Hydrological Summary
for the United Kingdom

January 2007

General

Overall, January was a wet and mild month - the 2nd warmest on record for the UK, but with very boisterous weather during the first three weeks - accompanied by many flood alerts. Drawdown of reservoir levels for flood alleviation purposes were correspondingly common but, entering February, reservoir stocks were mostly near to capacity, and overall stocks for England and Wales were around 3% above average. More significantly, stocks in the Southern Region were around twice those of a year ago. In the South West however, Colliford reservoir remained about 20% below average. Groundwater resources improved markedly over the month as the exceptional December/January infiltration reached the, widely depressed, water-tables in much of the English Lowlands. Residual pockets of drought stress aside (e.g. in Cornwall), the 4th wettest October-January period in the last 36 years (for E&W) has transformed the water resources outlook.

Rainfall

Rigorous cyclonic conditions, with damaging winds, predominated during much of January but were succeeded by more settled weather as high pressure extended across the British Isles; in some eastern areas snow and fog-drip comprised the greater part of the late-January precipitation. Frontal rainfall generated a few exceptional daily rainfall totals (e.g. 89 mm at Capel Curig on the 9th) and the early dominance of a moist westerly airflow is reflected in the January rainfall totals. Much of north-western Britain and Wales registered >120% of the January average with totals exceeding 200% in the wettest uplands (e.g. Snowdon). Totals in a relatively thin zone across southern England were below average, notably so in a few localities (e.g. Penzance, Isle of Wight); eastern Aberdeenshire was relatively dry also. The UK reported its 6th successive month with above average rainfall and, over wide areas, the October-January rainfall was exceptional. In this timeframe, Scotland eclipsed its previous maximum by a very wide margin (in a series from 1914) and all regions (but not all areas) registered above average rainfall. With the exception of the South West, regional accumulations over 12 months also exceed the long term average. For the Highland Region the February-January precipitation was the 3rd highest in 93 years – reinforcing the exceptional wetness of northern Scotland over the last 15 years.

River Flow

River flows began the month close to, or modestly above, bankfull over wide areas; many flood alerts were in operation. The rapid passage of most frontal systems had a moderating effect on storm rainfall totals but many rivers remained in spate – for over three weeks in the case of the Thames. Floodplain inundations were common on the 10/11th (e.g. at Callender, Appleby, Wensleydale, Milton Keynes) and by the 18th, flood alerts were in operation in all regions (with 135 Flood Watches across England and Wales). Most catchments were extremely vulnerable to further precipitation but strengthening anticyclonic conditions then initiated sustained recessions in responsive catchments; these continued well into February. By contrast, flows in many permeable catchments increased as the early winter pulse of groundwater recharge fuelled heavy spring outflows. Flows in the Lambourn during the last week of January were the highest for four years and runoff in rivers dependant on baseflow were, typically, two or three times the corresponding totals in 2006. January runoff totals were well above average across most of the UK, and a number of new monthly maxima were established (e.g. on the Naver, Yscir and Camowen). The Thames registered its 5th highest January flow in 48 years. Runoff rates over the post-October 2006 period have been exceptional across much of northern Britain, Northern Ireland and Wales. Many northern and western index rivers established new maximum November-January runoff totals, including the Tay, Earn and Welsh Dee, each with records exceeding 50 years. By contrast, in Cornwall, the Kenwyn reported its 14th successive month with below average flows and runoff accumulations since the early autumn of 2004 remain depressed over a wide range of timespans.

Groundwater

With soils in almost all aquifer outcrop areas close to saturation, the January rainfall (mostly of moderate intensity) extended a very notable infiltration episode which began in mid-December 2006. Initial estimates indicate that in parts of the Chilterns effective rainfall total for the 2006/07 recharge season had, by mid January exceeded that for the combined recharge seasons of 2004/05 and 2005/06. Correspondingly, recoveries in groundwater levels have been exceptionally steep in many areas. At West Woodyates, Chilgrove and Tilshead, levels in the Chalk have risen 20-30 metres since the late-2006 minima and, by mid-January, levels at Rockley were approaching their mid-winter maximum. As notably in terms of the post-drought recovery, levels in much of the eastern Chalk had returned to, or were approaching, the normal late-winter range. Typical January levels characterised most index wells in the limestone aquifers, although levels were seasonally high in the Cotswolds. In many of the Permo-Triassic sandstones outcrops recoveries are well established – with levels in most of the south-western and northern outcrops appreciably above average. In the Midlands, however, levels remain very low in those aquifer units which respond very sluggishly to recharge (e.g. Heathlanes).

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Rainfall . . . Rainfall . . .

Rainfall accumulations and return period estimates

Area	Rainfall	Jan 2007	Oct 06-Jan 07	RP	Aug 06-Jan 07	RP	Feb 06-Jan07	RP	Nov 04-Jan07	RP
England & Wales	**mm**	**107**	**461**		**626**		**1000**		**1980**	
	%	**119**	**127**	**5-10**	**121**	**5-10**	**110**	**2-5**	**95**	**2-5**
North West	mm	**162**	697		927		1439		2852	
	%	**136**	140	15-25	128	10-20	118	5-15	102	2-5
Northumbrian	mm	**113**	429		607		945		1999	
	%	**135**	130	5-10	125	5-15	109	2-5	101	2-5
Severn Trent	mm	**86**	358		515		843		1653	
	%	**122**	125	5-10	122	5-10	110	2-5	94	2-5
Yorkshire	mm	**103**	419		621		999		1894	
	%	**129**	132	5-15	134	15-25	120	10-20	99	2-5
Anglian	mm	**61**	257		417		669		1292	
	%	**120**	119	2-5	130	10-20	111	2-5	94	2-5
Thames	mm	**79**	365		508		800		1457	
	%	**119**	137	10-20	132	10-20	114	5-10	91	5-10
Southern	mm	**76**	407		539		849		1591	
	%	**94**	123	5-10	118	2-5	108	2-5	87	5-15
Wessex	mm	**97**	451		569		926		1827	
	%	**108**	129	5-10	116	2-5	108	2-5	92	2-5
South West	mm	**114**	545		665		1118		2412	
	%	**82**	104	2-5	94	2-5	94	2-5	86	10-20
Welsh	mm	**185**	754		934		1480		3013	
	%	**128**	129	5-15	116	2-5	110	2-5	96	2-5
Scotland	**mm**	**248**	**935**		**1181**		**1773**		**3778**	
	%	**160**	**149**	**>100**	**133**	**60-80**	**121**	**30-40**	**111**	**15-25**
Highland	mm	**350**	1234		1494		2211		4798	
	%	**193**	162	>100	141	80-100	127	40-60	118	>100
North East	mm	**106**	491		659		1052		2349	
	%	**103**	121	5-10	112	2-5	102	2-5	99	2-5
Tay	mm	**199**	799		1029		1525		3169	
	%	**136**	147	30-50	135	20-35	118	5-15	106	2-5
Forth	mm	**179**	624		844		1302		2794	
	%	**151**	133	10-20	124	10-20	114	5-10	106	2-5
Tweed	mm	**128**	523		741		1125		2337	
	%	**127**	133	10-20	129	10-20	112	5-10	102	2-5
Solway	mm	**197**	863		1123		1718		3472	
	%	**130**	142	25-40	129	10-20	120	10-20	105	2-5
Clyde	mm	**291**	1137		1464		2167		4490	
	%	**154**	150	70-100	136	70-100	124	30-45	111	10-20
Northern Ireland	**mm**	**134**	**533**		**761**		**1240**		**2531**	
	%	**116**	**119**	**2-5**	**118**	**5-10**	**113**	**5-10**	**100**	**<2**

% = percentage of 1961-90 average *RP = Return period*

Important note: Figures in the above table may be quoted provided that their source is acknowledged. See page 12. Where appropriate, specific reference must be made to the uncertainties associated with the return period estimates. Generally, the return period estimates are based on tables provided by the Met Office but those for Northern Ireland are based on the estimates for north-west England. The estimates relate to the specified region and span of months only (RPs may be an order of magnitude less if n-month periods beginning in any month are considered), they reflect rainfall variability over the period 1911-70 only, and assume a stable climate. (For further details see Tabony, R. C., 1977, *The variability of long duration rainfall over Great Britain*, Scientific Paper No. 37). The timespans featured do not purport to represent the critical periods for any particular water resource management zone and, normally, for hydrological or water resources assessments of drought severity, river flows and groundwater levels provide a better guide than return periods based on rainfall totals. All monthly rainfall totals since September 2006 are provisional.

