HYDROLOGICAL SUMMARY FOR ENGLAND AND WALES

JUNE 1989

Data for this review have been provided, principally, by the Regional Units of the National Rivers Authority and by the Meteorological Office.

A proportion of the data featured is of a provisional nature and subject to later revision. In particular, the areal rainfall totals derive from a limited raingauge network and, given the substantial spatial variability in the June precipitation, the figures tabulated in this report should be treated with caution.

SUMMARY

During much of June, hot and dry conditions prevailed throughout most of England and Wales. Evaporation losses, especially in mid-month, were high and soil moisture deficits climbed steeply. As a consequence, and following a remarkably dry May, the general perception was of an intensifying drought. In fact, weather was very unsettled both at the beginning and at the end of June. The associated rainfall was substantial in many areas and, overall, June rainfall was close to the average for England and Wales as a whole.

River flows declined more gently than in May, but over wide areas, June runoff totals were the lowest for June since 1976. However, apart from some southern districts, discharge rates remain several times greater than the corresponding flows in 1976 and, typically, the June flows are associated with return periods in the 5-10 year range. Normally minimal infiltration to major aquifers occurs normally in June, currently, the groundwater situation remains fairly stable with levels below average but, in most regions, substantially above those registered during historic droughts. Summer rainfall has only a minor influence on water resources and the longer term impact of the 1989 drought will be largely determined by precipitation amounts from September onwards when replenishment of reservoirs and recharge to aquifers would normally be expected to re-commence.

REVIEW

A sequence of moderate low pressure systems - on a northerly airstream - brought widespread showery conditions to much of the UK over the period 1-8th June; thundery showers were widespread and accompanied by significant - if locally very variable - rainfall. Pressure then rose and an anticyclonic weather pattern became established. Apart from a brief interlude on the 20/21st, dry and very hot weather characterised almost all regions until the rainless spell - which extended to 18 days in some localities - was terminated by sustained rainfall associated with an active cold front on the 28th. This heralded a series of depressions bringing significant rainfall to all regions; precipitation totals were modest, however, in South Wales and the South West. In these latter areas the monthly rainfall, in parts, was less than half the average; by contrast parts of the North Downs, East Anglia, Yorkshire and coastal districts of Lancashire exceeded 150 per cent.

The rainfall deficit over the ten-week period ending in late June was significant in most regions but the combined total for May and June is not remarkable; a return period of about five years being typical. Over the nine months to the end of June a more notable drought may be recognised, albeit one with two distinct phases separated by a wet interlude in the spring (see Table 1). Overall, the greatest rainfall deficits continue to be found in the Southern Water area where a significant shortfall may be traced back to April 1988 - a return period of approximately 20 years is associated with this deficit and in some districts a drought of greater

severity may be recognised. However, except in a few localities, comparisons with 1975/76 are clearly inappropriate; this latter event was of an extreme severity recording approximately 130-170 mm less rainfall in those water authority areas where the current drought has achieved its greatest intensity.

Mean temperatures and sunshine amounts were significantly above average in June and potential evaporation totals - especially in mid-month - were very high. Soil moisture deficits increased sharply over this period and even though some stabilisation occurred at the month's end, SMDs entering July were greater than 100 mm throughout most of England and Wales south of the Wash. Relative to the late June average, 1989 deficits were generally 50 mm greater and, apart from eastern coastal districts, substantially exceed those normally obtaining at the end of the summer.

June river flows throughout England and Wales were generally in the range 30 to 90 per cent of the average (see Table 2) with clear regional patterns difficult to discern; partly this reflects the variation in the June rainfall and the contrasting geological character of individual catchments. Broadly speaking western and northern areas - parts of Yorkshire and Lancashire excepted - continued the steep recessions that became established in late April. A few rivers in South Wales recorded June flows lower (marginally) than in 1976. More generally, flows tended to be the lowest recorded since the late summer of 1984 and, typically, may be expected once every 5-10 years or so. Less spatial coherence may be identified in the English lowlands. A few rivers, including the Mole in Surrey, recorded above average June flows; a response to abundant rainfall on the North Downs and the continuing benefit to baseflows deriving from the late recharge over the March to May period. More typically, June runoff totals were the lowest - for the month - since 1976 but often exceeded the corresponding flows in 1988 by only a modest margin. Apart from rivers in the Southern Water area - where return periods of twenty years or more have been estimated - discharge rates are generally well below average but significantly greater than those registered during major historical droughts. Flows in the Thames, for instance are three times those recorded in 1976 and considerably greater than the June mean flow recorded in the droughts of 1899, 1921, 1933, 1944 and 1949. The accumulated runoff totals (since October 1988) given in Table 2 testify to a significant rather than severe hydrological drought in all but a few catchments.

Whilst groundwater levels through the late winter and early spring of 1989 were the lowest since 1976 over wide areas, the subsequent infiltration, though limited in comparison with winter recharge in a normal year, boosted groundwater resources at a time when a seasonal decline in levels is generally underway. Consequently, in early summer, water tables stood at around average levels in some regions (see, for instance, the Compton and Rockley traces) though most observation boreholes stood somewhat below the June average. However, only in parts of the Chalk aquifer in Sussex and Kent and the Permian Sandstones of east Devon were levels reported comparable with those registered in June 1976; increased abstraction rates as well as the meteorological conditions are an important factor in some of these localities.

Infiltration appears, generally, to have ceased by June and groundwater hydrographs - except those for deep wells which respond to rainfall only after a lag of several months - are now, typically, showing a normal summer recession. The set of groundwater level hydrographs illustrate that even where 1989 recharge has been very modest, at Dalton Holme for example, groundwater levels remain considerably above the minimum on record. No significant recharge to the major aquifers is likely to occur before October - when rainfall may be expected to exceed evaporative losses. Groundwater shortages - other than those of a localised nature -

may be anticipated only if, as happened in 1988, autumn and early winter rainfall is inadequate to allow normal recharge to produce a substantial upturn in groundwater levels.

