Hydrological Summary for Great Britain

MAY 1995

Rainfall

May was a month of contrasts. Heatwave conditions in the first seven days were transformed as a high pressure cell drifted eastwards bringing a northerly airstream across most of the British Isles. Temperatures declined exceptionally steeply before recovering as cloudy, showery conditions predominated over the latter half of the month. Overall, May was another relatively warm month with, northern Britain excepted, notably high sunshine totals and, correspondingly, above average evaporative demands. For Scotland as a whole the May rainfall total was around average but a few eastern pockets reported below 50% of the monthly mean. England and Wales registered its third successive month with rainfall significantly below average. Frontal systems which brought adequate rainfall to some western areas mostly failed to penetrate to the English lowlands where the showery nature of most of the rainfall resulted in large spatial variations in monthly totals. Many districts, in central areas especially, recorded below 40% of the May mean. Parts of the lower Severn Basin were also very dry. Some notable localised downpours were, however, reported: torrential rain over a two-hour period contributed to the wettest May rain-day (28.7 mm on the 30th) on record at the Institute's meteorological station. This terminated a notably dry 10-week spell during which rainfall totals were well below half the average throughout much of England. Spring rainfall totals were close to normal in Scotland but England and Wales recorded its second driest March-May period since 1976. Rainfall deficiencies were particularly marked in southern regions, and few low-lying north-eastern areas. Even in these areas, however, rainfall totals in the spring of 1990 (and, in most areas, 1976 also) were much lower. Rainfall totals for the year thus far remain above average in all regions, notably so in northern Scotland.

River Flow

Hot, dry conditions in most catchments early in May accelerated the spring recessions and flows generally declined briskly through the month - interrupted by some minor spates in mid-month (e.g. on the Wye) and very localised, mostly urban, flooding associated with intense storm events towards month-end. In northern and western Scotland, some May catchment runoff totals were close to, or above, the monthly average. The same is true of a number of Chalk catchments in England where spring flows continue to show the benefit of high winter groundwater recharge. Generally however, May flows were well below average - markedly so in rivers draining impervious catchments (examples include the Rivers Wharfe, Lymington and, notably, the Teme). Despite modest flow rates throughout May over wide areas, monthly means are generally unremarkable, especially when viewed in the context of the recent past. As an illustration, runoff for the Yorkshire Derwent was the seventh lowest in a 34-year series but still easily eclipsed the May totals for 1989-92. Runoff totals for the spring are low but generally not exceptionally so and accumulations for 1995 (and over longer timespans) are mostly very healthy; relatively depressed longer term runoff totals being largely confined to a few north-eastern catchments (e.g. the Whiteadder).

Groundwater

Substantial - exceptional in some areas - soil moisture deficits had developed in the English lowlands by mid-May and generally infiltration was meagre and spatially very restricted, some recharge was reported where thin soil cover coincided with localised heavy rainfall (e.g. in parts of the Cotswolds). In the Chalk, except for a few of the deepest wells, water-tables were in brisk decline during May, commonly exhibiting similarities with the steep recessions of 1988 and 1990. Nonetheless, the elevated levels at which the 1995 recessions began have generally ensured that late spring levels are well within the normal range. In much of the eastern Chalk outcrop levels remain considerably above average and close to the average elsewhere. As is normally the case, levels in the older aquifers have declined more steeply but, again, water-tables are mostly close to the early summer mean - although levels remain particularly high in Lancashire Permo-Triassic sandstones. Levels are relatively depressed in a few minor aquifers where 1994/95 winter recharge was modest (e.g. in parts of the North-East). 1995 minima are expected to be in the normal range but the outlook for 1996 will depend, in part, on the dryness of the soils in late summer and the associated delay in the onset of winter recharge.

General

The limited May rainfall and high temperatures early in the month produced stress in some water distribution systems, but despite appreciable declines in reservoir stocks, the resources outlook for the summer is good; overall reservoir stocks are considerably greater than at the same time in 1990. If dry conditions persist, some problems may be anticipated in relation to spray irrigation, especially where abstraction is from rivers supported by only a moderate baseflow component.