Rainfall . . . Rainfall . . .

Key

00% Percentage of 1961-90 average

Very wet

Substantially above average

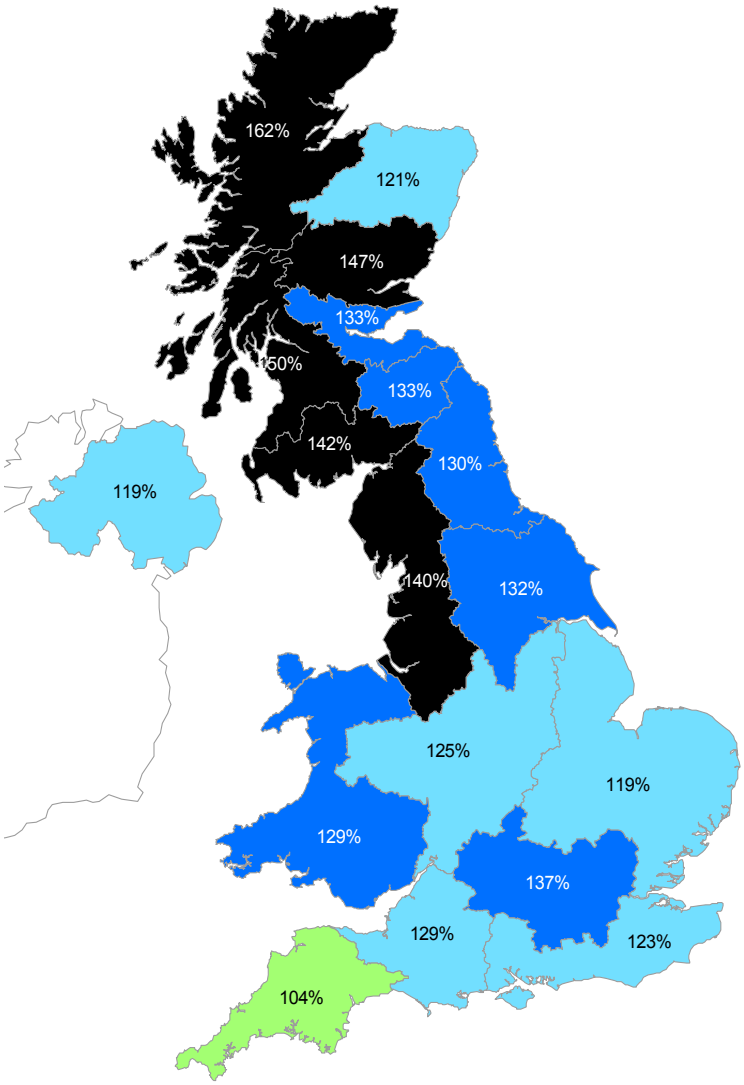
Above average

Normal range

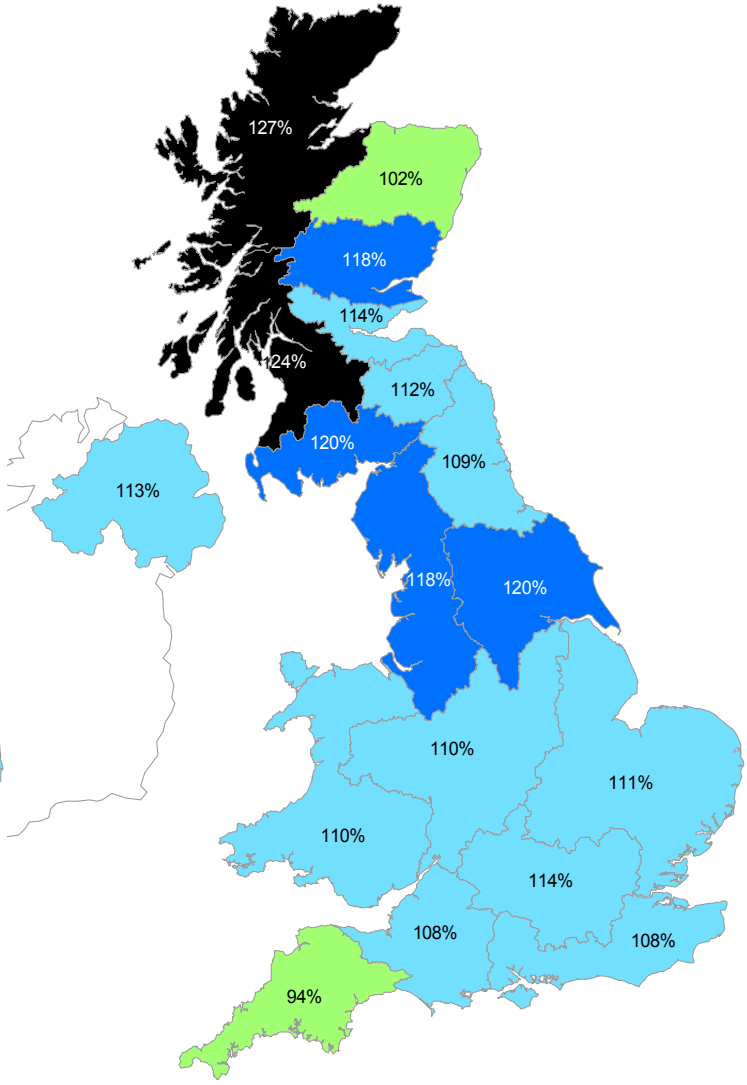
Below average

Substantially below average

Exceptionally low rainfall



October 2006 - January 2007

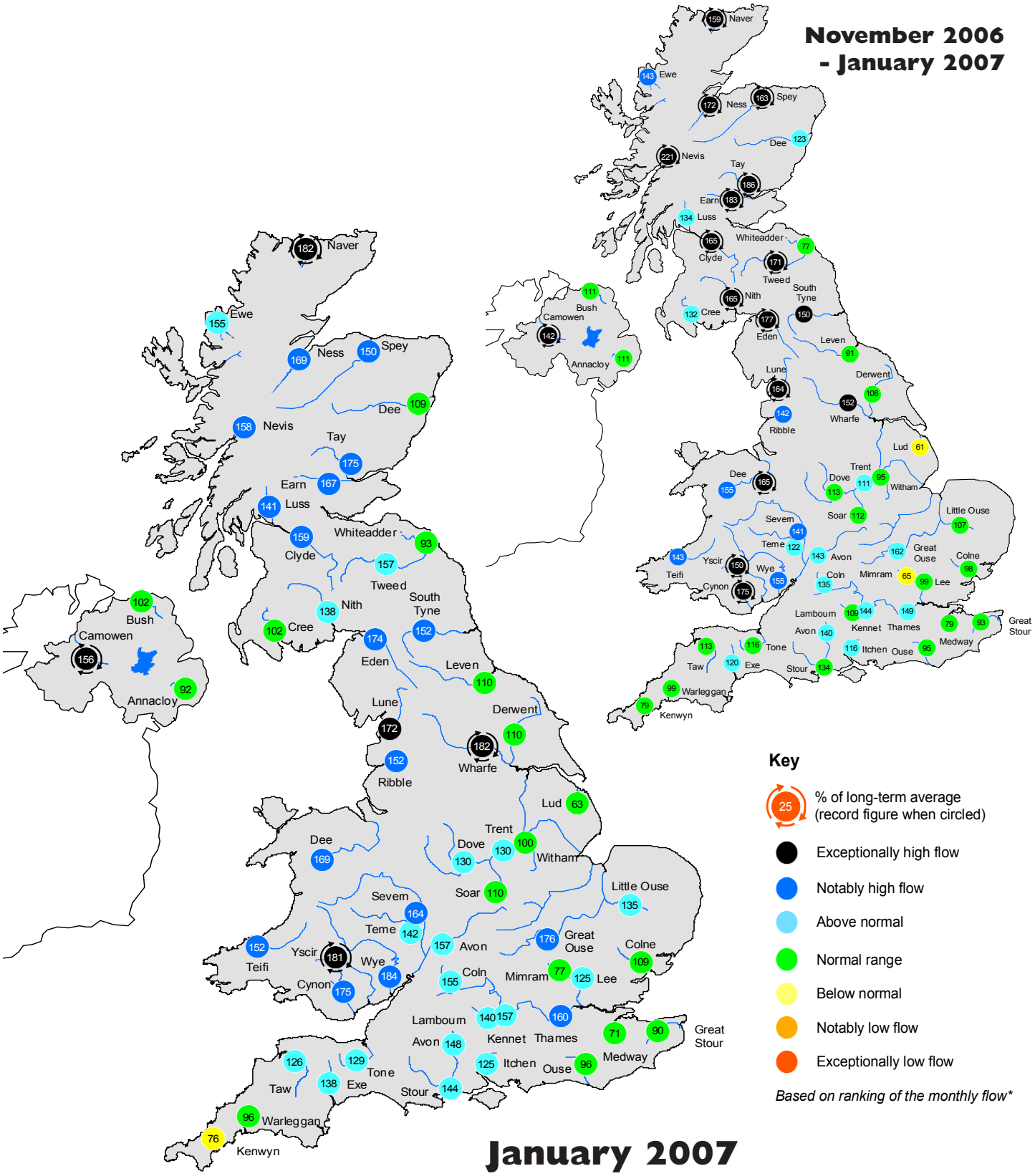


February 2006 - January 2007

Rainfall accumulation maps

The regional rainfall maps covering the last 4- and 12-month periods demonstrate why the focus of hydrological stress has switched from drought to the risk of flooding, in north-west Britain especially. The February 2006 - January 2007 period is the 6th wettest for the UK as whole in a series from 1914 and positive anomalies in the 20-30% range characterise the October 2006 - January 2007 rainfall over most of the region afflicted by drought in the summer of 2006. The exception is the South West where within-region variations in accumulated rainfall totals remain large.