IH/BGS

11/7/89

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TABLE 1 1988/9 RAINFALL IN MM AND AS A PERCENTAGE OF THE 1941-70 AVERAGE

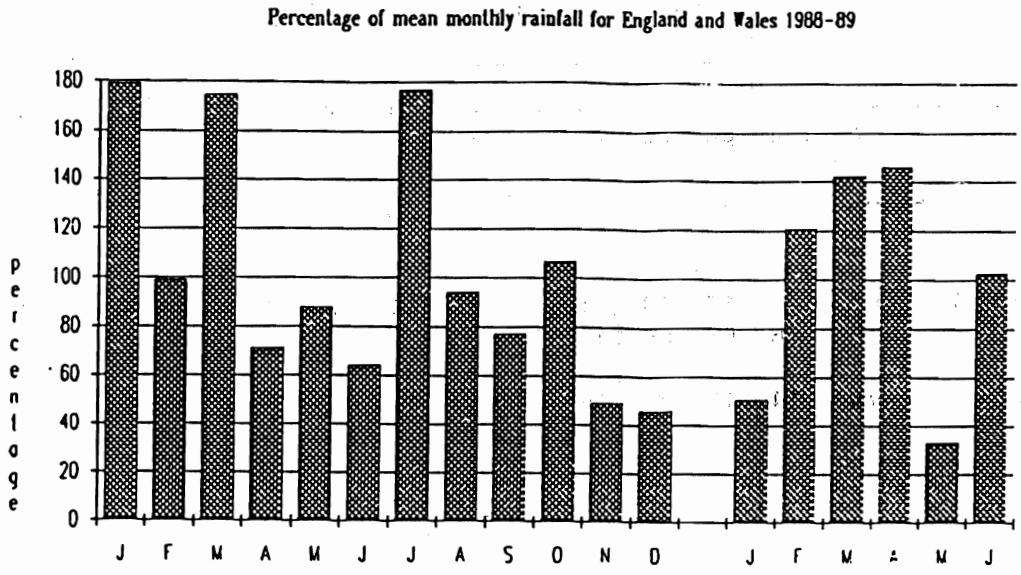
		Oct 1988	Nov	Dec	Jan 1989	Feb	Mar	Apr	May	Jun	Oct-Jun	Approx Return* Period	Oct 75-Jun 76
England and Wales	mm	89	48	47	44	78	84	85	22	63	560	5-10	411
	%	107	49	52	51	121	142	146	33	103	84		62
WATER AUTHORITIES													
North West	mm	120	67	116	68	123	113	92	33	102	834	0-5	707
	%	102	55	97	61	151	157	120	40	123	96		82
Northumbria	mm	101	73	53	32	70	55	49	25	65	523	5-10	433
	%	135	78	71	40	106	105	89	38	107	84		70
Severn Trent	mm	62	38	33	35	65	69	87	23	53	465	5-10	344
	%	95	48	47	51	122	132	168	35	95	83		61
Yorkshire	mm	90	54	47	24	64	63	79	24	84	529	0-5	442
	%	130	61	64	31	100	118	140	40	145	88		74
Anglia	mm	52	36	22	31	34	48	74	14	62	373	5-10	239
	%	100	58	42	59	81	121	186	30	127	85		55
Thames	mm	66	28	16	31	68	65	77	14	46	403	5-10	232
	%	103	38	24	50	129	141	167	25	88	79		45
Southern	mm	84	32	19	29	62	75	81	11	50	443	10-15	268
	%	108	34	25	38	109	144	169	20	100	75		45
Wessex	mm	101	34	22	44	89	87	74	25	33	509	5-10	303
	%	123	35	24	52	151	149	137	36	61	79		47
South West	mm	144	55	59	65	135	115	92	18	38	721	5-10	530
	%	127	41	44	50	151	137	130	21	58	80		59
Welsh	mm	125	67	73	80	140	151	89	23	65	813	5-10	653
	%	97	47	50	59	146	174	103	25	79	82		66

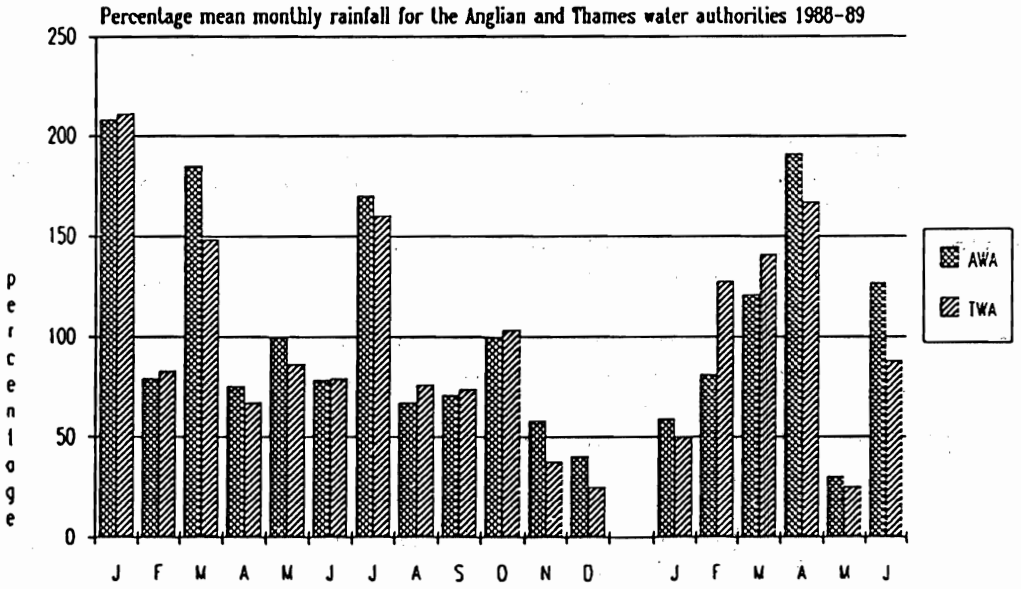
Note: January to May rainfalls are based upon MORECS figures supplied by the Meterological Office.
*The return periods have been estimated from data provided by the Meteorological Office.

