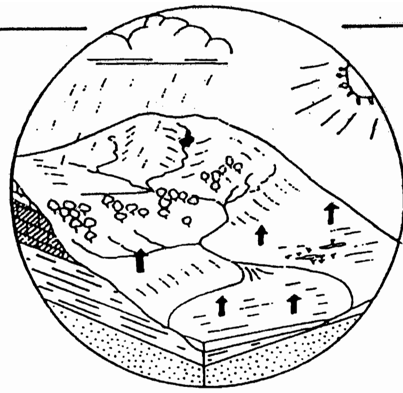
Hydrological Summary for Great Britain



FEBRUARY 1992

Rainfall

Over 85% of average for Britain as a whole but again very dry in much of the English lowlands - large areas experienced their seventh successive month with below average rainfall. The England and Wales rainfall for the two years ending in February is the lowest in a series from 1767. The meteorological drought is exceptionally severe in parts of eastern and southern England.

River flows

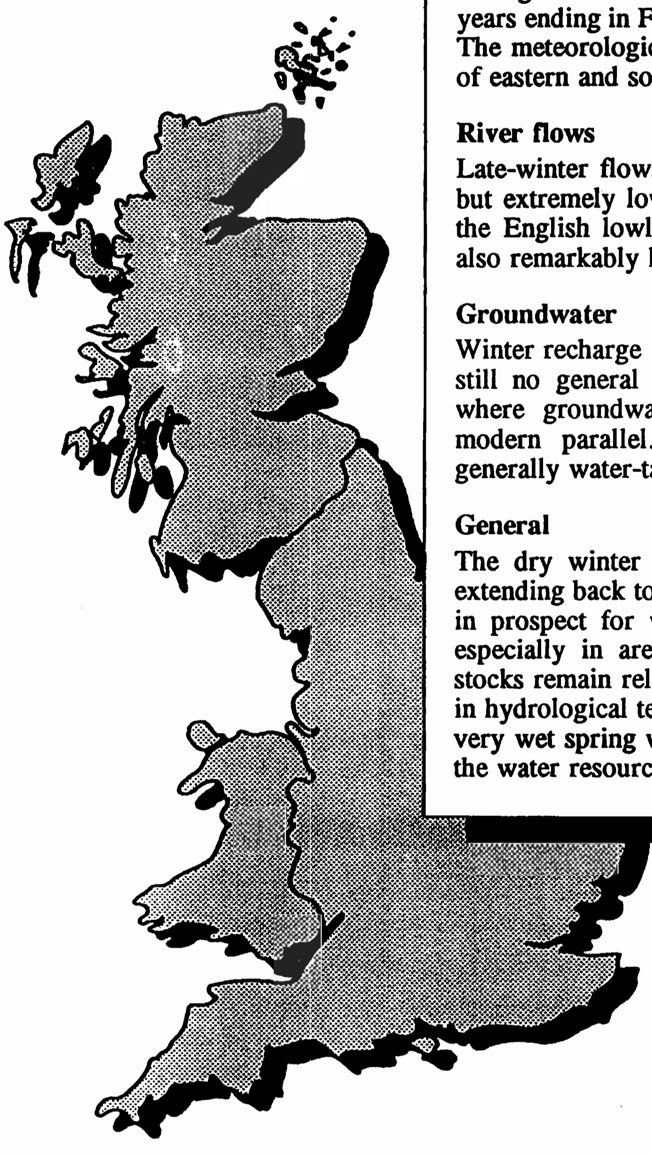
Late-winter flows were above average in western Scotland but extremely low - often unprecedented for February - in the English lowlands where accumulated runoff totals are also remarkably low.

Groundwater

Winter recharge thus far has been very limited and there is still no general recovery underway in the eastern Chalk where groundwater levels (for the winter) are without modern parallel. Conditions improve to the west but generally water-tables are notably depressed.

General

The dry winter allied to a long term rainfall deficiency extending back to the spring of 1988, signals a difficult year in prospect for water resources in the English lowlands, especially in areas dependent on groundwater. Reservoir stocks remain relatively healthy, but the drought is extreme in hydrological terms from Humberside to Hertfordshire. A very wet spring will be essential to allay concern regarding the water resources outlook.



Institute of Hydrology

British Geological Survey

Institute of Hydrology / British Geological Survey
Maclean Building
Crowmarsh Gifford
Wallingford
Oxfordshire
OX10 8BB

HYDROLOGICAL SUMMARY FOR GREAT BRITAIN - FEBRUARY 1992

Data for this report have been provided principally by the regional divisions of the National Rivers Authority in England and Wales, the River Purification Boards in Scotland and by the Meteorological Office. Reservoir contents information has been supplied by the Water Services Companies, the NRA or, in Scotland, the Lothians Regional Council. The most recent areal rainfall figures are derived from a restricted network of raingauges (particularly in Scotland) and a proportion of the river flow data is of a provisional nature.

A map (Figure 4) is provided to assist in the location of the principal monitoring sites.

Rainfall

High pressure dominated weather patterns over Britain for much of February with rain-bearing low pressure systems generally following a more northerly track than is typical for late winter. Although unusual in relation to average conditions, the rainfall pattern was one that has become very familiar in recent years, the accentuation of the normal north-west to south-east rainfall gradient across the country - evident to an exaggerated extent in February - provides the backcloth to the exceptionally protracted drought in the English lowlands.

Despite a damp complexion to the weather, and several wet interludes in the west, rainfall totals were below average throughout most of England and Wales. The few frontal systems that did penetrate to the eastern seaboard produced only light, patchy rainfall and many districts in eastern and central southern England were notably dry; some areas in East Anglia registered less than a quarter of the February average. In contrast, parts of western Scotland recorded more than twice the monthly average. Thus, the effect of the February rainfall was to further intensify the lowland drought and to emphasise its regional character.

Provisional data indicate that the 1991/92 winter (Dec.-Feb.) is the third driest this century for England and Wales (after 1963/64 and 1933/34). Some parts of central southern England have been especially dry, Wokingham (Berkshire), for example, reported its lowest winter rainfall total in a 110-year record. For the seven months beginning in August 1991, the accumulated rainfall total for England and Wales is the lowest this century and, more remarkably, the two-year rainfall total (from March 1990) is without precedent in the full series from 1767. Considering accumulations over ANY 24-month sequences, only in 1932-34 have similar nationwide rainfall totals been recorded this century; marginally drier conditions also occurred in the 1850s and, more conjecturally, in the 1780s.

The medium term rainfall deficiencies are most marked in the lowlands where, over large areas, rainfall has been below average in each of the last seven months and drought conditions now extend up to four years. In parts of eastern England, 1990 and 1991 both rank among the three driest years this century and some districts in East Anglia have recorded only three or four months with above average rainfall since February 1990. In some parts of the English lowlands, accumulated deficiencies since the summer of 1988 are the equivalent of a full year's rainfall. Rainfall deficiencies in the two-, three-, and four-year timeframes are the highest or close to the highest this century over much of eastern England. In the Thames Valley for instance, rainfall accumulations for the two- and four-year periods ending in February are unparalleled in a record from 1883.

When associated with the remarkably high rates of evaporation loss which have characterised most of the post-1988 period, droughts of such a magnitude inevitably produce considerable water resources and environmental stress.

Evaporation and Soil Moisture Deficits

February was a mild, dull month in most regions. Evaporation rates were within the normal range for the month and for the winter period also - December 1991 to February 1992 losses being appreciably below those registered in 1988/89 and 1989/90.

Soils are at, or very close to, field capacity throughout the whole of Britain with the notable exception of parts of East Anglia, the South-East and a few localities close to the eastern seaboard. In a few areas SMDs actually increased over the month - very unusual for February - and by month-end deficits exceeded 40 mm in and around London. Close to the Thames Estuary end of winter deficits (for grass) were twice the previous highest in the 31-year MORECS series. In such areas there is a rapidly decreasing liklihood of any aquifer recharge this winter. To the west and north prospects are considerably better but heavily dependant on rainfall over the next eight weeks or so.

Runoff

Above-average runoff totals in February were largely confined to western Scotland (discharge increased towards month-end in other western catchments). Elsewhere, flows generally declined from the modest January rates and remain extremely low in many lowland rivers, typically 30-40% of the long term average. New minimum February runoff totals were established over wide areas - from the Dee to the Itchen - and were particularly common for gauging stations commissioned since the early 1960s (which featured several dry winters).