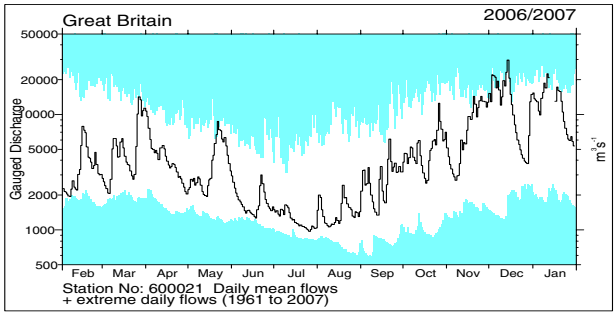
River flow . . . River flow . . .

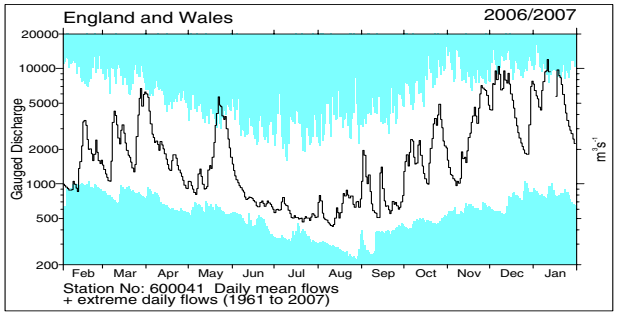


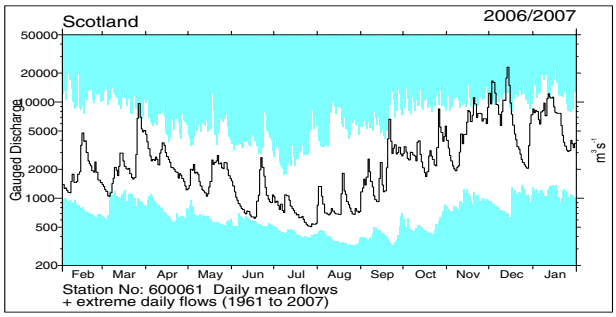
River flows

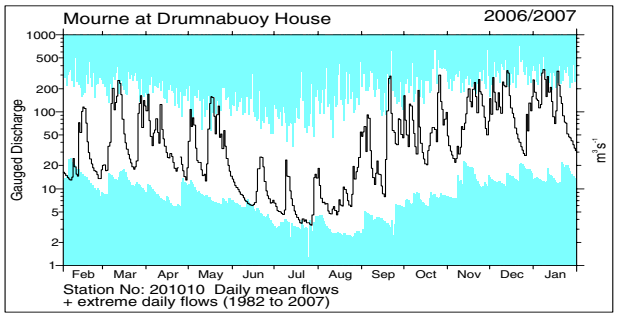
*Comparisons based on percentage flows alone can be misleading. A given percentage flow can represent extreme drought conditions in permeable catchments where flow patterns are relatively stable but be well within the normal range in impermeable catchments where the natural variation in flows is much greater. Note: the period of record on which these percentages are based varies from station to station. Percentages may be omitted where flows are under review.

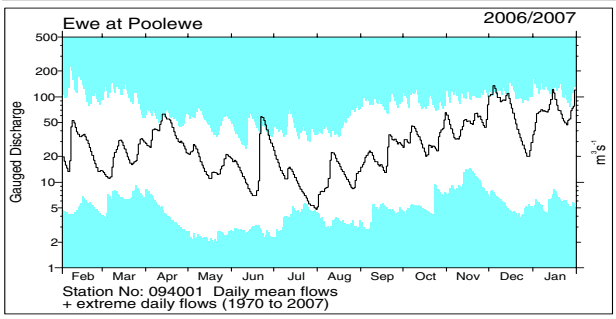
River flow . . . River flow . . .

