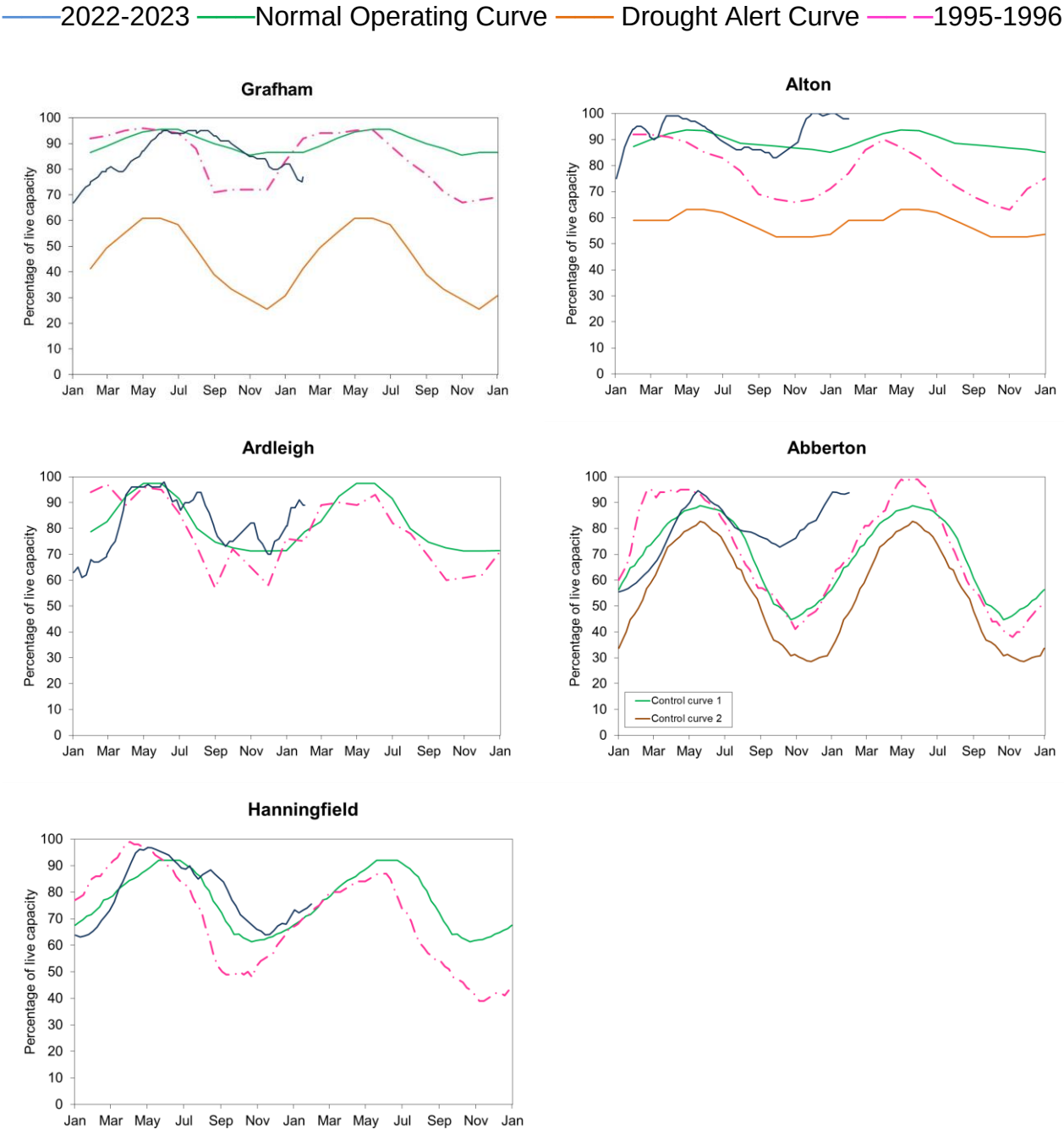




Source: Environment Agency, 2024.