Following a short-lived upturn in flow rates in the autumn, monthly runoff totals have remained notably stable in many lowland rivers (see, for example, the Itchen and the Mimram). At the winter/spring transition the lack of any real recovery has resulted in very low flows from Yorkshire to Wessex, especially in groundwater-fed rivers. The depressed nature of river flows in the east is perhaps best exemplified on the River Lee - runoff totals for each of the winter months fell below the previous monthly minimum in a 109-year record.

Those index catchments registering new minimum winter runoff totals (the Itchen, Mimram, Little Ouse and Derwent - see Table 3) broadly identify the region where runoff rates are currently most depressed. Notably modest winter runoff totals were also recorded in the Midlands, north Wales and eastern Scotland but the very protracted nature of the drought is most evident in the English lowlands where winter runoff was typically only around one-third of the average. Medium and long term runoff totals are also exceptionally low. The average flow over the last eight months on the Mimram and the Little Ouse, for instance, are comfortably below any eight-month mean prior to 1991 - a telling index of drought severity given that the 1992 recession may be expected to begin soon. For the Little Ouse catchment, which is close to the zone of maximum drought intensity, average winter runoff over the last four years has been less than half that of the preceding decade. As a consequence, the spring recessions have commenced at successively lower flow rates and since the spring of 1990 runoff has remained close to the long term minimum. Without very exceptional spring rainfall this year, many of these minima will be superseded in 1992.

The importance of the healthy replenishment to many reservoirs in November 1991 may now be readily appreciated. Net inflows over the winter have been limited (but pumped augmentation has been substantial in some areas). Nonetheless stocks remain relatively healthy in most regions and concern is restricted to a few smaller impoundments. Generally, reservoir storages are similar to stocks at the same time in 1991.

Groundwater

Proportionally, the shortfall in groundwater replenishment since early 1988 is very much greater than that for rainfall. In the eastern lowlands, four successive years with modest recharge, separated by very extended groundwater level recessions, have produced remarkably depressed levels. This is particularly true of the Chalk aquifer from Hertfordshire to Humberside where accumulated recharge over the last four winters is generally less than 50% of the long term average; there is no modern parallel for such a shortfall.

Generally, the groundwater situation deteriorated further in February: infiltration in most districts within England and Wales varied from very modest to none at all. In terms of recharge, much of the eastern Chalk has received less than 10% of the mean annual recharge over the winter thus far. Throughout large parts of the Midlands, north Wales and southern England recharge has been less than 20% and, generally, the long-awaited recovery of water levels has still not taken place.

In those areas of eastern England so far most affected, the decline in groundwater levels has generally been arrested but any spring recovery will need to be generated from an exceptionally low base. During February, the lowest levels ever recorded were measured at Wetwang (in a 21-year record), Dalton Holme (102 years), Washpit Farm (41 years) and Redlands Hall (27 years). The lowest levels in any February were recorded at Little Brocklesby (in a 65-year record), Fairfields (17 years), the Holt (27 years) Alstonfield (17 years) and Llanfair DC (19 years). The well at Therfield Rectory remains dry for the first time since 1923; in a record from 1883 the only protracted dry sequence occurred in 1902/03. In the Permo-Triassic sandstones of the Midlands, the Weeford Flats borehole is still dry and levels at Morris Dancers are below those registered at the corresponding time in 1976. Remarkable as many of the current levels are it should be noted that, commonly, they are only modestly below the spring 1991 levels and often only a couple of metres outside the normal range.

Only in the western part of southern England do water levels appear to be near to their seasonal norm. Even here, where significant winter recharge has taken place, water-tables have again started to fall (see, for instance, the hydrographs for Bussels and West Woodyates). For north-west England, where the February rainfall exceeded the long-term monthly mean, a significant rise in the water-table may be expected although there is a lack of available information at present to demonstrate this.

Throughout a substantial proportion of the Chalk, the equivalent of around two years average recharge would be required over the next couple of months to restore levels to their normal late-spring range. Sharp recoveries in levels have occurred, most notably 1976 and (in some areas) in 1990 but around twice the average rainfall will be necessary to return levels to above the corresponding 1991 level. If sustained heavy rainfall does not take place through March and into April, the summer recession over a large part of England may be expected to start at unprecedentedly low levels. By the end of the summer of 1992, water tables in the eastern Chalk aquifers may well have fallen to levels appreciably below any yet recorded. The outlook for groundwater resources is thus fragile (especially in relation to private supplies, many of which are obtained from shallow wells).

Institute of Hydrology/British Geological Survey
11 March 1992

TABLE 1 1991/92 RAINFALL AS A PERCENTAGE OF THE 1941-70 AVERAGE

		Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec 1991	Jan 1992	Feb
England and	mm	65	75	69	14	90	68	31	62	75	90	49	47	42
Wales	%	100	127	119	21	148	93	34	75	90	92	54	55	64
NRA REGIONS														
North West	mm	94	110	67	18	105	67	65	68	111	152	118	54	97
	%	116	153	87	22	127	65	52	55	94	126	98	48	120
Northumbria	mm	113	85	41	22	69	53	37	42	75	105	78	32	68
	%	171	163	75	34	113	69	37	53	100	112	104	30	103
Severn-Trent	mm	43	59	67	11	74	77	21	55	54	69	39	58	31
	%	81	113	129	17	132	118	26	82	83	87	56	84	58
Yorkshire	mm	88	63	49	14	73	36	21	40	63	93	61	46	42
	%	138	119	88	23	126	51	23	56	91	104	82	60	65
Anglian	mm	39	29	45	13	77	38	18	62	26	53	23	45	17
	%	93	73	113	28	157	67	28	119	50	85	44	86	39
Thames	mm	38	45	63	13	96	79	19	52	36	66	16	28	22
	%	81	98	137	23	185	132	27	84	56	90	25	45	47
Southern	mm	39	59	56	17	125	88	15	50	51	81	23	18	30
	%	68	113	117	31	250	149	21	70	65	86	28	24	52
Wessex	mm	40	81	72	10	107	73	19	70	84	71	30	36	34
	%	68	140	133	15	198	118	23	89	102	73	33	43	57
South West	mm	82	127	100	9	127	90	32	84	123	112	52	44	64
	%	91	151	141	11	195	107	32	81	109	84	39	34	71
Welsh	mm	94	127	124	15	111	97	54	85	153	138	67	75	75
	%	98	146	144	16	135	102	45	68	119	97	46	55	78
Scotland	mm	83	127	123	41	122	91	67	129	162	222	143	132	136
	%	80	138	137	45	133	81	52	94	109	156	92	96	131
RIVER PURIFICATION BOARDS														
Highland	mm	71	141	131	63	125	105	86	181	191	294	173	180	209
	%	53	124	115	61	114	83	58	115	103	174	88	110	157
North-East	mm	77	81	62	46	131	57	34	57	116	129	50	67	58
	%	104	131	102	60	187	62	32	66	120	125	49	74	78
Tay	mm	90	117	110	23	135	93	41	108	146	147	91	109	93
	%	98	143	147	24	163	91	35	94	120	124	68	92	101
Forth	mm	86	103	90	18	110	97	38	99	109	112	109	108	90
	%	112	149	132	21	147	99	33	92	103	104	100	109	117
Tweed	mm	102	93	62	21	90	65	36	66	99	120	90	67	80
	%	148	160	102	28	132	73	32	71	113	115	100	72	116
Solway	mm	108	150	148	17	122	77	69	79	175	198	157	89	166
	%	116	165	168	18	136	70	53	52	122	137	104	64	178
Clyde	mm	90	156	184	33	129	108	87	157	190	274	209	165	185
	%	80	149	179	34	125	83	61	90	104	164	112	102	164

Note: The most recent monthly rainfall figures for England and Wales correspond to the MORECS areal assessments derived by the Meteorological Office; for the Scottish RPBs the February 1992 totals were estimated from the isohyetal map provided with the MORECS bulletin. The regional areal rainfall figures are regularly updated (normally one or two months in arrears) using figures derived from a far denser raingauge network.