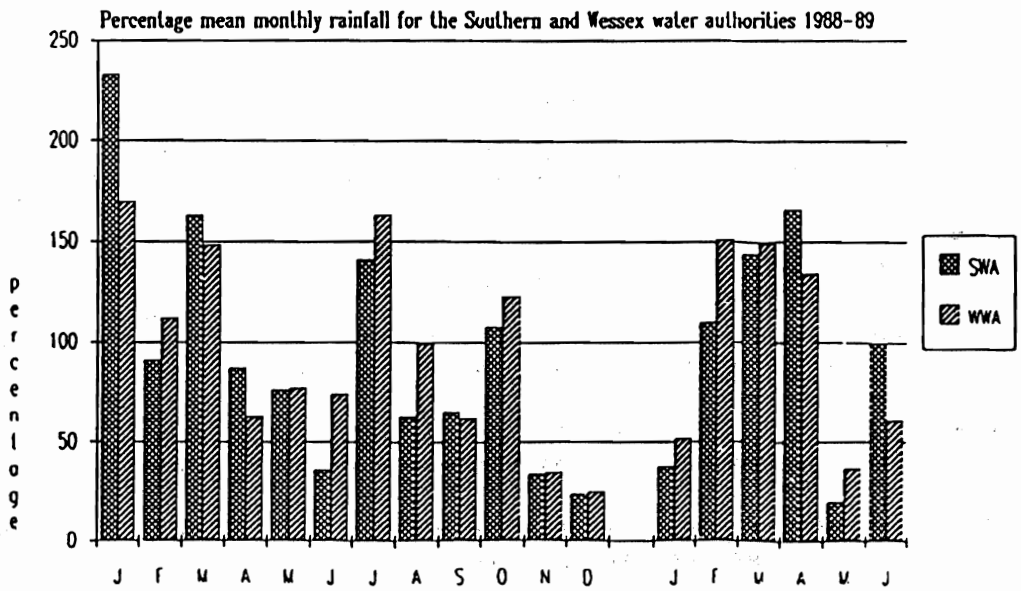
TABLE 2 CATCHMENT RUNOFF IN MM AND AS A PERCENTAGE OF LTA

River/Station Name		Oct 1988	Nov	Dec	Jan 1989	Feb	Mar	Apr	May	Jun	Oct '88-Jun '89	Rank/No. of Years	Oct '75-Jun '76
Wharfe at Flint Ml	mm	80	65	81	42	64	95	71	15	13	526	9/34	389
	%	125	80	84	43	84	127	131	39	51	87		64
Derwent at B'crambe	mm	22	21	29	17	17	22	29	13	9	179	2/16	164
	%	92	81	67	33	39	49	85	52	51	58		53
Trent at Colwick	mm	23	17	29	21	26	42	57	18	13	246	7/31	133
	%	96	55	64	41	59	105	178	69	68	79		43
Lud at Louth	mm	14	13	17	15	12	16	17	15	12	131	4/21	62
	%	117	87	85	48	33	42	50	54	60	56		26
Witham at Claypole	mm	5	5	9	8	8	12	31	14	8	100	5/30	36
	%	66	41	44	31	28	46	148	92	80	60		22
Ouse at Bedford	mm	11	9	18	13	23	37	46	13	7	177	25/56	36
	%	110	45	64	36	85	119	242	101	94	88		18
Colne at Lexden	mm	9	7	11	13	14	23	20	6	4	108	10/30	42
	%	100	59	65	59	74	128	154	75	82	85		33
Thames at Kingston (nat)	mm	14	12	15	13	19	36	26	133	9	157	28/106	77
	%	108	57	50	35	59	116	118	765	75	72		35
Kennet at Theale	mm	18	14	16	16	19	31	29	22	16	181	4/27	92
	%	117	70	59	46	32	82	94	78	76	72		37
Coln at Bibury	mm	15	15	18	15	19	48	44	30	18	222	4/26	79
	%	88	60	44	30	56	91	102	89	86	64		23
Ouse at Gold Bridge	mm	13	10	11	8	12	44	37	16	6	157	2/27	139
	%	43	20	20	13	25	98	109	60	40	43		38
Test at Broadlands	mm	21	20	20	19	20	31	27	27	17	202	3/30	148
	%	90	80	67	50	40	79	79	89	71	73		53
Itchen at Highbrdge	mm	28	26	27	26	26	41	40	36	23	273	3/31	246
	%	89	75	62	53	46	79	85	83	66	71		64
Stour at Throop	mm	25	13	21	19	28	57	39	15	11	228	2/16	109
	%	111	40	35	31	51	110	118	63	66	64		30
Taw at Umberleigh	mm	109	22	67	54	95	107	36	15	17	522	7/31	296
	%	108	24	55	46	116	162	80	48	31	82		47
Tone at Bishops H	mm	43	20	26	25	54	80	40	19	11	318	5/28	150
	%	164	45	37	31	75	138	107	66	60	74		35
Severn at Bewdley	mm	45	22	37	29	48	77	48	12	7	325	15/68	174
	%	135	41	58	41	84	168	152	49	41	82		44
Yscir at Pont'yscir	mm	91	39	66	92	130	182	72	18	10	700	2/16	472
	%	98	28	43	64	123	160	120	41	33	80		54
Dee at Manley Hall	mm	105	59	94	75	88	183	98	28	27	757	16/52	491
	%	121	84	69	56	84	194	158	61	80	92		60
Lune at Caton	mm	129	68	168	256	167	191	82	20	14	1095	22/25	705
	%	71	42	86	174	192	193	106	37	35	119		77