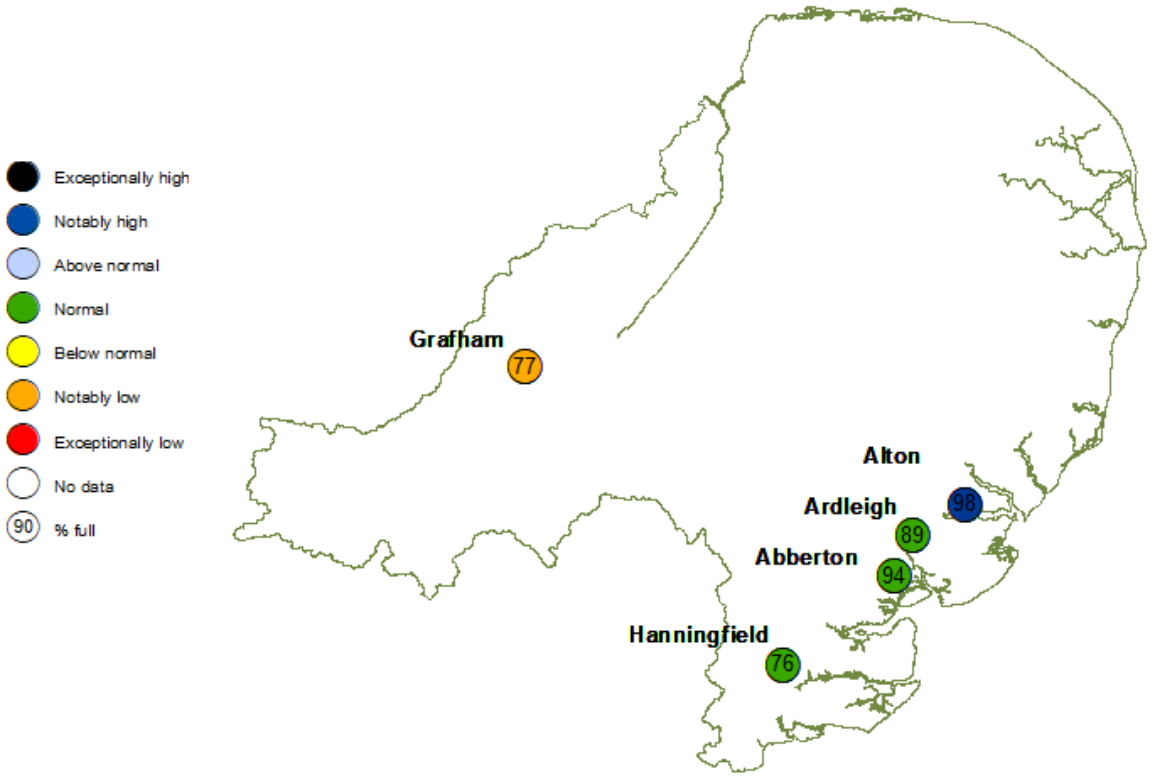
6 Reservoir stocks

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).