TABLE 2 RAINFALL RETURN PERIOD ESTIMATES

		Dec 91 - Feb 92	Est Return Period, years	Aug 91-Feb 92	Est Return Period, years	Mar 90 - Feb 92	Est Return Period, years	Aug 88 - Feb 92	Est Return Period, years
England and	mm	138		396		1434		2849	
Wales ▲	% LTA	57	20-35	67	40-60	79	80-120	86	40-60
NRA REGIONS									
North West	mm	269		665		2090		4078	
	% LTA	86	2-5	83	5-10	86	10-20	92	5-10
Northumbria	mm	178		437		1521		2739	
	% LTA	80	2-5	77	5-15	87	5-15	85	40-60
Severn Trent	mm	128		327		1207		2394	
	% LTA	67	5-10	68	20-35	78	60-80	85	30-45
Yorkshire	mm	149		366		1306		2535	
	% LTA	69	5-10	68	20-35	78	70-90	84	50-70
Anglian	mm	85		244		874		1730	
	% LTA	57	10-20	65	30-45	72	>200	78	>200
Thames	mm	66		239		1000		2061	
	% LTA	38	70-90	54	110-140	71	>200	81	70-110
Southern	mm	71		268		1192		2344	
	% LTA	33	110-150	50	>200	75	80-120	80	100-130
Wessex	mm	100		344		1295		2675	
	% LTA	43	40-60	60	40-60	74	100-130	84	30-45
South West	mm	160		511		1941		3944	
	% LTA	45	40-60	63	40-60	81	25-40	90	5-15
Welsh	mm	217		647		2212		4465	
	% LTA	58	15-25	72	15-25	83	20-30	91	5-10
Scotland	mm	411		991		3103		5880	
	% LTA	104	2-5	104	2-5	108	5-10	112	40-50
RIVER PURIFICATION BOARDS									
Highland	mm	562		1314		3862		7501	
	% LTA	114	2-5	114	5-10	112	10-20	119	>200
North-East	mm	175		511		1835		3298	
	% LTA	66	10-20	77	10-20	90	5-10	88	25-40
Tay	mm	293		735		2444		4809	
	% LTA	85	2-5	90	2-5	97	2-5	105	2-5
Forth	mm	307		665		2253		4294	
	% LTA	108	2-5	92	2-5	101	2-5	105	2-5
Tweed	mm	237		558		1861		3402	
	% LTA	94	2-5	86	2-5	94	2-5	93	5-10
Solway	mm	412		933		2786		5387	
	% LTA	107	2-5	98	2-5	98	2-5	103	2-5
Clyde	mm	559		1267		3727		7180	
	% LTA	122	5-10	112	2-5	111	5-15	117	160-200

▲ Historical rainfall data based on the homogenised series derived by the University of East Anglia (CRU).
Return period assessments are based on tables provided by the Meteorological Office*. These assume a start in a specified month; return periods for a start in any month may be expected to be an order of magnitude less. "Wet" return periods underlined.
The tables reflect rainfall totals over the period 1911-70 only and the estimate assumes a sensibly stable climate.

* Tabony, R.C., 1977, The Variability of long duration rainfall over Great Britain, Scientific Paper No. 37, Meteorological Office (HMSO).

FIGURE 1. MONTHLY RAINFALL FOR 1990-1992 AS A PERCENTAGE OF THE 1941-1970 AVERAGE

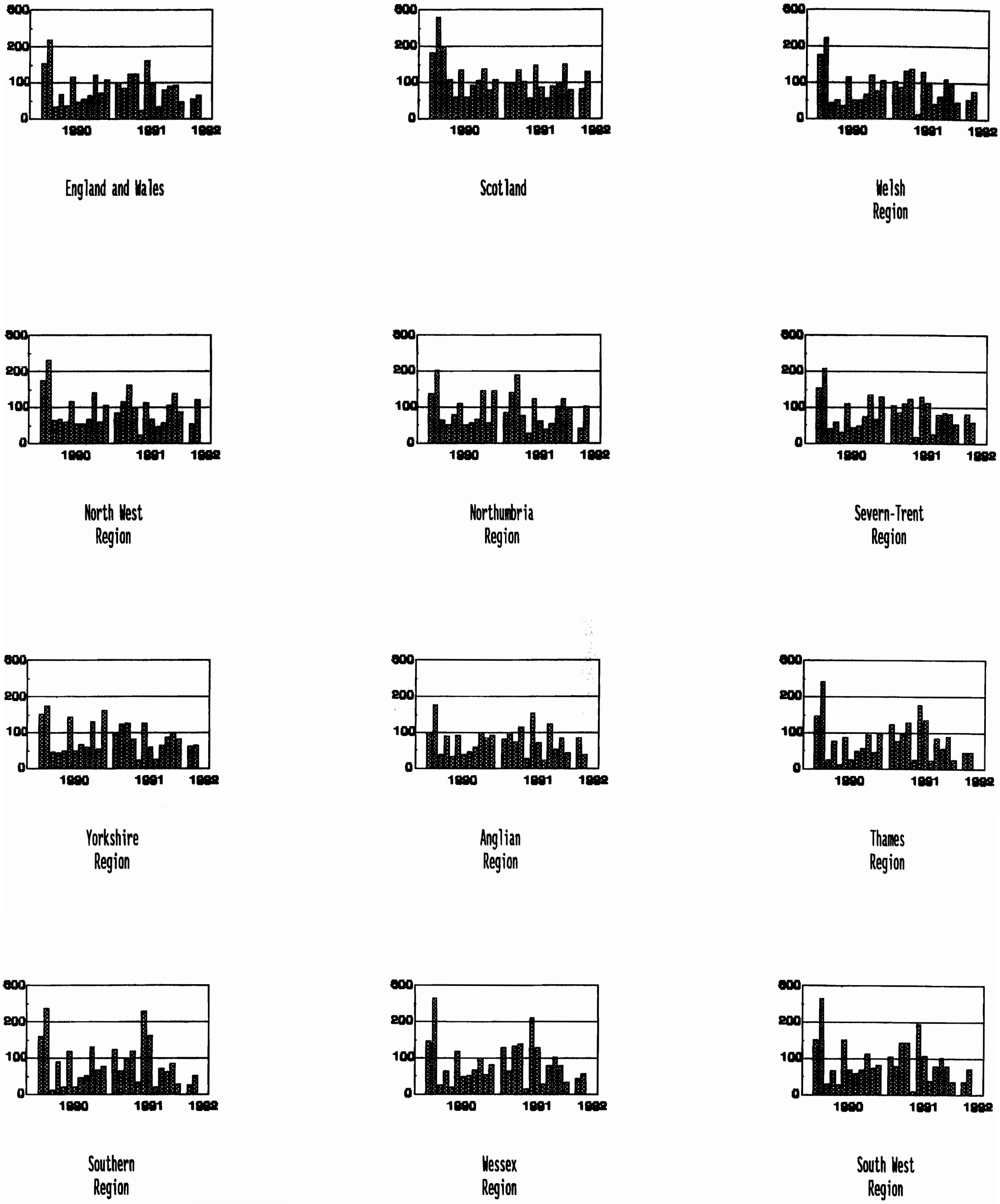
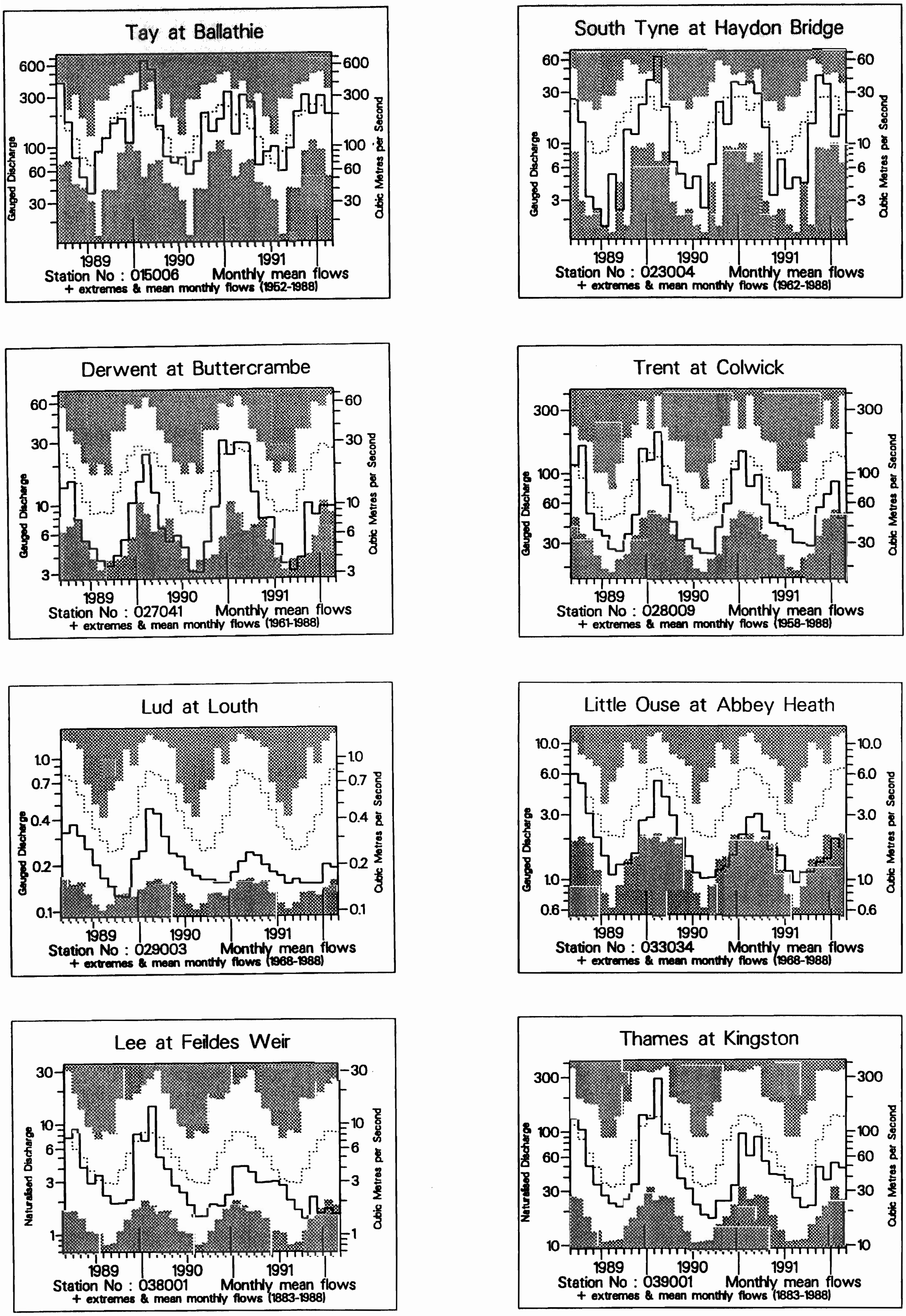
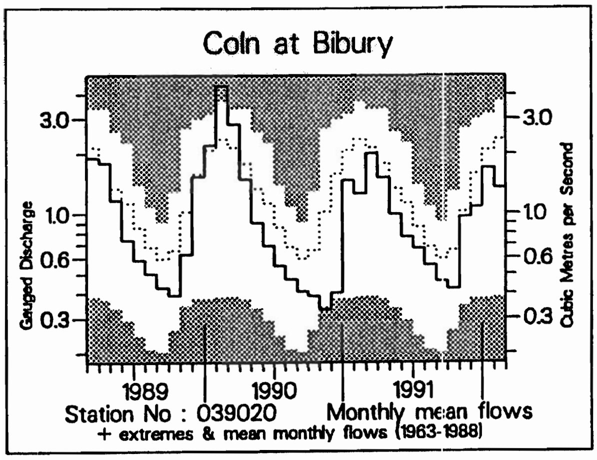
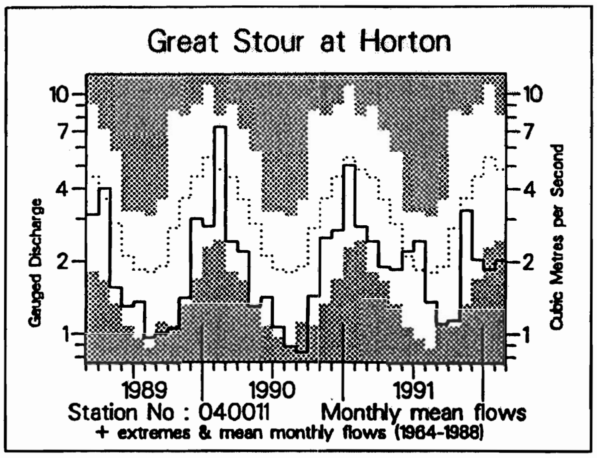
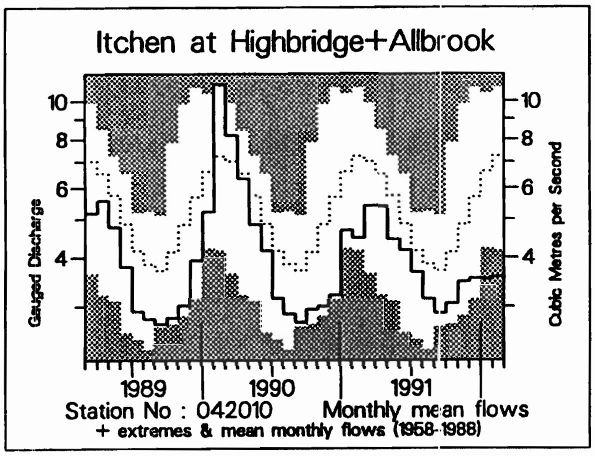