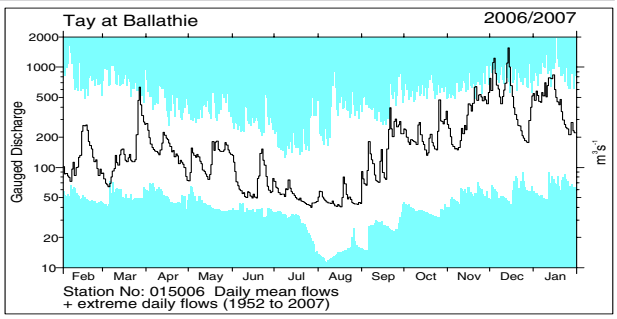


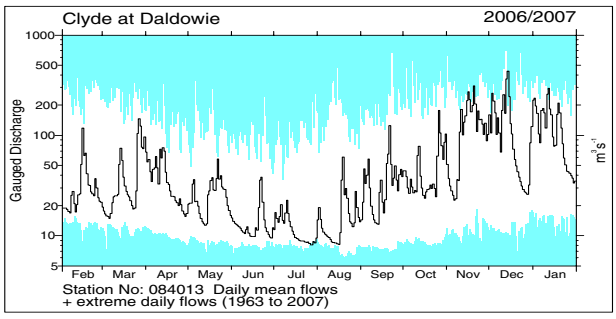


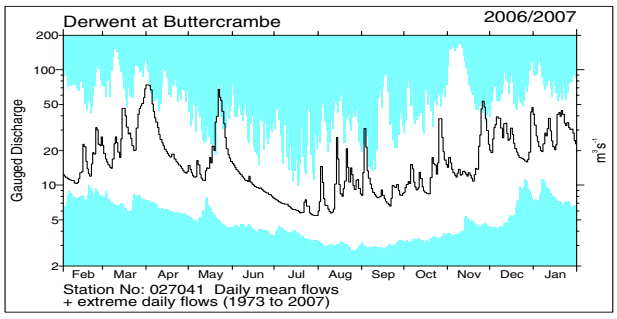


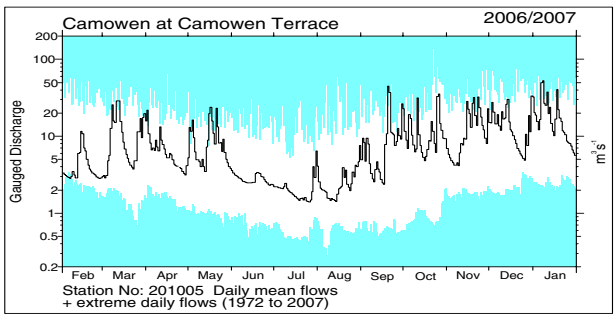


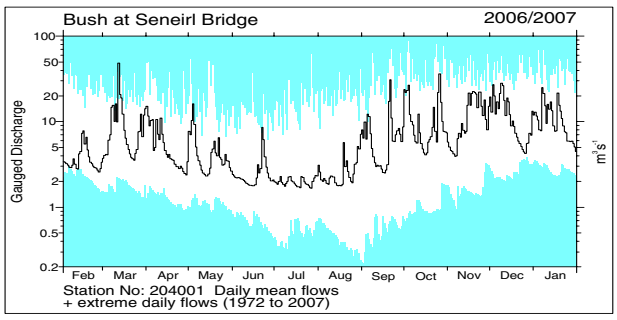








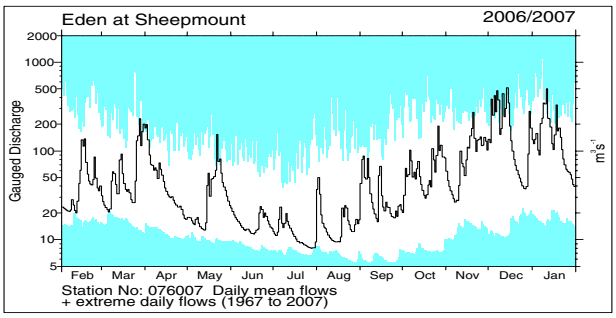


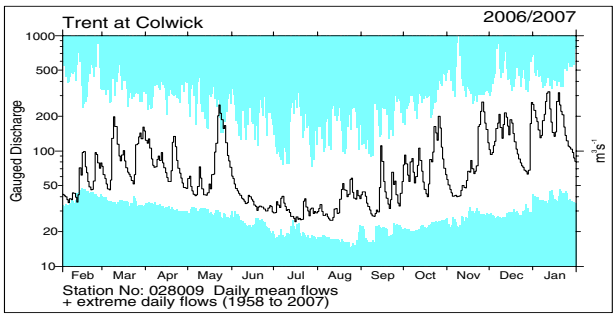


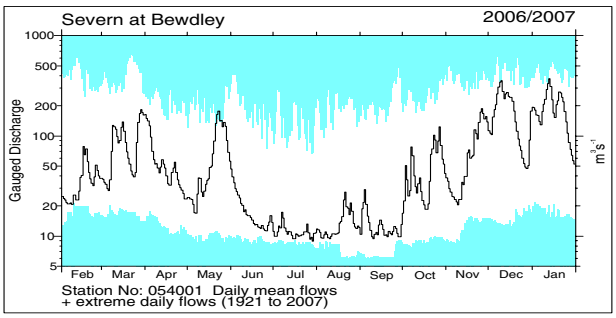
River flow hydrographs

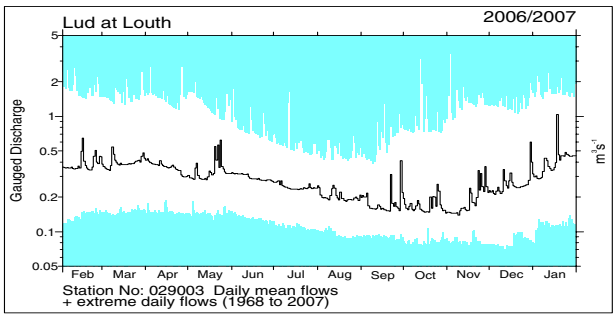
The river flow hydrographs show the daily mean flows together with the maximum and minimum daily flows prior to February 2006 (shown by the shaded areas). Daily flows falling outside the maximum/minimum range are indicated where the bold trace enters the shaded areas.

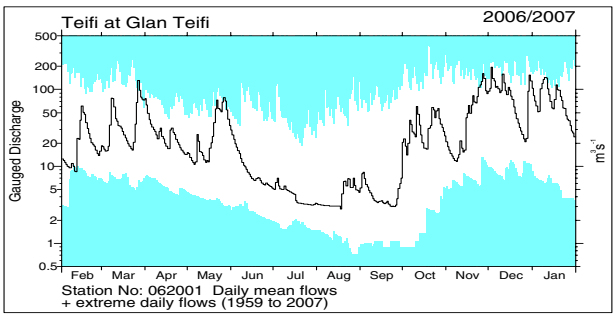
River flow . . . River flow . . .