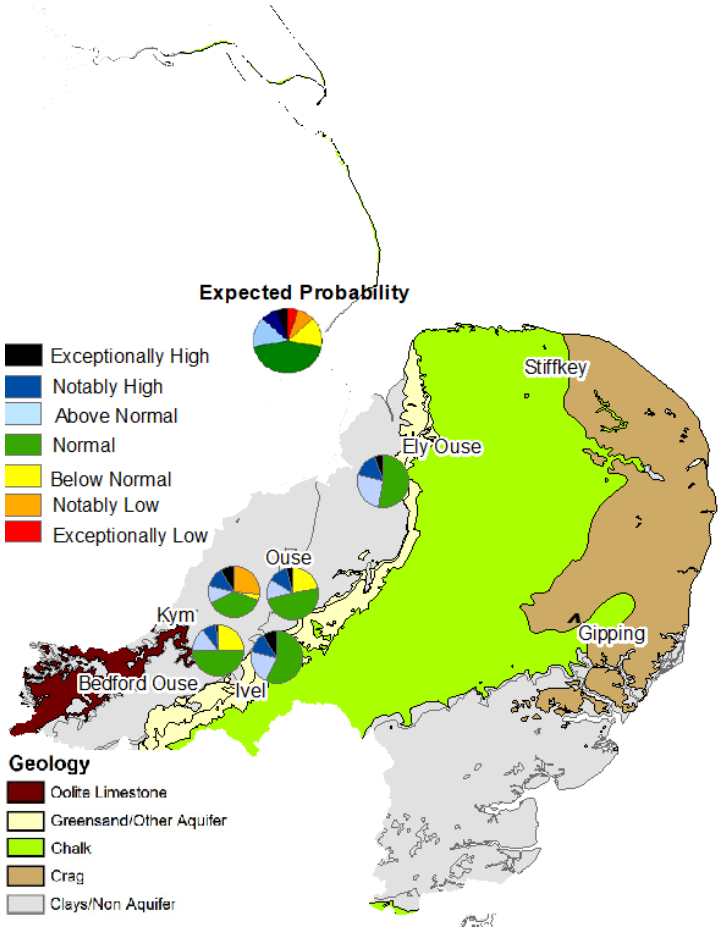
6.1 Reservoir stocks map



7 Forward look

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

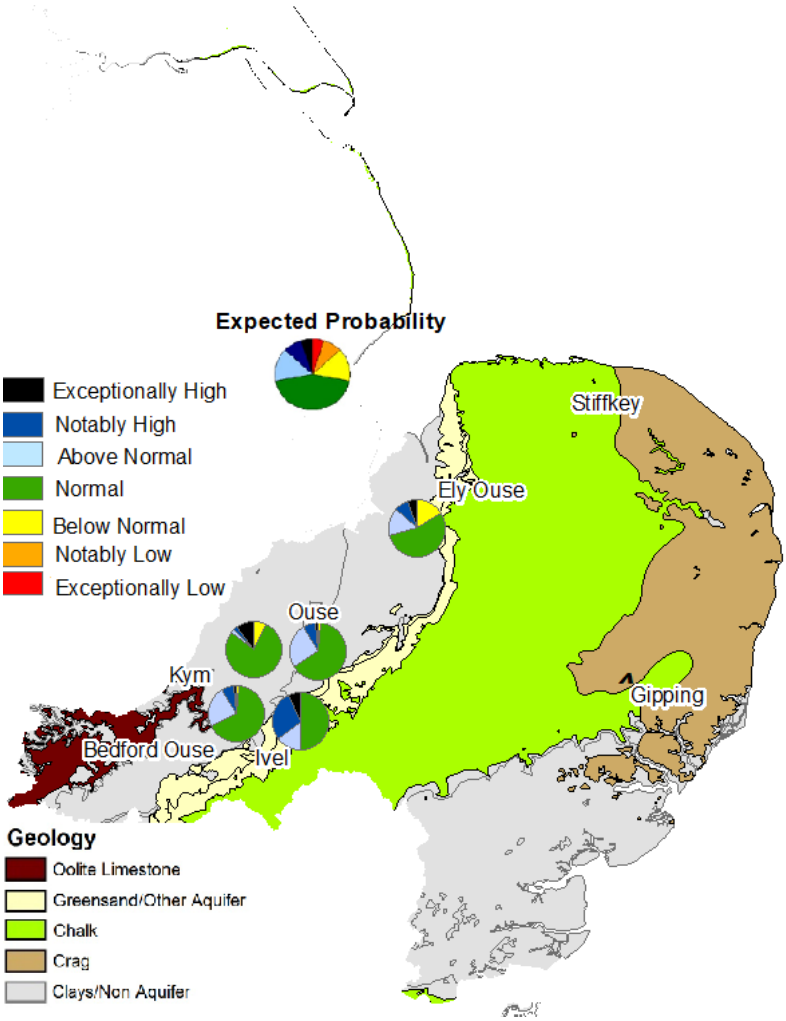
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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