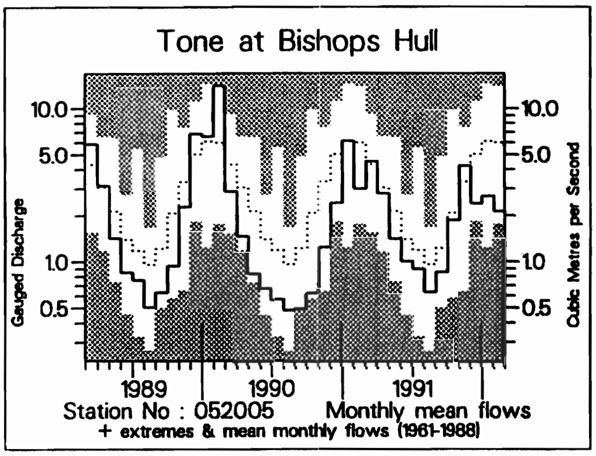
FIGURE 2 RIVER FLOW HYDROGRAPHS

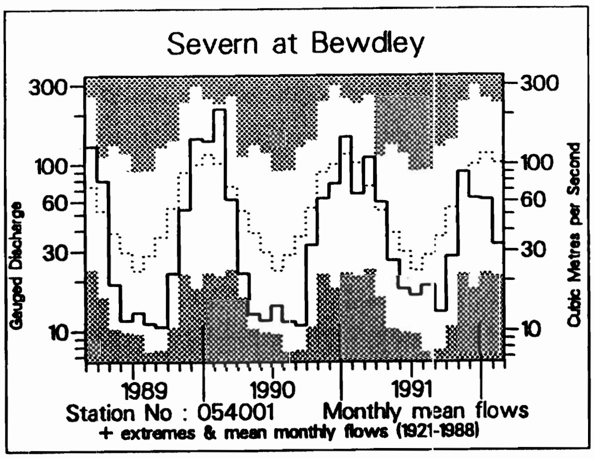


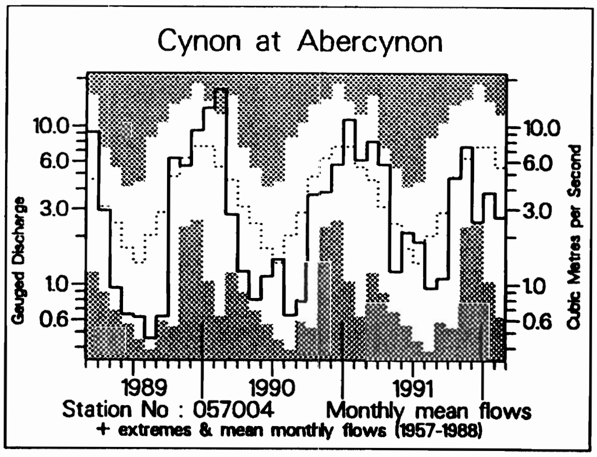

Coln at Bibury
3.0
1.0
0.6
0.3
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
Station No : 039020
Monthly mean flows
+ extremes & mean monthly flows (1963-1988)