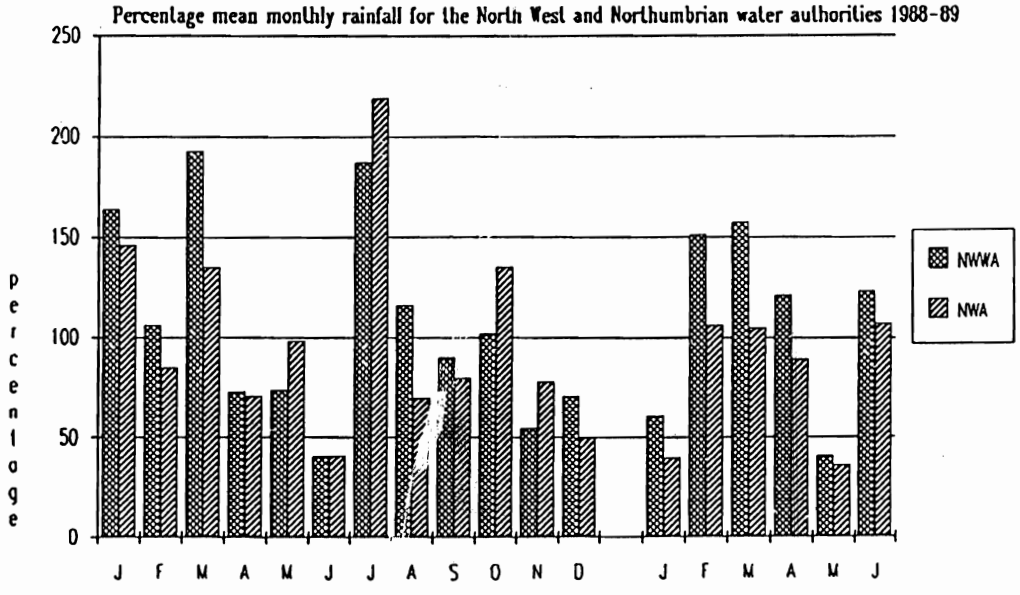
MONTHLY RAINFALL - JANUARY 1988 TO JUNE 1989



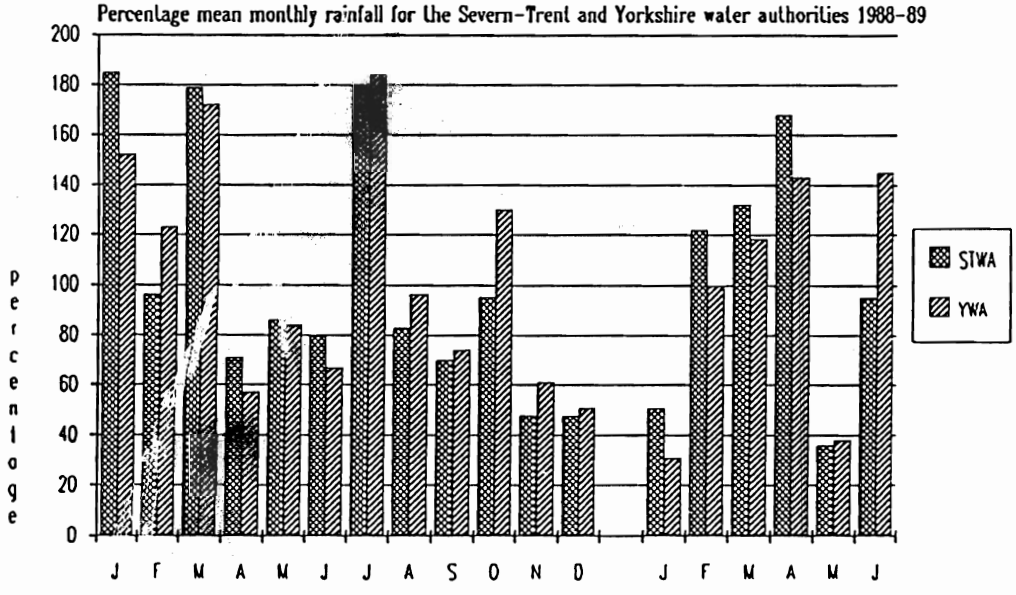




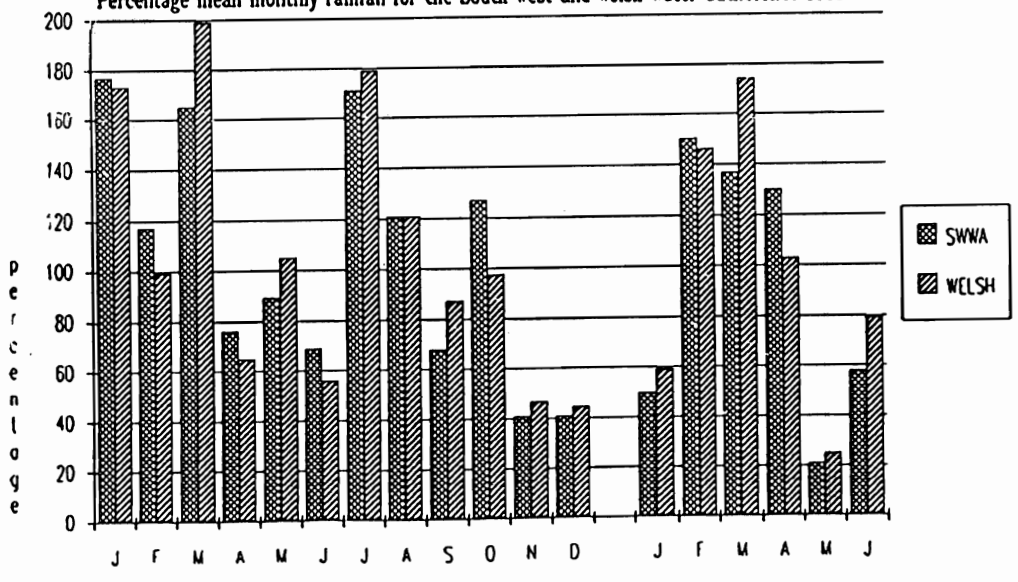
Percentage mean monthly rainfall for the North West and Northumbrian water authorities 1988-89