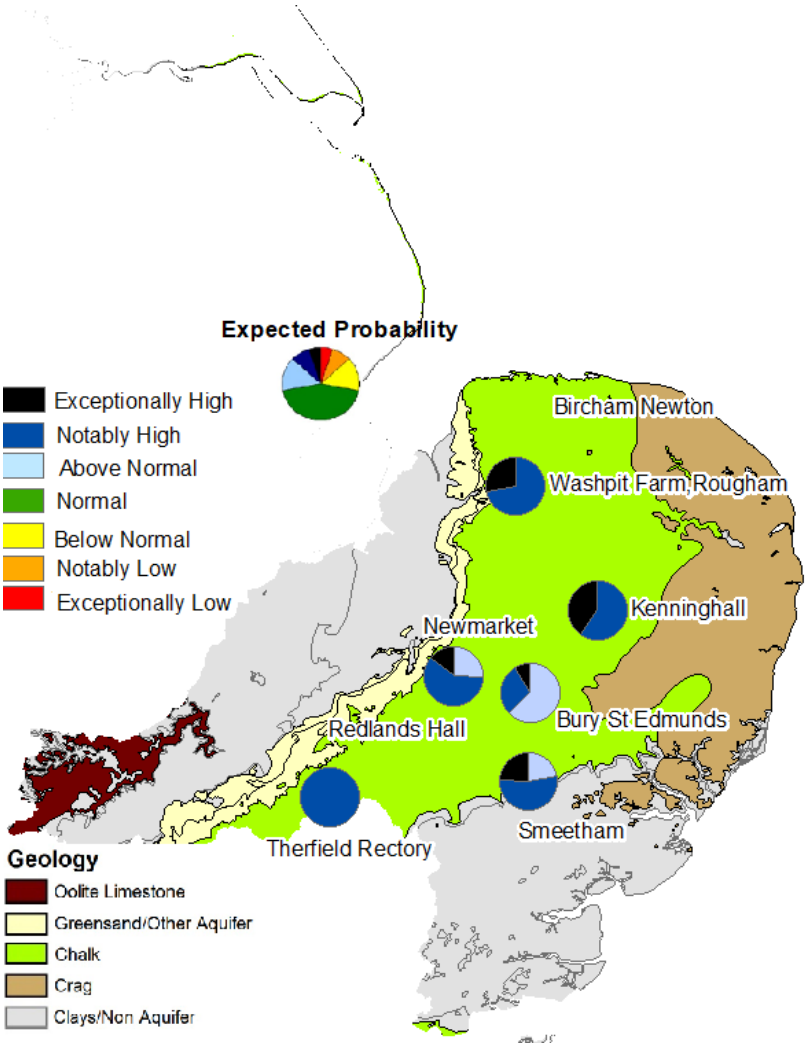
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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