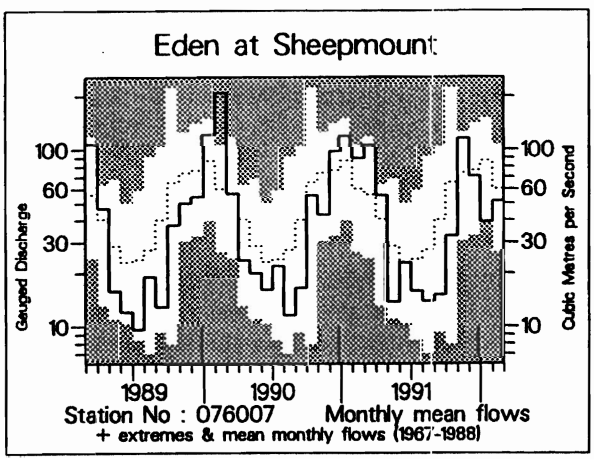

Great Stour at Horton
10
7
4
2
1
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
Station No : 040011
Monthly mean flows
+ extremes & mean monthly flows (1964-1988)


Itchen at Highbridge+Allbrook
10
8
6
4
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
Station No : 042010
Monthly mean flows
+ extremes & mean monthly flows (1958-1988)


Tone at Bishops Hull
10.0
5.0
1.0
0.5
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
Station No : 052005
Monthly mean flows
+ extremes & mean monthly flows (1961-1988)


Severn at Bewdley
300
100
60
30
10
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
Station No : 054001
Monthly mean flows
+ extremes & mean monthly flows (1921-1988)


Cynon at Abercynon
10.0
6.0
3.0
1.0
0.6
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
Station No : 057004
Monthly mean flows
+ extremes & mean monthly flows (1957-1988)


Eden at Sheepmount
100
60
30
10
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
Station No : 076007
Monthly mean flows
+ extremes & mean monthly flows (1967-1988)

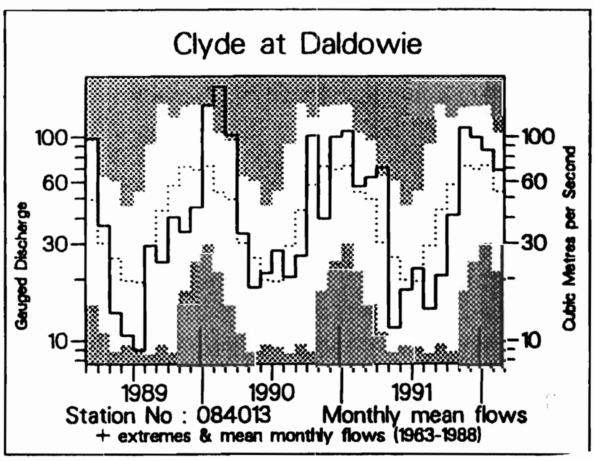

Clyde at Daldowie
100
60
30
10
Gauged Discharge
Cubic Metres per Second
1989
1990
1991
Station No : 084013
Monthly mean flows
+ extremes & mean monthly flows (1963-1988)

TABLE 3 RUNOFF AS MM. AND AS A PERCENTAGE OF THE PERIOD OF RECORD AVERAGE WITH SELECTED PERIODS RANKED IN THE RECORD

River/ Station name	Oct	Nov	Dec	Jan	Feb		12/91 to 2/92		5/91 to 2/92		5/90 to 2/92		5/89 to 2/92	
		1991		1992	1992									
	mm %LT	mm %LT	mm %LT	mm %LT	mm %LT	rank /yrs	mm %LT	rank /yrs	mm %LT	rank /yrs	mm %LT	rank /yrs	mm %LT	rank /yrs
Dee at	70	122	44	61	38	3	142	1	506	4	1214	4	1840	1
Park	87	165	50	67	51	/20	58	/20	83	/19	87	/18	83	/17
Tay at	124	173	118	176	111	24	406	22	940	23	2051	21	3504	29
Ballathie	111	145	84	124	96	/40	102	/40	103	/39	100	/38	111	/37
Whiteadder Water at	9	35	30	38	21	4	89	4	178	5	623	7	801	4
Hutton Castle	32	94	66	65	43	/23	59	/23	59	/22	89	/21	73	/20
South Tyne at	55	148	125	41	62	15	232	11	518	4	1282	8	1959	6
Haydon Bridge	79	165	128	42	85	/30	86	/30	83	/28	92	/26	91	/24
Wharfe at	36	117	91	61	49	13	201	7	438	3	1078	4	1665	2
Flint Mill Weir	56	149	94	62	64	/37	74	/37	74	/36	82	/35	82	/34
Derwent at	7	17	14	16	15	3	45	1	114	1	383	3	553	1
Buttercrambe	34	60	35	35	38	/31	37	/31	45	/30	65	/29	60	/28
Trent at	10	19	25	31	16	1	72	4	165	2	423	1	727	1
Colwick	43	63	56	62	37	/34	53	/34	59	/33	66	/32	73	/31
Lud at	7	7	7	10	9	2	26	3	81	1	191	1	335	1
Louth	58	48	36	33	26	/24	32	/24	44	/23	44	/22	48	/21
Witham at	5	7	7	15	9	7	30	6	71	5	180	4	336	4
Claypole Mill	59	59	38	59	34	/33	44	/33	53	/33	56	/32	67	/31
Little Ouse at	4	5	6	8	6	1	19	1	53	1	132	1	244	1
Abbey Heath	40	41	36	34	27	/24	32	/24	41	/24	44	/23	52	/22
Colne at	3	5	5	7	5	2	16	2	45	3	105	1	214	1
Lexden	36	41	30	30	27	/33	28	/33	43	/32	44	/31	58	/30
Mimram at	4	5	4	5	4	1	13	1	48	2	124	1	239	2
Panshanger Park	48	58	40	43	34	/40	40	/40	49	/39	56	/38	68	/37
Thames at	6	12	10	14	12	9	36	8	100	9	235	3	479	7
Kingston (natr.)	45	56	33	38	36	/110	37	/109	52	/109	54	/108	70	/107
Coln at	11	23	27	43	32	8	101	5	221	7	477	3	889	7
Bibury	69	96	70	84	59	/29	72	/29	76	/28	69	/27	82	/26
Great Stour at	9	25	16	15	15	2	45	2	148	1	334	1	532	1
Horton	44	94	47	37	44	/28	42	/27	64	/26	63	/24	65	/22
Itchen at	23	25	26	26	25	1	78	1	260	1	603	1	1020	1
Highbridge+Allbrook	76	73	63	54	51	/34	57	/34	72	/33	73	/32	79	/31
Piddle at	23	30	28	26	24	3	79	3	234	6	510	1	911	3
Baggs Mill	113	105	68	50	40	/29	53	/28	78	/27	72	/25	81	/23
Exe at	56	128	75	48	37	4	161	2	452	4	1149	1	1895	2
Thorverton	75	134	57	37	35	/36	44	/36	66	/36	76	/35	81	/34
Taw at	28	162	53	41	34	4	127	2	386	4	994	3	1681	5
Umberleigh	45	181	45	35	39	/34	40	/34	67	/33	78	/32	86	/31
Tone at	25	54	32	36	27	4	94	3	237	3	549	1	1052	1
Bishops Hull	94	130	48	45	36	/32	44	/31	64	/31	65	/30	79	/29
Severn at	17	54	39	38	19	6	96	5	224	4	599	6	1033	9
Bewdley	51	101	62	54	33	/71	50	/71	60	/71	73	/70	81	/69
Wye at	167	315	192	145	132	12	469	4	1468	6	3447	6	5441	5
Cefn Brwyn	80	126	68	59	76	/38	67	/38	84	/34	89	/29	92	/24
Cynon at	120	182	63	96	63	6	223	3	706	4	1924	5	3367	13
Abercynon	99	120	33	50	54	/34	43	/34	67	/32	83	/30	94	/28
Dee at	146	260	189	114	102	5	406	2	1061	1	2660	2	4336	1
New Inn	72	107	76	47	60	/23	63	/23	70	/22	80	/21	84	/20
Eden at	38	132	83	46	57	9	186	4	451	4	1208	8	1914	7
Sheepmount	51	162	92	45	77	/22	70	/21	79	/20	96	/18	98	/16
Clyde at	58	151	140	120	90	22	351	24	680	16	1583	18	2485	21
Daldowie	70	160	143	114	119	/29	124	/29	105	/28	111	/27	114	/26

Notes:
(i) Values based on gauged flow data unless flagged (natr.), when naturalised data have been used.
(ii) Values are ranked so that lowest runoff as rank 1.
(iii) %LT means percentage of long term average from the start of the record to 1991. For the long periods (at the right of this table), the end date for the long term is 1991.