Percentage mean monthly rainfall for the Severn-Trent and Yorkshire water authorities 1988-89



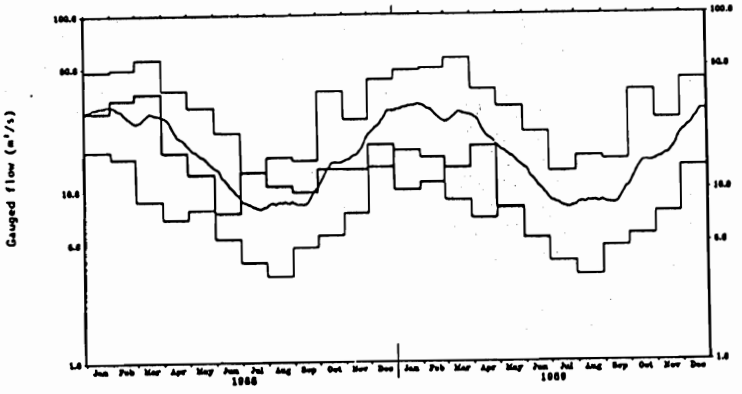
Percentage mean monthly rainfall for the South West and Welsh water authorities 1988-89



MONTHLY HYDROGRAPHS

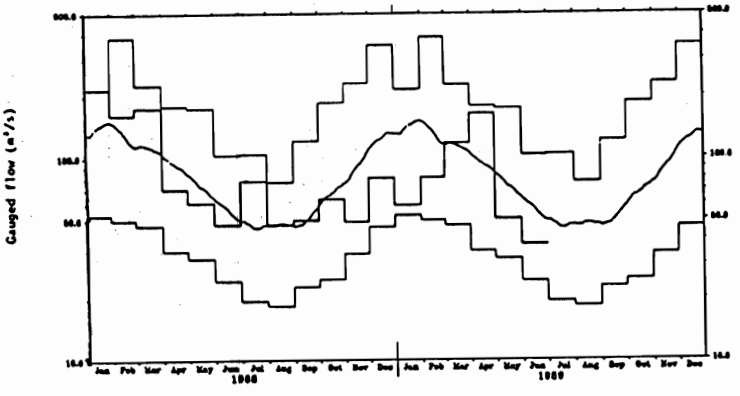
027041 Derwent at Buttercrambe

Monthly mean flows for 1968-1969
+ extremes and 30 day running mean for 1975-1987



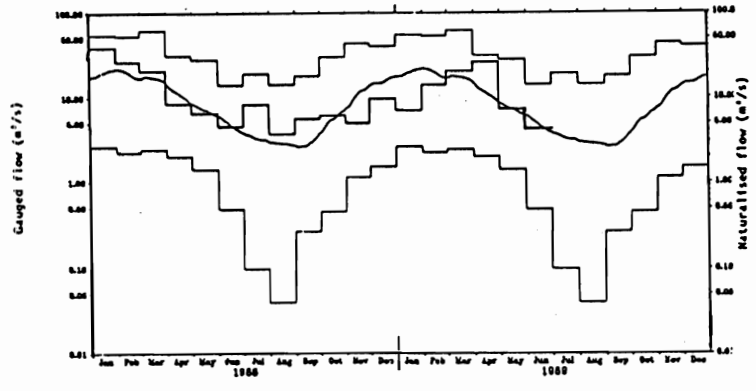
028009 Trent at Colwick

Monthly mean flows for 1968-1969
+ extremes and 30 day running mean for 1956-1987



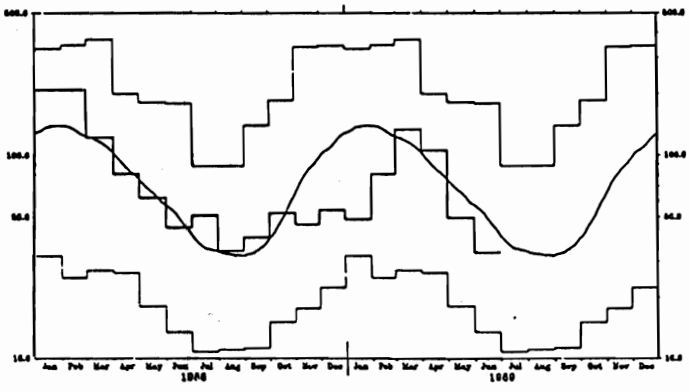
033002 Bedford Ouse at Bedford

Monthly mean flows for 1968-1969
+ extremes and 30 day running mean for 1933-1987



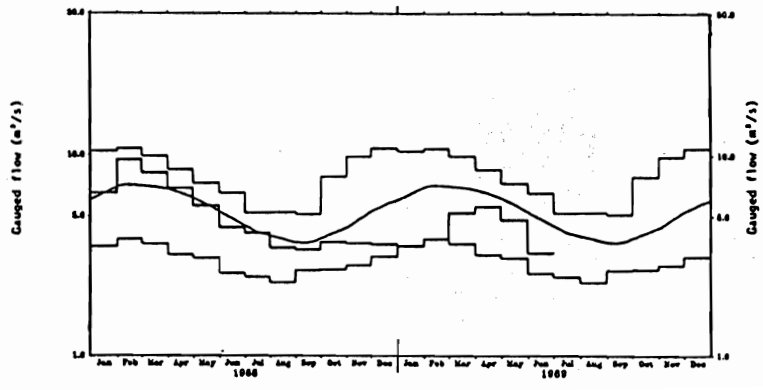
039001 Thames at Kingston

Monthly mean flows for 1968-1969
+ extremes and 30 day running mean for 1883-1987