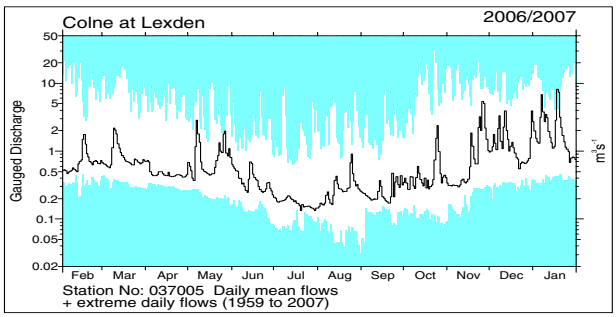


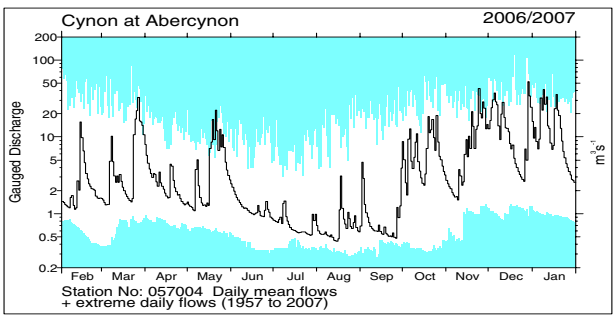


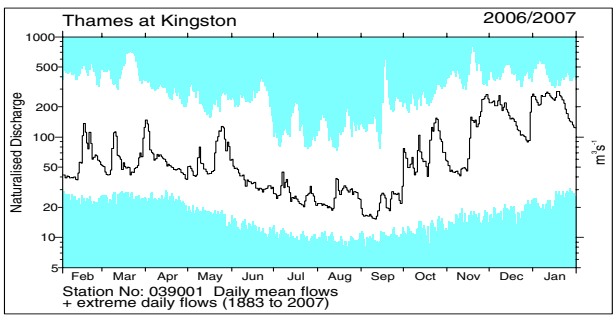


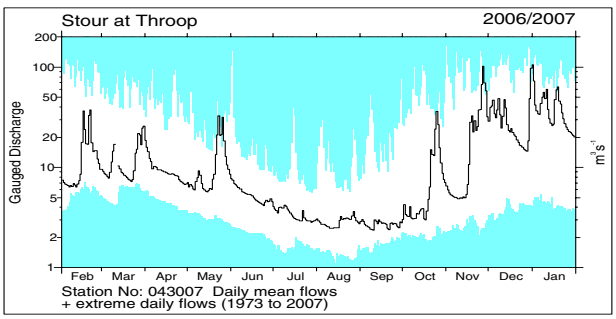


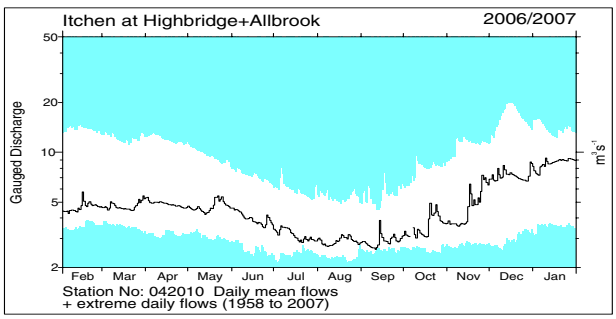










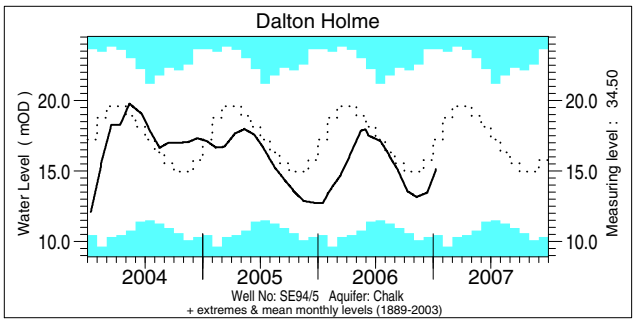


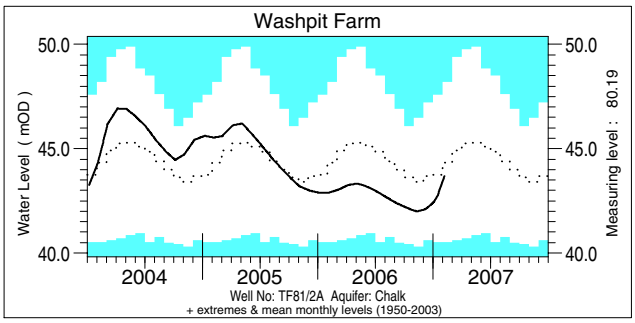
Notable runoff accumulations (a) November 2006 - January 2007, (b) November 2004 - January 2007

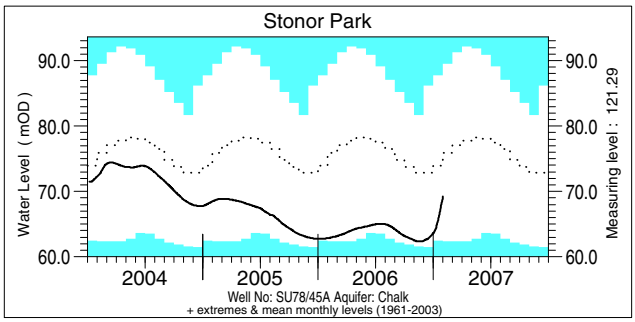
	River	%lta	Rank
a)	Spey (Boat o'Brig)	163	55/55
	Tay	186	55/55
	Earn	183	59/59
	Forth	168	26/26
	Tweed (Boleside)	171	46/46
	Cynon	175	49/49
	Tawe	158	48/48
	Dee (Manley Hall)	165	70/70
	Lune	164	45/45
	Eden	177	40/40
	Nith	165	50/50
	Clyde (Blairston)	177	47/47
	Leven (Linnbrane)	180	44/44
	Naver	159	30/30
	Camowen	142	34/34
b)	Ness	117	31/32
	Mimram	54	1/49
	Lambourn	63	1/43
	Medway	47	1/40
	Test	70	1/46
	Kenwyn	70	1/37
	Nevis	119	22/23

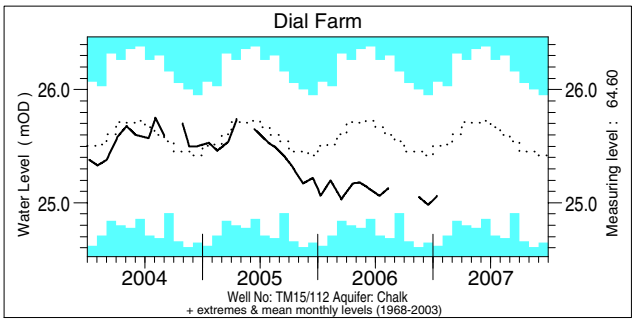
lta = long term average
Rank 1 = lowest on record