TABLE 4 START-MONTH RESERVOIR STORAGES UP TO MARCH 1992

Area	Reservoir (R)/ Group (G)		Capacity● (Ml)	Oct	Nov	Dec	1992 Jan	Feb	Mar	1991 Mar
					(%)▲					
North West	Northern Command Zone[1]	(G)	133375	33	41	72	79	70	80	98
	Vyrnwy	(R)	55146	71	82	85	95	86	88	100
Northumbria	Teesdale[2]	(G)	87936	31	41	68	88	88	89	97
	Kielder	(R)	199175*	85*	85*	96*	99*	91*	94*	87
Severn-Trent	Clywedog	(R)	44922	74	75	82	87	88	85	96
	Derwent Valley[3]	(G)	39525	35	32	46	84	94	92	99
Yorkshire	Washburn[4]	(G)	22035	36	28	48	65	77	83	95
	Bradford supply[5]	(G)	41407	38	37	70	86	90	94	99
Anglian	Grafham	(R)	58707	81	76	81	88	90	88	76
	Rutland	(R)	130061	68	63	63	63	67	71	71
Thames	London[6]	(G)	206232	66	57	71	75	81	88	91
	Farmoor [7]	(G)	13843	82	89	97	99	99	97	63
Southern	Bewl	(R)	28170	62	54	58	58	58	54	55
	Ardingly	(R)	4730	84	81	85	88	92	89	100
Wessex	Clatworthy	(R)	5364*	40*	59*	89*	87	88*	82*	98*
	Bristol WW [8]	(G)	36620	46	39	50	53	58	65	73
South West	Colliford	(R)	28540	81	79	83	83	82	81	85
	Roadford	(R)	34500	84	81	86	85	85	87	87
	Wimbleball[10]	(R)	21320	52	57	69	73	76	77	74
	Stithians	(R)	5205	40	34	34	37	38	45	98
Welsh	Celyn + Brenig	(G)	131155	68	71	84	94	93	97	100
	Brianne	(R)	62140	84	89	100	100	97	100	100
	Big Five[11]	(G)	69762	69	73	87	93	93	92	93
	Elan Valley[12]	(G)	99106	77	90	94	94	91	100	100
Lothian	Edinburgh/Mid Lothian	(G)	97639				95	92	96	99
	West Lothian	(G)	5613				90	82	91	99
	East Lothian	(G)	10206				95	98	98	97

● Live or usable capacity (unless indicated otherwise)

* Gross storage/percentage of gross storage

▲ Percentage of live or usable capacity at or close to the beginning of the month according to data availability (unless indicated otherwise)

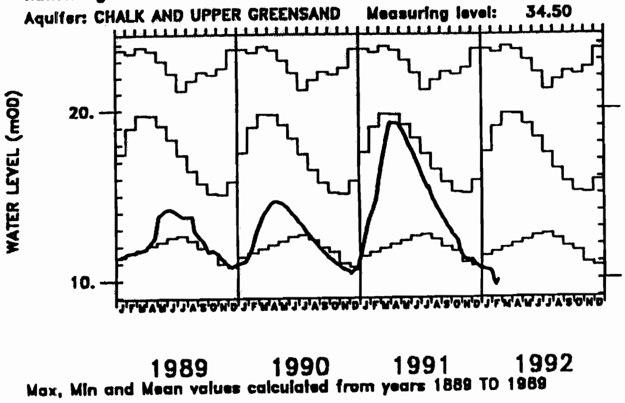
1. Includes Haweswater, Thirlmere, Stocks and Barnacre.
2. Cow Green, Selset, Grassholme, Balderhead, Blackton and Hury.
3. Howden, Derwent and Ladybower.
4. Swinsty, Fewston, Thruscross and Eccup.
5. The Nidd/Barden group (Scar House, Angram, Upper Barden, Lower Barden and Chelker) plus Grimwith.
6. Lower Thames (includes Queen Mother, Wraysbury, Queen Mary, King George VI and Queen Elizabeth II) and Lee Valley (includes King George and William Girling) groups - pumped storages.
7. Farmoor 1 and 2 - pumped storages.
8. Blagdon, Chew Valley and others.
9. The new Roadford reservoir was still filling after impounding.
10. Shared between South West (river regulation for abstraction) and Wessex (direct supply).
11. Usk, Talybont, Llandegfedd (pumped storage), Taf Fechan, Taf Fawr.
12. Claerwen, Caban Coch, Pen y Garreg and Craig Goch.

Note: Variations in storage depend on the balance between inputs (from catchment rainfall and any pumping) and outputs (to supply, compensation flow, HEP, amenity). There will be additional losses due to evaporation, especially in the summer months. Operational strategies for making the most efficient use of water stocks will further affect reservoir storages. Table 4 provides a link between the hydrological conditions described elsewhere in the report and the water resources situation.

FIGURE 3 GROUNDWATER HYDROGRAPHS

Site name: DALTON HOLME

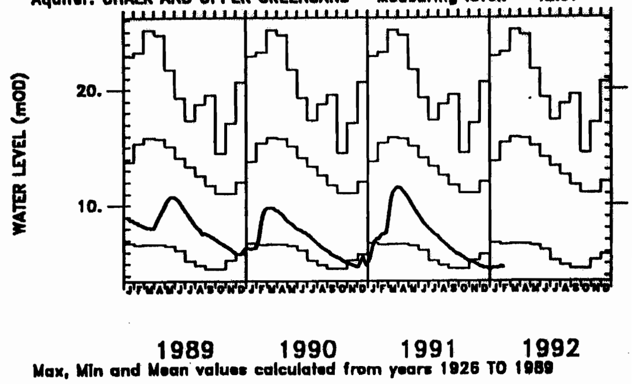
National grid reference: SE 9651 4530 Well number: SE94/5
Aquifer: CHALK AND UPPER GREENSAND Measuring level: 34.50



Max, Min and Mean values calculated from years 1889 TO 1989

Site name: LITTLE BROCKLESBY

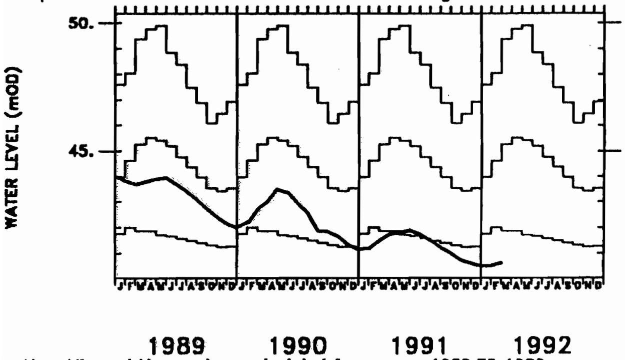
National grid reference: TA 1371 0888 Well number: TA10/40
Aquifer: CHALK AND UPPER GREENSAND Measuring level: 42.97



Max, Min and Mean values calculated from years 1926 TO 1989

Site name: WASHPIT FARM

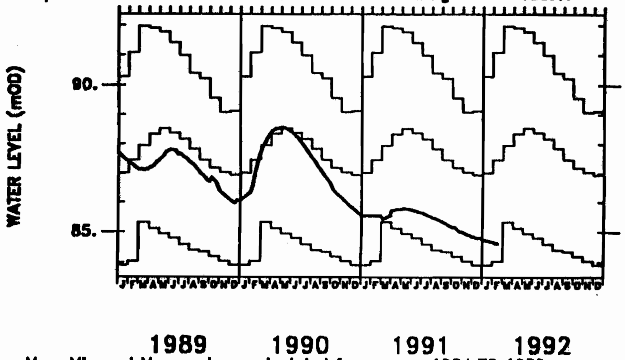
National grid reference: TF 8138 1960 Well number: TF81/2
Aquifer: CHALK AND UPPER GREENSAND Measuring level: 80.20