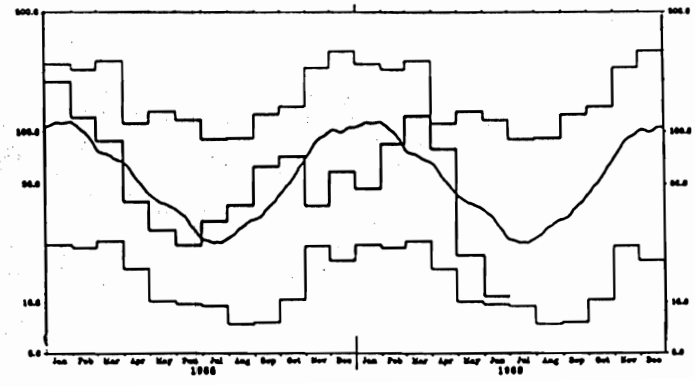
042010 Itchen at Highbridge+Allbrook

Monthly mean flows for 1968-1969
+ extremes and 30 day running mean for 1956-1987



054001 Severn at Bewdley

Monthly mean flows for 1968-1969
+ extremes and 30 day running mean for 1921-1987

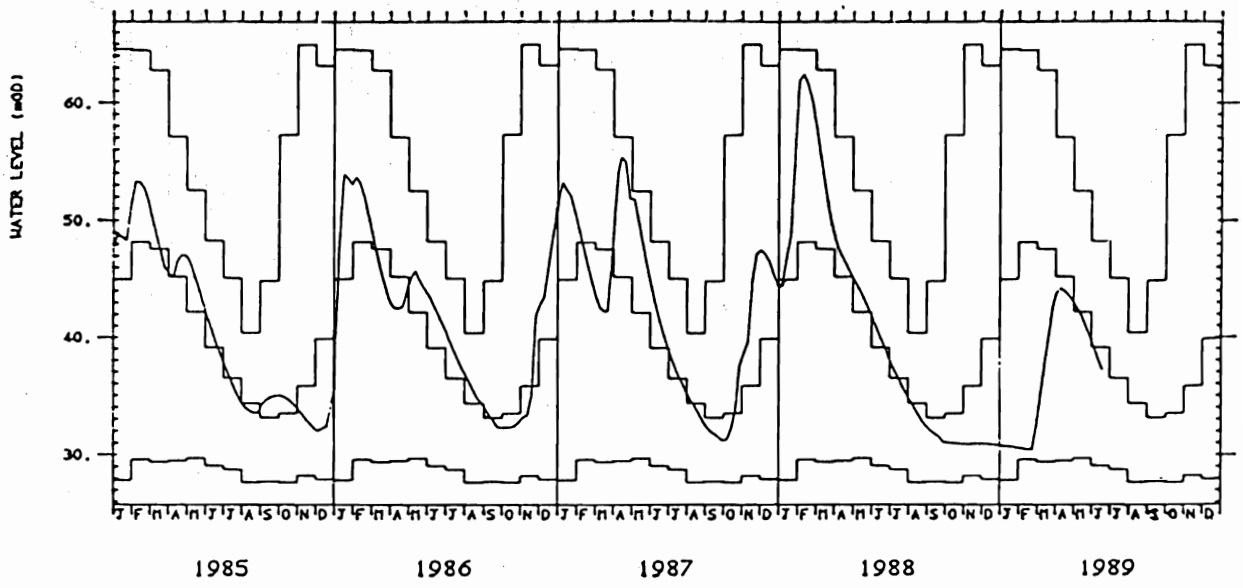


GROUNDWATER OBSERVATION WELL HYDROGRAPHS

Site name: COMPTON HOUSE

National grid reference: SU 7755 1490 Well number: SU71/23

Aquifer: CHALK AND UPPER GREENSAND Measuring level: 81.37



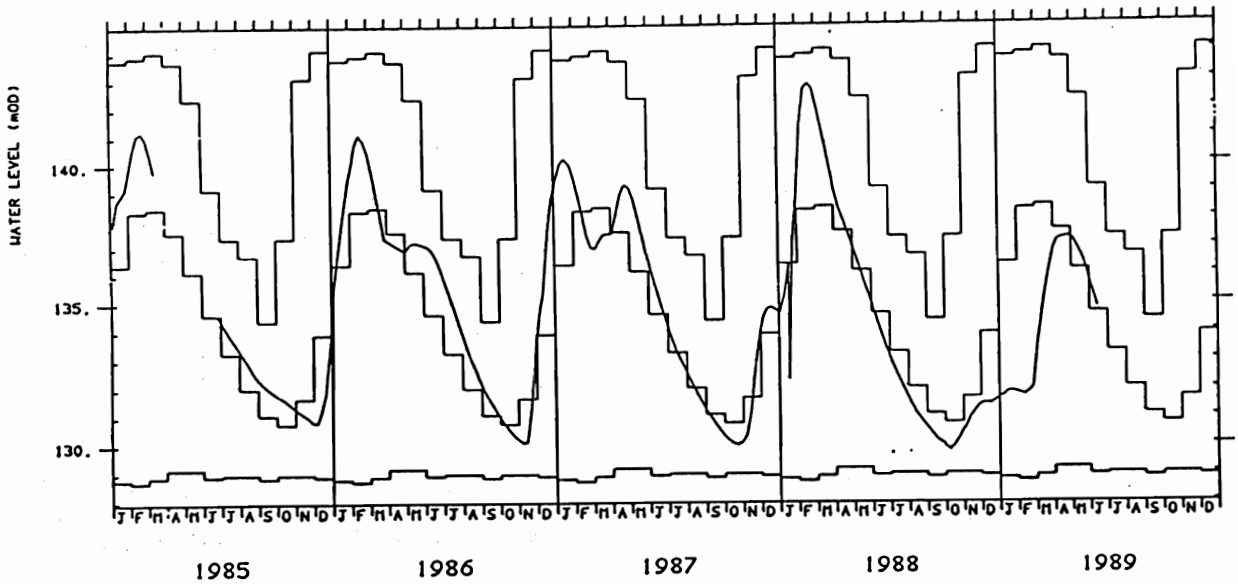
Max, Min and Mean values calculated from years 1894 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: ROCKLEY