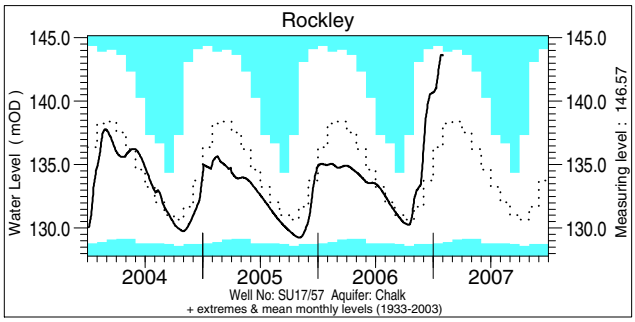
Groundwater . . . Groundwater

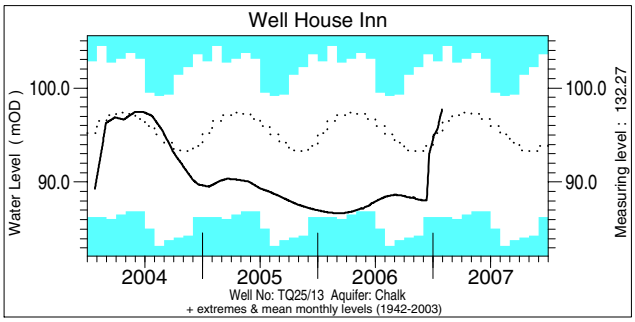


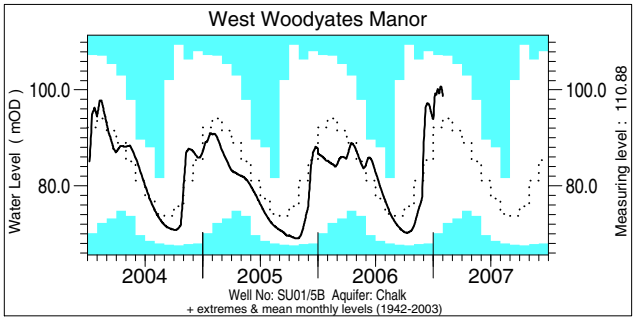


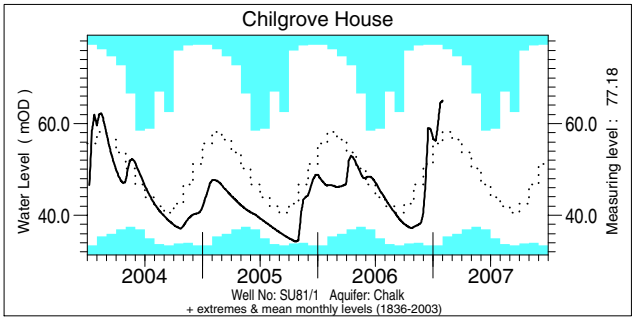


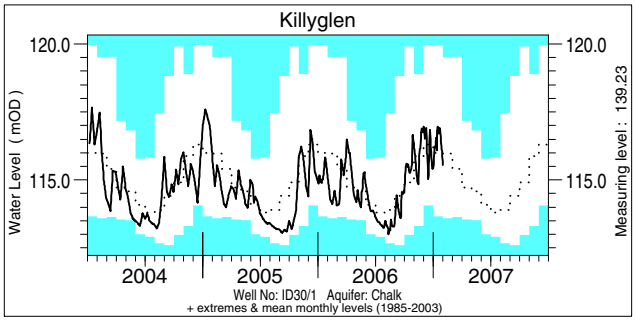


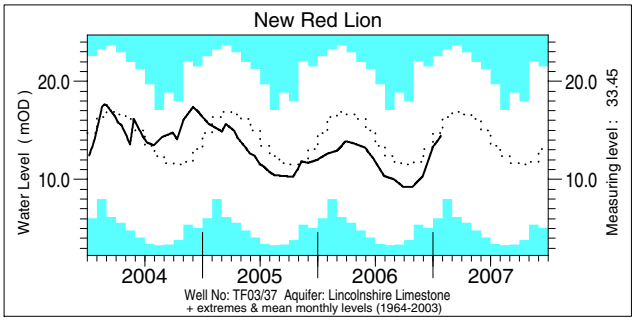






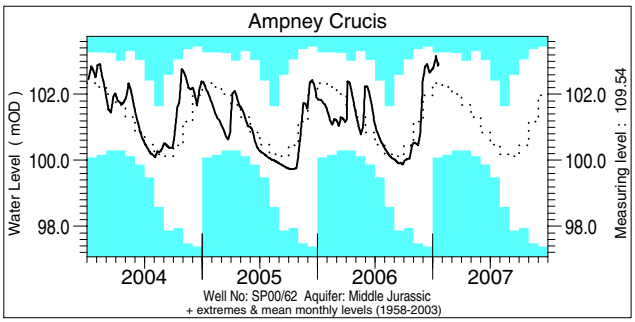


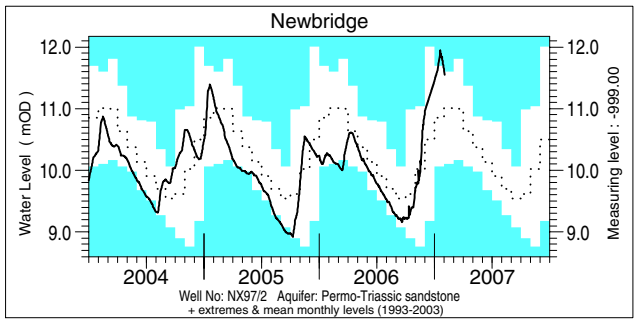


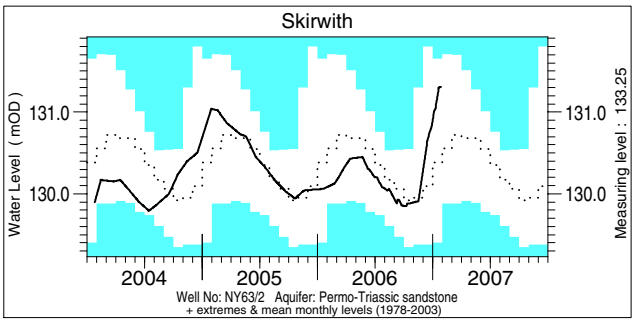


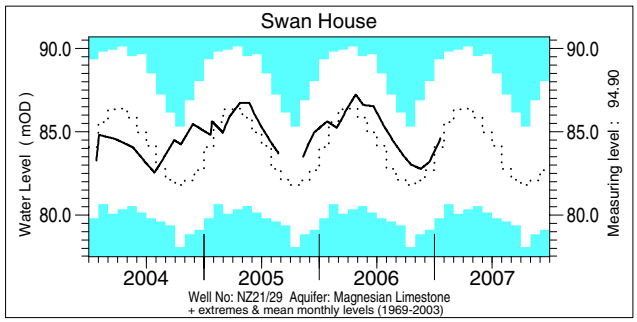
Groundwater levels normally rise and fall with the seasons, reaching a peak in the spring following replenishment through the winter (when evaporation losses are low and soil moist). They decline through the summer and early autumn. This seasonal variation is much reduced when the aquifer is confined below overlying impermeable strata. The monthly mean and the highest and lowest levels recorded for each month are displayed in a similar style to the river flow hydrographs. Note that most groundwater levels are not measured continuously – the latest recorded levels are listed overleaf.