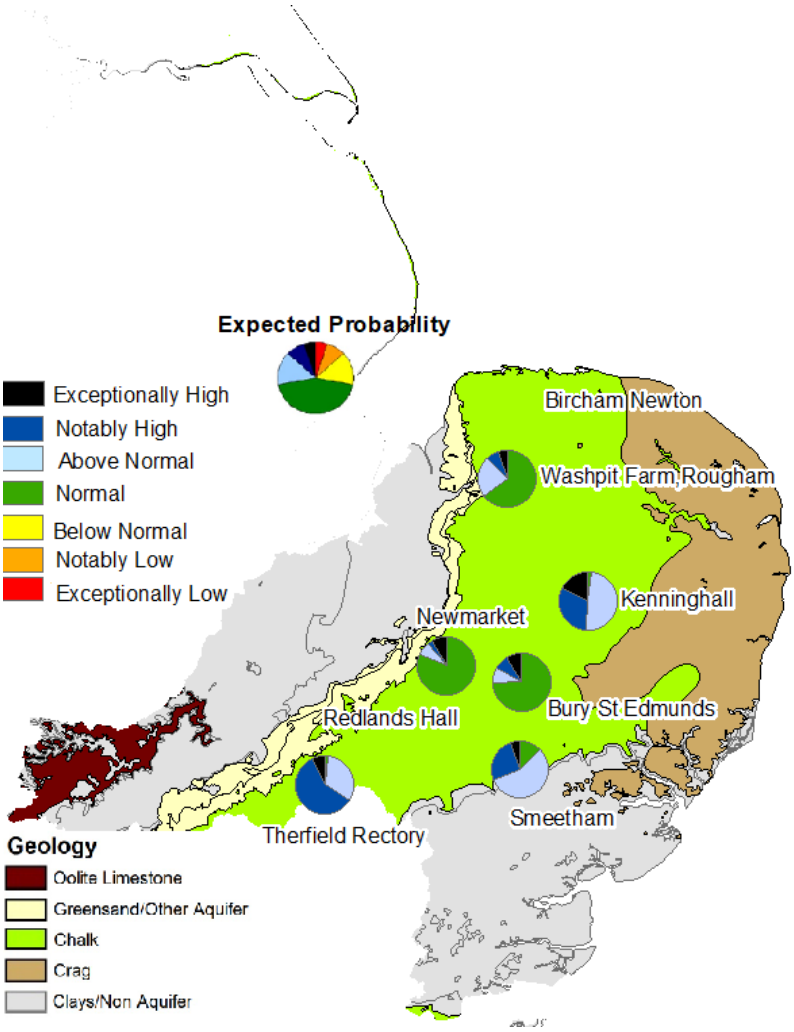
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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

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)

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	Jan 2024 rainfall % of long term average 1961 to 1990	Jan 2024 band	Nov 2023 to January cumulative band	Aug 2023 to January cumulative band	Feb 2023 to January cumulative band
Broadland Rivers	107	Normal	Above normal	Exceptionally high	Exceptionally high
Cam	123	Normal	Above normal	Exceptionally high	Exceptionally high
Central Area Fenland	125	Normal	Notably high	Exceptionally high	Exceptionally high
East Suffolk	113	Normal	Above normal	Exceptionally high	Exceptionally high
Little Ouse And Lark	107	Normal	Notably high	Exceptionally high	Exceptionally high
Lower Bedford Ouse	130	Above Normal	Notably high	Exceptionally high	Exceptionally high
North Essex	100	Normal	Notably high	Exceptionally high	Notably high
North Norfolk	116	Normal	Above normal	Exceptionally high	Notably high
Nw Norfolk And Wissey	111	Normal	Notably high	Exceptionally high	Exceptionally high

South Essex	88	Normal	Above normal	Above normal	Above normal
Upper Bedford Ouse	118	Normal	Notably high	Notably high	Exceptionally high

9.2 River flows table

Site name	River	Catchment	Jan 2024 band	Dec 2023 band
Abbey Heath	Little Ouse	Little Ouse	Notably high	Notably high
Blunham	Ivel	Ivel	Notably high	Notably high
Bramford	Gipping	Gipping	Exceptionally high	Notably high
Burnham Overy	Burn	Burn	Exceptionally high	Notably high
Burnt Mill	Rhee	Rhee	Exceptionally high	Exceptionally high
Cappenham	Tove	Tove	Above normal	Notably high
Colney	Yare	Yare	Notably high	Notably high
Denver	Ely Ouse	Cutoff and Renew Channel	Above normal	Notably high
Dernford	Cam	Cam	Notably high	Notably high
Ingworth	Bure	Bure	Above normal	Notably high
Lexden	Colne	Colne Essex	Above normal	Notably high
Marham	Nar	Nar	Notably high	Above normal
Needham Weir Total	Waveney (lower)	Waveney	Notably high	Notably high