National grid reference: SU 1655 7174 Well number: SU17/57

Aquifer: CHALK AND UPPER GREENSAND Measuring level: 146.39



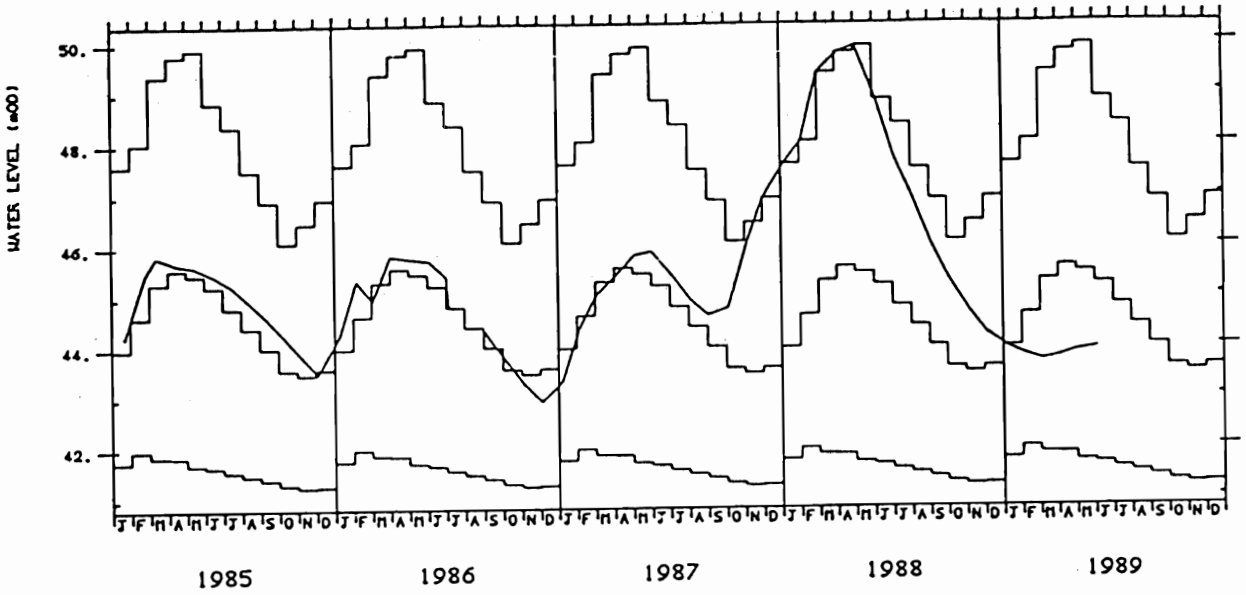
Max, Min and Mean values calculated from years 1933 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: WASHPIT FARM

National grid reference: TF 8138 1960 Well number: TF81/2

Aquifer: CHALK AND UPPER GREENSAND Measuring level: 80.20



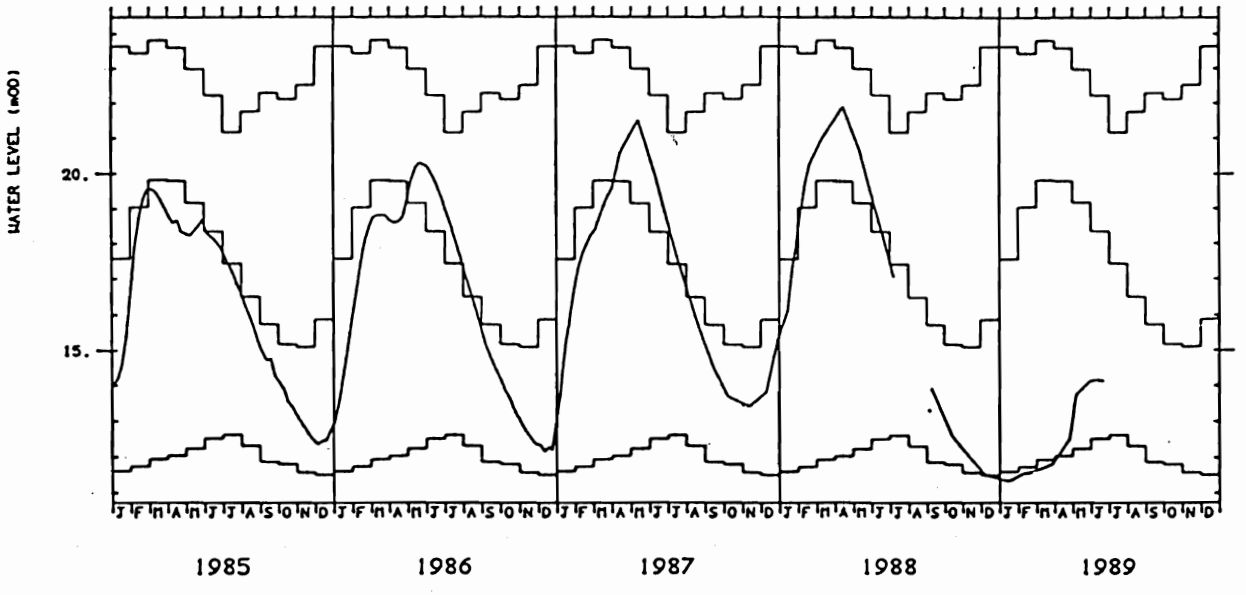
Max, Min and Mean values calculated from years 1950 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: DALTON HOLME