Max, Min and Mean values calculated from years 1950 TO 1989

Site name: THE HOLT

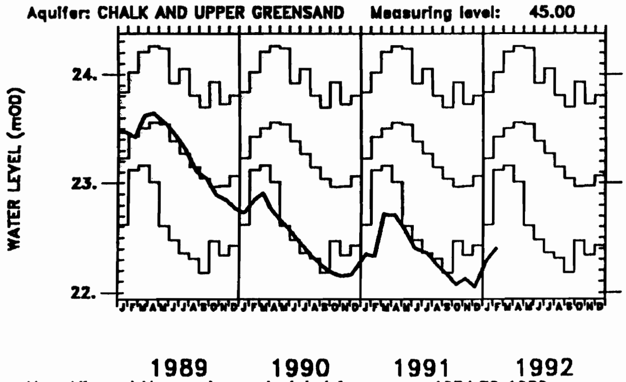
National grid reference: TL 1692 1965 Well number: TL11/9
Aquifer: CHALK AND UPPER GREENSAND Measuring level: 138.17



Max, Min and Mean values calculated from years 1964 TO 1989

Site name: FAIRFIELDS

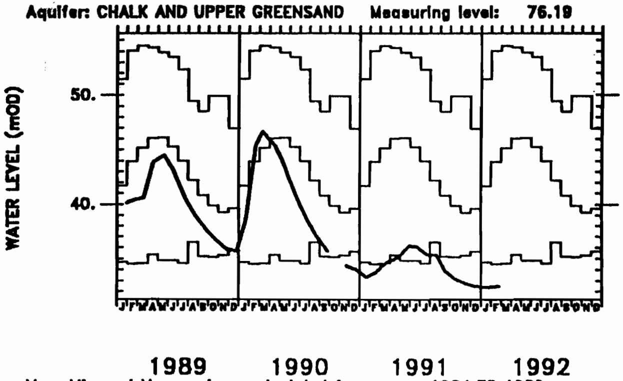
National grid reference: TM 2461 6109 Well number: TM26/46
Aquifer: CHALK AND UPPER GREENSAND Measuring level: 45.00



Max, Min and Mean values calculated from years 1974 TO 1989

Site name: REDLANDS HALL,ICKLETON

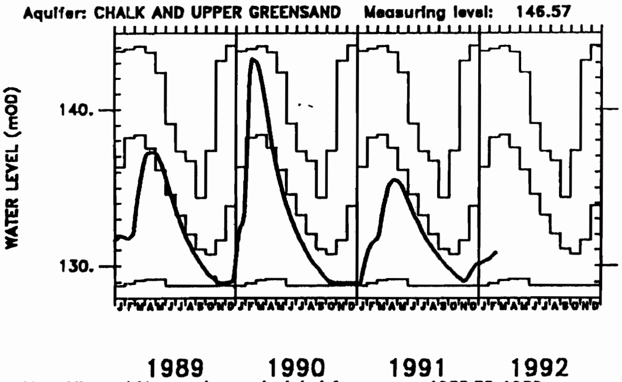
National grid reference: TL 4522 4182 Well number: TL44/12
Aquifer: CHALK AND UPPER GREENSAND Measuring level: 76.19



Max, Min and Mean values calculated from years 1964 TO 1989

Site name: ROCKLEY

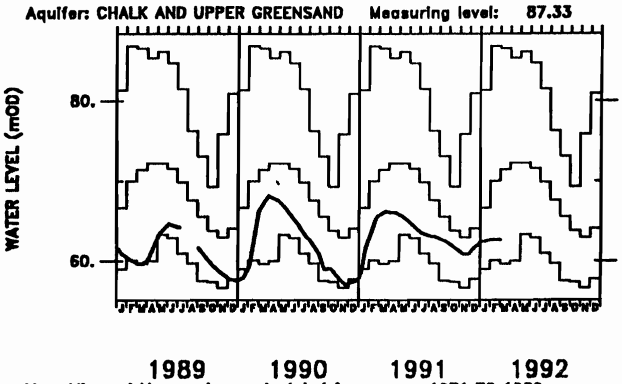
National grid reference: SU 1655 7174 Well number: SU17/57
Aquifer: CHALK AND UPPER GREENSAND Measuring level: 146.57



Max, Min and Mean values calculated from years 1933 TO 1989

Site name: LITTLE BUCKET FARM,WALTHAM

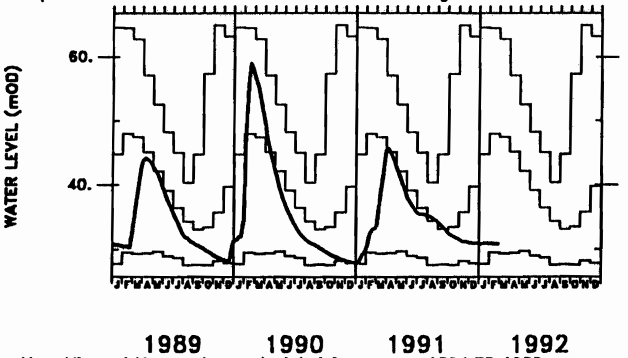
National grid reference: TR 1225 4690 Well number: TR14/9
Aquifer: CHALK AND UPPER GREENSAND Measuring level: 87.33



Max, Min and Mean values calculated from years 1971 TO 1989

Site name: COMPTON HOUSE

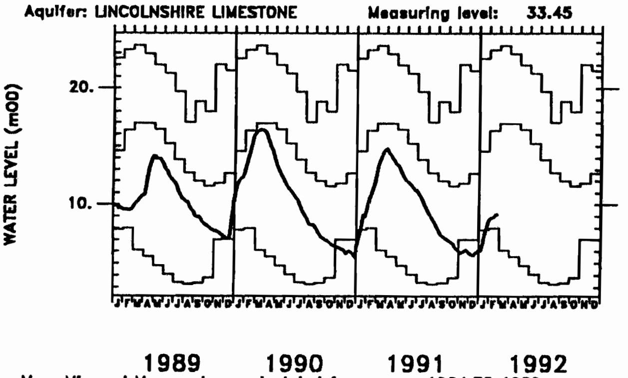
National grid reference: SU 7755 1490 **Well number:** SU71/23
Aquifer: CHALK AND UPPER GREENSAND **Measuring level:** 81.37



Max, Min and Mean values calculated from years 1894 TO 1989

Site name: NEW RED LION

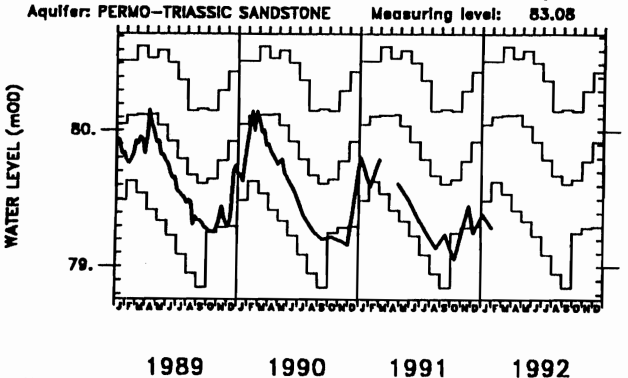
National grid reference: TF 0885 3034 **Well number:** TF03/37
Aquifer: LINCOLNSHIRE LIMESTONE **Measuring level:** 33.45



Max, Min and Mean values calculated from years 1964 TO 1989

Site name: LLANFAIR DC

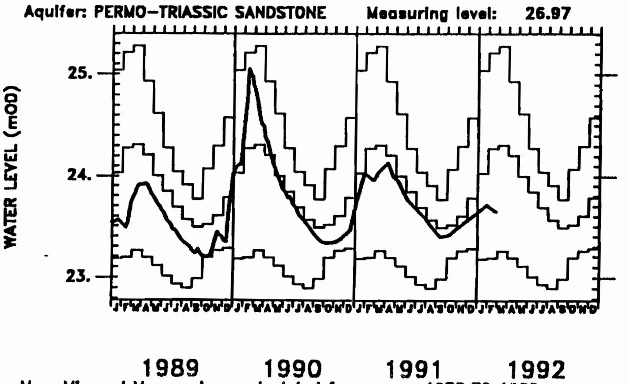
National grid reference: SJ 1374 5556 **Well number:** SJ15/15
Aquifer: PERMO-TRIASSIC SANDSTONE **Measuring level:** 83.08