Offord (gross Flows)	Great Ouse	Ouse Beds	Notably high	Above normal
Roxton	Great Ouse	Ivel	Notably high	Above normal
Springfield	Chelmer	Chelmer Upper	Above normal	Notably high
Swanton Morley Total	Wensum	Wensum	Exceptionally high	Exceptionally high
Temple	Lark	Lark	Notably high	Notably high
Willen	Ouzel	Ouzel	Notably high	Notably high

9.3 Groundwater table

Site name	Aquifer	End of Jan 2024 band	End of Dec 2023 band
Biggleswade	Ivel Woburn Sands	Notably high	Notably high
Breckland	Wissey Chalk		Notably high
Bury St Edmunds	Upper Lark Chalk	Notably high	Exceptionally high
Castle Farm, Offton	East Suffolk Chalk		Exceptionally high
Gog Magog, Stapleford	Cam Chalk	Notably high	Notably high
Hazlewood Common	East Suffolk Crag		Normal
Hindolveston	Norfolk Chalk		Above normal
Kenninghall	Little Ouse Chalk	Exceptionally high	Exceptionally high
Linton	Cam Chalk	Notably high	Notably high
Newmarket	Snail Chalk	Notably high	Notably high
Old Primary School, South Creake	North Norfolk Chalk		Exceptionally high
Rook Hall, Braiseworth	East Suffolk Chalk		Normal

Smeetham Hall Cottages, Bulmer	North Essex Chalk	Notably high	Notably high
The Spinney, Costessey	Wensum Chalk		Exceptionally high
Washpit Farm, Rougham	North West Norfolk Chalk	Notably high	Above normal
Therfield Rectory	Upper Lee Chalk	Above normal	Normal
Fringford P.s.	Upper Bedford Ouse Oolitic Limestone (great)	Normal	Notably high

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	Bedford Ouse	Kym	Ivel	Ouse	Ely Ouse
Exceptionally low	0	0	0	0	0
Notably low	0	27	0	0	0
Below normal	25	4	0	21	0
Normal	50	38	57	50	53
Above normal	14	11	21	13	26
Notably high	9	13	13	13	16
Exceptionally high	2	9	9	4	5

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

Percentage of pie chart for each band

Site	Bedford Ouse	Kym	Ivel	Ouse	Ely Ouse
Exceptionally low	0	0	0	0	0
Notably low	0	0	0	0	0
Below normal	2	7	0	2	16
Normal	66	79	50	64	55
Above normal	23	2	14	25	16
Notably high	7	2	29	7	8
Exceptionally high	2	11	7	2	5

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

Percentage of pie chart for each band

Site	Therfield Rectory	Newmarket	Washpit Farm	Kenninghall	Bury St Edmunds	Smeetham
Exceptionally low	0.0	0.0	0.0	0.0	0.0	0.0
Notably low	0.0	0.0	0.0	0.0	0.0	0.0
Below normal	0.0	0.0	87.5	0.0	0.0	0.0
Normal	0.0	0.0	12.5	0.0	0.0	0.0
Above normal	0.0	25.7	0.0	0.0	62.9	22.2
Notably high	100.0	60.0	0.0	60.0	28.6	53.7
Exceptionally high	0.0	14.3	0.0	40.0	8.6	24.1

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

Percentage of pie chart for each band

Site	Therfield Rectory	Newmarket	Washpit Farm	Kenninghall	Bury St Edmunds	Smeetham
Exceptionally low	0.0	0.0	0.0	0.0	0.0	0.0
Notably low	0.0	0.0	12.5	0.0	0.0	0.0
Below normal	0.0	0.0	12.5	0.0	0.0	0.0
Normal	1.8	81.1	59.4	2.2	74.3	13.0
Above normal	32.1	8.1	3.1	48.9	8.6	55.6
Notably high	58.9	2.7	9.4	31.1	8.6	25.9
Exceptionally high	7.1	8.1	3.1	17.8	8.6	5.6