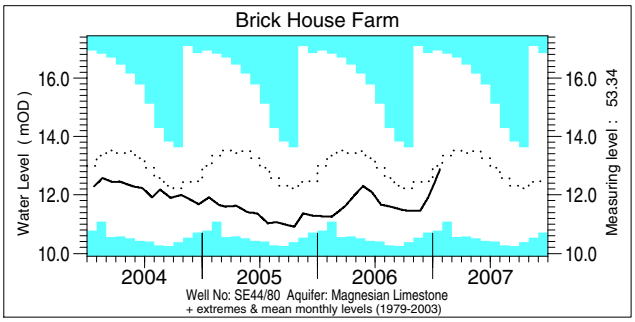
Groundwater . . . Groundwater

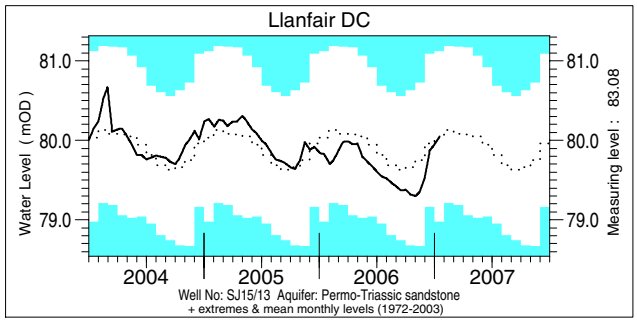


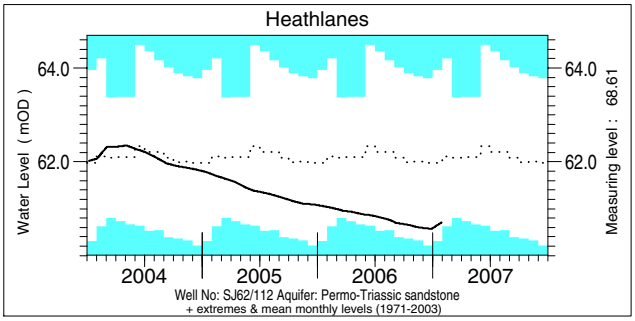


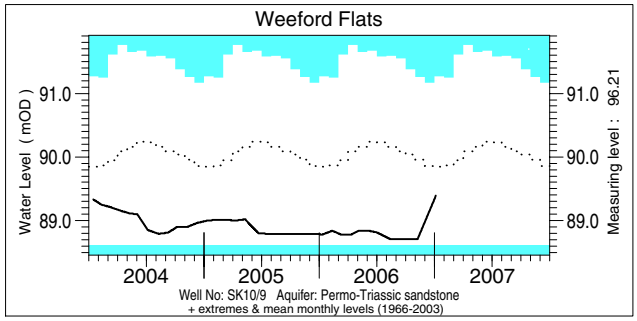


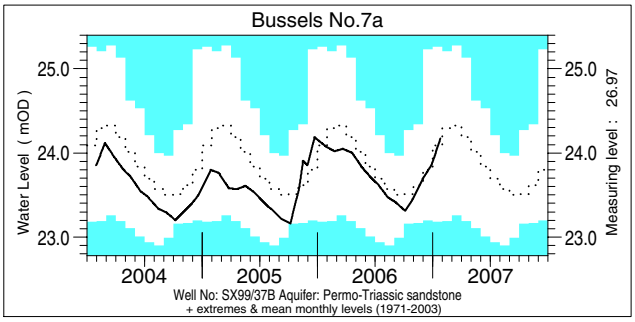


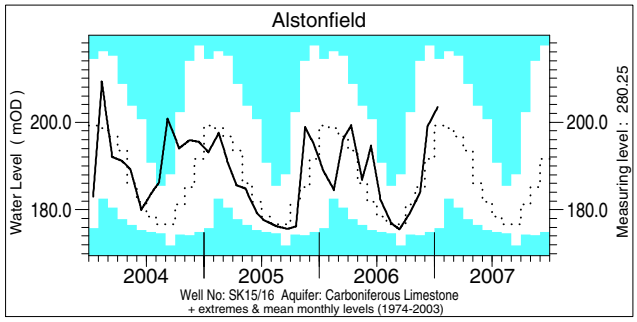










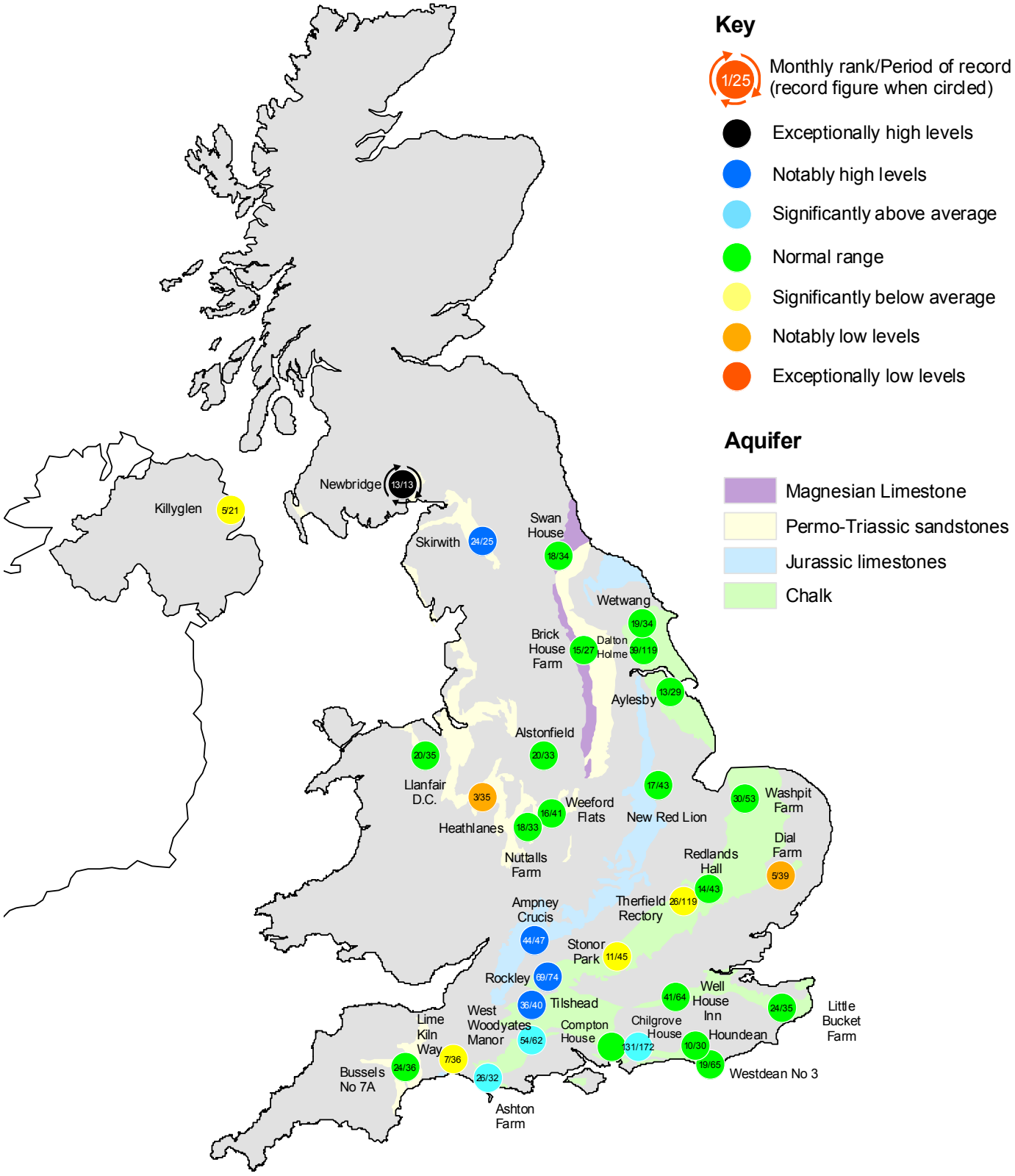


Groundwater levels January / February 2007

Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.	Borehole	Level	Date	Jan. av.
Dalton Holme	15.13	08/01	17.16	Chilgrove House	65.09	31/01	56.12	Brick House Farm	12.88	23/01	12.82
Washpit Farm	43.70	05/02	43.78	Killyglen	115.54	31/01	116.16	Llanfair DC	80.05	15/01	79.96
Stonor Park	69.27	31/01	73.42	New Red Lion	14.44	25/01	14.80	Heathlanes	60.71	28/01	61.94
Dial Farm	25.06	12/01	25.49	Ampney Crucis	102.94	19/01	102.32	Weeford Flats	89.39	03/01	89.65
Rockley	143.63	31/01	136.26	Newbridge	11.55	01/02	10.72	Bussels No.7a	24.17	24/01	24.12
Well House Inn	97.70	29/01	94.90	Skirwith	131.31	26/01	130.43	Alstonfield	203.47	09/01	198.49
West Woodyates	98.72	31/01	91.55	Swan House	84.59	18/01	84.28				

Levels in metres above Ordnance Datum

Groundwater . . .Groundwater



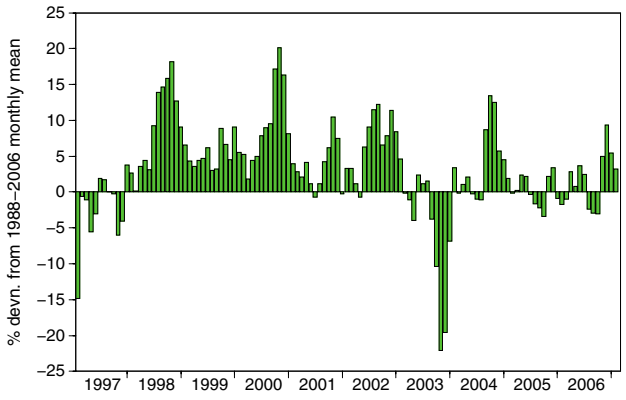
Groundwater levels - January 2007

The rankings are based on a comparison between the average level in the featured month (but often only single readings are available) and the average level in each corresponding month on record. They need to be interpreted with caution especially when groundwater levels are changing rapidly or when comparing wells with very different periods of record. Rankings may be omitted where they are considered misleading.

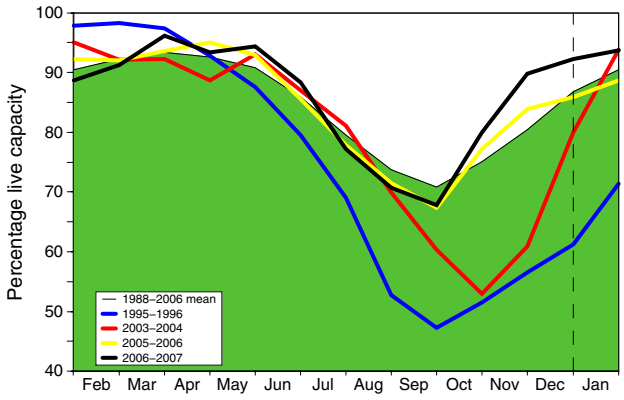
Notes: i. The outcrop areas are coloured according to British Geological Survey conventions.
ii. Yew Tree Farm levels are now received quarterly.
iii. Data for Nuttalls Farm are currently under review.

Reservoirs . . . Reservoirs . . .

Guide to the variation in overall reservoir stocks for England and Wales



Comparison between overall reservoir stocks for England and Wales in recent years



These plots are based on the England and Wales figures listed below.