Max, Min and Mean values calculated from years 1972 TO 1989

Site name: BUSSELS NO.7A

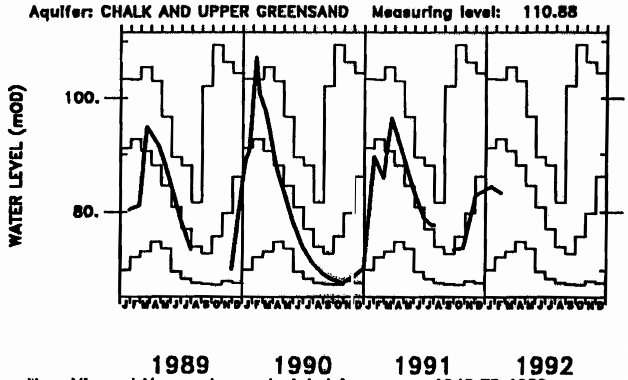
National grid reference: SX 9528 9872 **Well number:** SX99/37B
Aquifer: PERMO-TRIASSIC SANDSTONE **Measuring level:** 26.97



Max, Min and Mean values calculated from years 1972 TO 1989

Site name: WEST WOODYATES MANOR

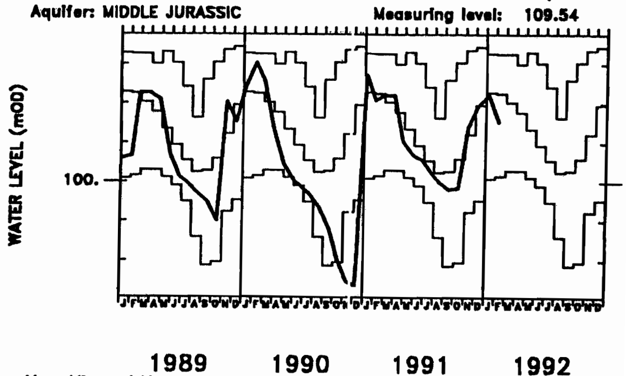
National grid reference: SU 0160 1960 **Well number:** SU01/5B
Aquifer: CHALK AND UPPER GREENSAND **Measuring level:** 110.88



Max, Min and Mean values calculated from years 1942 TO 1989

Site name: AMPNEY CRUCIS

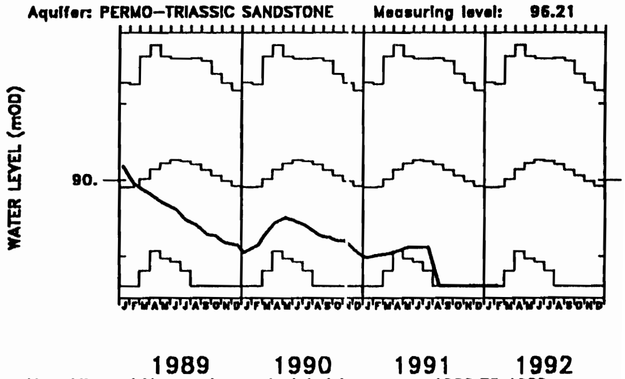
National grid reference: SP 0595 0190 **Well number:** SP00/62
Aquifer: MIDDLE JURASSIC **Measuring level:** 109.54



Max, Min and Mean values calculated from years 1958 TO 1989

Site name: WEEFORD FLATS,WEEFORD

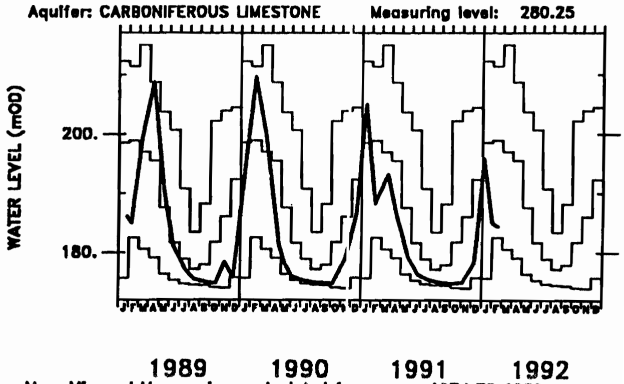
National grid reference: SK 1440 0464 **Well number:** SK10/9
Aquifer: PERMO-TRIASSIC SANDSTONE **Measuring level:** 96.21



Max, Min and Mean values calculated from years 1966 TO 1989

Site name: ALSTONFIELD

National grid reference: SK 1292 5547 **Well number:** SK15/16
Aquifer: CARBONIFEROUS LIMESTONE **Measuring level:** 280.25



Max, Min and Mean values calculated from years 1974 TO 1989

TABLE 5 A COMPARISON OF FEBRUARY GROUNDWATER LEVELS : 1992, 1989 AND 1976

Site	Aquifer	Records commence	Average February Level	February 1976		February 1989		February and March 1992		No of years February levels <1992	Lowest pre-1992 level (any month)
				Day	Level	Day	Level	Day	Level		
Wetwang	C & UGS	1971	26.19	3/02	21.72	28/02	19.53	07/02	16.66	0	16.84
Dalton Holme	C & UGS	1889	18.98	28/02	13.80	17/02	11.56	21/02	9.91	0	10.34
Little Brocklesby	C & UGS	1926	15.36	10/02	6.70	22/02	8.31	11/02	4.69	0	4.56
Washpit Farm	C & UGS	1950	44.61	1/02	43.20	06/02	43.80	03/03	40.61	0	41.24
The Holt	C & UGS	1964	87.46	26/02	86.68	22/02	87.20	16/02	84.60	1	83.90
Therfield Rectory	C & UGS	1883	78.70	28/02	77.59	03/02	82.36	16/02	dry	6	dry (below 71.60)
Fairfields	C & UGS	1974	23.43	24/02	23.28	20/02	23.42	11/02	22.40	1	22.05
Redlands Farm	C & UGS	1964	43.91	1/02	38.90	21/02	40.34	25/02	32.47	0	34.04
Rockley	C & UGS	1933	138.19	29.02	dry	26/02	132.04	01/03	130.89	5	dry (below 128.94)
Little Bucket Farm	C & UGS	1971	70.04	02/02	66.88	15/02	60.12	02/03	62.54	4	56.77
Compton House	C & UGS	1894	48.04	26/02	30.40	23/02	30.38	27/02	30.79	4	27.64
Chilgrove House	C & UGS	1836	57.11	28/02	38.68	23/02	39.15	27/02	39.95	5	33.46
West Dean No 3	C & UGS	1940	2.32	27/02	1.59	27/02	1.41	14/02	1.46	5	1.01
Lime Kiln Way	C & UGS	1969	125.33	15/02	124.64	06/02	124.48	27/02	124.12	0	124.09
Ashton Farm	C & UGS	1974	69.67	02/02	64.84	14/02	66.19	17/02	67.70	3	63.10
West Woodyates	C & UGS	1942	92.64	01/02	72.22	27/02	81.06	17/02	83.30	5	67.62
New Red Lion	LLst	1964	16.34	27/02	7.97	27/02	9.59	25/02	9.16	2	3.29
Ampney Crucis	Mid Jur	1958	102.27	29/02	100.34	27/02	102.27	10/02	101.54	7	97.38
Dunmurry (NI)	PTS	1985	28.62	no	levels	no	levels	25/02	28.10	0	27.47
Llanfair DC	PTS	1972	80.11	1/02	79.63	28/02	79.92	3/02	79.29	0	78.85
Morris Dancers	PTS	1969	32.61	24/02	31.97	14/02	32.49	10/02	32.06	2	30.87
Weeford Flats	PTS	1966	89.91	26/02	89.26	15/02	89.95	10/02	dry	1	dry (below 88.61)
Bussels 7A	PTS	1972	24.28	24/02	23.23	24/02	23.64	26/02	23.65	2	22.90
Rusheyford NE	MgLst	1967	76.05	24/02	65.87	27/02	76.05	04/02	74.75	>10	64.77
Peggy Ellerton	MgLst	1968	34.68	23/02	31.73	10/02	34.88	13/02	32.14	1	31.10
Alstonfield	CLst	1974	198.93	26/02	185.13	08/02	185.00	18/02	184.44	1	174.22

Groundwater levels are in metres above Ordnance Datum

C & UGS	Chalk and Upper Greensand	Mid Jur	Middle Jurassic limestones
LLst	Lincolnshire Limestone	MgLst	Magnesian Limestone
PTS	Permo-Triassic sandstones	CLst	Carboniferous Limestone

FIGURE 4 LOCATION MAP OF GAUGING STATIONS AND GROUNDWATER INDEX WELLS