National grid reference: SE 9651 4530 Well number: SE94/5

Aquifer: CHALK AND UPPER GREENSAND Measuring level: 33.50



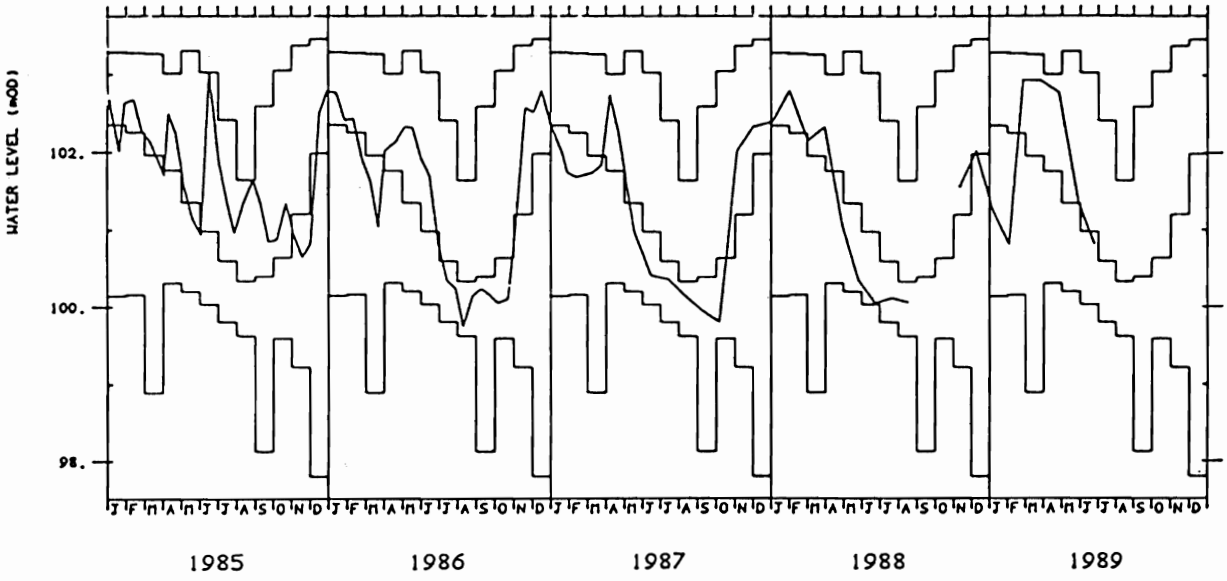
Max, Min and Mean values calculated from years 1889 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: AMPNEY CRUCIS

National grid reference: SP 0595 0190 Well number: SP00/62

Aquifer: MIDDLE JURASSIC Measuring level: 109.70



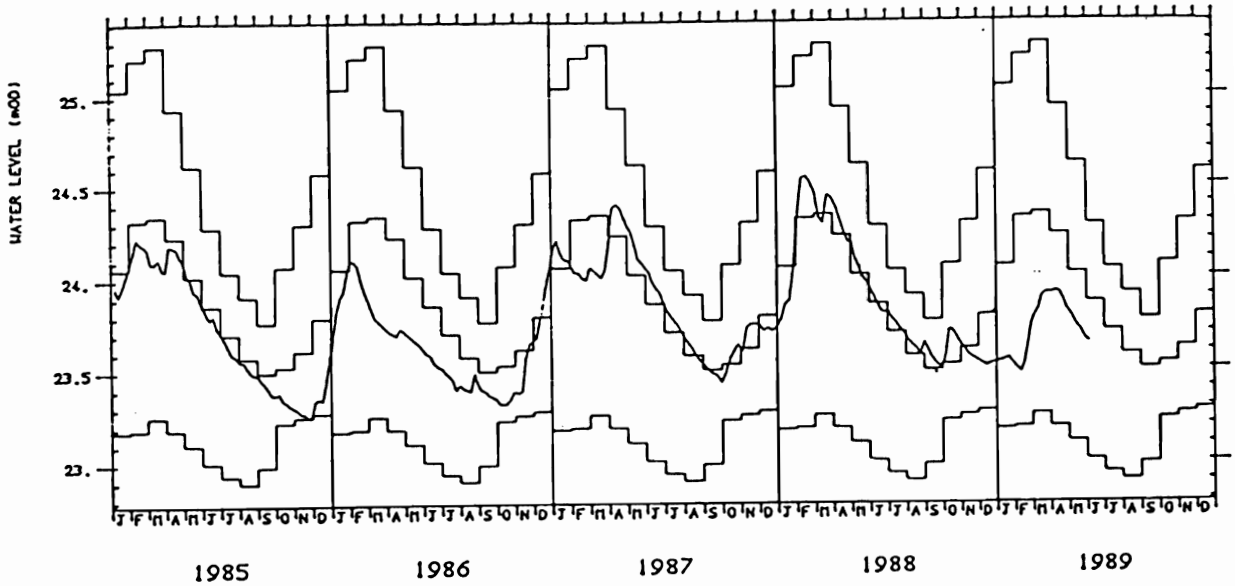
Max, Min and Mean values calculated from years 1958 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks

Site name: BUSSELS NO.7A

National grid reference: SX 9528 9872 Well number: SX99/37B

Aquifer: PERMO-TRIASSIC SANDSTONE Measuring level: 26.07



Max, Min and Mean values calculated from years 1972 TO 1988

A break in the data line indicates a recording interval of greater than 8 weeks