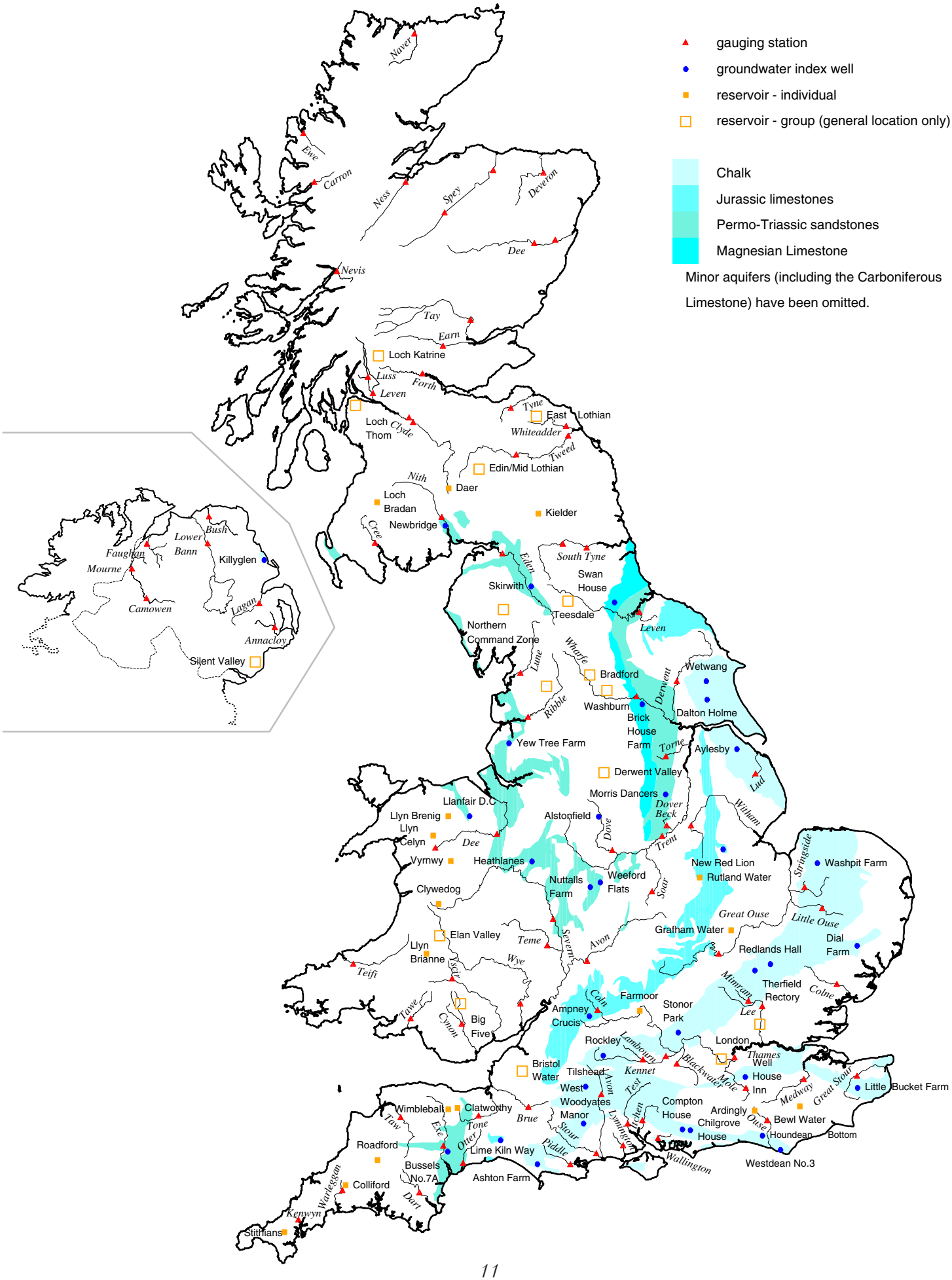
Percentage live capacity of selected reservoirs at start of month

Area	Reservoir	Capacity (Ml)	2006 Dec	Jan	2007 Feb	Feb Anom.	Min. Feb	Year* of min.	2006 Feb	Diff 07-06
North West	N Command Zone	• 124929	97	99	**96**	4	63	1996	89	7
	Vyrnwy	55146	95	99	**93**	2	45	1996	91	2
Northumbrian	Teesdale	• 87936	100	89	**86**	-6	51	1996	94	-8
	Kielder	(199175)	(94)	(92)	**(91)**	-3	(85)	1989	(93)	-2
Severn Trent	Clywedog	44922	82	83	**90**	3	62	1996	87	3
	Derwent Valley	• 39525	91	87	**100**	7	15	1996	93	7
Yorkshire	Washburn	• 22035	94	96	**96**	8	34	1996	85	11
	Bradford supply	• 41407	97	100	**98**	6	33	1996	82	16
Anglian	Grafham	(55490)	(88)	(93)	**(93)**	7	(67)	1998	(85)	8
	Rutland	(116580)	(75)	(88)	**(94)**	9	(68)	1997	(80)	14
Thames	London	• 202406	95	92	**95**	6	70	1997	92	3
	Farmoor	• 13822	84	100	**95**	3	72	2001	93	2
Southern	Bewl	28170	62	83	**100**	20	37	2006	37	63
	Ardingly	4685	88	100	**100**	8	65	2006	65	35
Wessex	Clatworthy	5364	70	100	**100**	5	62	1989	100	0
	Bristol WW	• (38666)	(69)	(87)	**(97)**	13	(58)	1992	(76)	21
South West	Colliford	28540	46	53	**61**	-21	52	1997	60	1
	Roadford	34500	61	70	**78**	-2	30	1996	69	9
	Wimbleball	21320	73	84	**100**	11	59	1997	84	16
	Stithians	5205	43	67	**85**	-2	38	1992	83	2
Welsh	Celyn and Brenig	• 131155	96	98	**98**	4	61	1996	96	2
	Brianne	62140	100	100	**97**	-1	84	1997	95	2
	Big Five	• 69762	89	96	**97**	4	67	1997	97	0
	Elan Valley	• 99106	100	100	**97**	0	73	1996	98	-1
Scotland(E)	Edinburgh/Mid Lothian	• 97639	93	100	**100**	7	72	1999	95	5
	East Lothian	• 10206	78	93	**100**	3	68	1990	100	0
Scotland(W)	Loch Katrine	• 111363	100	100	**94**	1	85	2000	94	0
	Daer	22412	100	98	**98**	-1	91	1997	100	-2
	Loch Thom	• 11840	97	97	**94**	-4	90	2004	100	-6
Northern Ireland	Total+	• 67270	90	90	**89**	0	75	2002	90	-1
	Silent Valley	• 20634	93	93	**91**	8	46	2002	94	-3

() figures in parentheses relate to gross storage • denotes reservoir groups +excludes Lough Neagh *last occurrence - see footnote

Details of the individual reservoirs in each of the groupings listed above are available on request. The percentages given in the Average and Minimum storage columns relate to the 1988-2006 period except for West of Scotland and Northern Ireland where data commence in the mid-1990's. In some gravity-fed reservoirs (e.g. Clywedog) stocks are kept below capacity during the winter to provide scope for flood attenuation purposes.

Location map . . . Location map



National Hydrological Monitoring Programme

The National Hydrological Monitoring Programme (NHMP) was instigated in 1988 and is undertaken jointly by the Centre for Ecology and Hydrology Wallingford (formerly the Institute of Hydrology - IH) and the British Geological Survey (BGS). Financial support for the production of the monthly Hydrological Summaries is provided by the Department for Environment, Food and Rural Affairs (Defra), the Environment Agency (EA), the Scottish Environment Protection Agency (SEPA), the Rivers Agency (RA) in Northern Ireland, and the Office of Water Services (OFWAT).

Data Sources

River flow and groundwater level data are provided by the Environment Agency, the Environment Agency Wales, the Scottish Environment Protection Agency and, for Northern Ireland, the Rivers Agency and the Department of the Environment (NI). In all cases the data are subject to revision following validation (flood and drought data in particular may be subject to significant revision).
Reservoir level information is provided by the Water Service Companies, the EA, Scottish Water and the Northern Ireland Water Service.

The National River Flow Archive (maintained by CEH Wallingford) and the National Groundwater Level Archive (maintained by BGS) provide the historical perspective within which to examine contemporary hydrological conditions.

Rainfall

Most rainfall data are provided by the Met Office (see opposite). To allow better spatial differentiation the rainfall data for Britain are presented for the regional divisions of the precursor organisations of the EA and SEPA. Following the discontinuation of the Met Office's CARP system in July 1998, the areal rainfall figures have been derived using several procedures, including initial estimates based on MORECS*. Recent figures have been produced by the Met Office, National Climate Information Centre (NCIC), using a technique similar to CARP. A significant number of additional monthly raingauge totals are provided by the EA and SEPA to help derive the contemporary regional rainfalls. Revised monthly national and regional rainfall totals for the post-1960 period (together with revised 1961-90 averages) were made available by the Met Office in 2004; these have been adopted by the NHMP. As with all regional figures based on limited raingauge networks the monthly tables and accumulations (and the return periods associated with them) should be regarded as a guide only.

NATURAL ENVIRONMENT RESEARCH COUNCIL

The monthly rainfall figures are provided by the Met Office (National Climate Information Centre) and are Crown Copyright and may not be passed on to, or published by, any unauthorised person or organisation.

*MORECS is the generic name for the Met Office services involving the routine calculation of evaporation and soil moisture throughout Great Britain.

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The National Hydrological Monitoring Programme depends on the active cooperation of many data suppliers. This cooperation is gratefully acknowledged.

Subscription

Subscription to the Hydrological Summaries costs £48 per year. Orders should be addressed to:

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Selected text and maps are available on the WWW at
http://www.nerc-wallingford.ac.uk/ih/nrfa/index.htm
Navigate via Water Watch

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02/07