Institute of Hydrology

British Geological Survey

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. Figure 3 is based on weather data collected by the Institute of Hydrology at Wallingford and Balquhidder (Central Region, Scotland). Reservoir contents information has been supplied by the Water Services Companies, the NRA or, in Scotland, the Lothian and Strathclyde Regional Councils. The most recent areal rainfall figures are derived from a restricted network of raingauges 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.

Financial support towards the production of the Hydrological Summaries is given by the Department of the Environment and the National Rivers Authority.

The Hydrological Summaries are available on annual subscription at a current cost of £48 per year - enquiries should be directed to the National Water Archive Office at the address below. No charge is made to those organisations providing data for the Summaries.

* For reasons of consistency and to provide greater spatial discrimination, the original ten regional divisions of the NRA have been retained for use in the Hydrological Summaries.

MORECS

Most of the recent monthly regional rainfall data featured in the Hydrological Summaries are MORECS assessments. MORECS is the generic name for The Meteorological Office services involving the calculation of evaporation and soil moisture routinely for Great Britain. Products include a weekly issue of maps and tables of potential and actual evaporation, soil moisture deficits, effective rainfall and the hydrometeorological variables used to calculate them. The data are used to provide values for 40 km squares - or larger areas - and various sets of maps and tables are available according to user requirements. Options include a day-by-day retrospective calculation of soil moisture at any of 4000 rain-gauge sites.

Further information about MORECS services may be obtained from: The Meteorological Office, Sutton House, London Road, Bracknell, RG12 2SY

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 12 June 1995

TABLE 1 1994/95 RAINFALL AS A PERCENTAGE OF THE 1961-90 AVERAGE

Note: The monthly rainfall figures are the copyright of The Meteorological Office.
These data may not be published or passed on to any unauthorised person or organisation.

		May 1994	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan 1995	Feb	Mar	Apr	May
England and	mm	62	36	47	72	106	97	84	139	157	111	64	27	49
Wales	%	97	55	76	95	138	114	93	148	178	176	89	46	76
NRA REGIONS														
North West	mm	35	70	70	103	113	123	124	204	210	148	88	36	77
	%	47	86	82	96	98	96	101	165	174	190	93	50	103
Northumbrian	mm	26	39	41	81	77	71	95	124	123	107	60	41	54
	%	42	65	63	100	105	93	110	153	146	181	86	74	87
Severn Trent	mm	54	24	44	56	127	68	74	115	128	88	52	21	51
	%	92	41	83	84	198	106	104	149	183	163	85	38	86
Yorkshire	mm	46	28	53	58	101	73	89	121	125	100	65	29	56
	%	77	47	90	78	149	100	111	146	158	172	96	48	94
Anglian	mm	51	25	41	57	89	70	32	58	98	62	51	17	32
	%	106	49	84	104	182	137	55	105	196	168	109	38	68
Thames	mm	79	25	21	50	74	85	53	90	136	83	50	18	38
	%	141	45	43	86	125	137	82	129	213	184	89	36	67
Southern	mm	91	39	29	68	90	118	68	123	163	112	58	18	28
	%	169	72	60	119	130	148	80	150	204	207	92	34	51
Wessex	mm	92	24	34	68	99	115	98	139	179	111	57	31	48
	%	151	42	65	103	138	146	118	149	206	171	81	59	78
South West	mm	99	32	49	103	131	140	127	213	230	163	92	40	52
	%	138	46	71	123	141	121	102	153	167	161	93	58	73
Welsh	mm	69	57	68	94	134	139	133	240	235	181	84	37	81
	%	84	72	88	93	117	101	94	157	164	187	79	46	99
Scotland	mm	29	110	67	101	103	110	150	240	225	205	147	56	80
	%	34	128	71	86	73	71	99	159	149	201	118	74	93
RIVER PURIFICATION BOARDS														
Highland	mm	36	148	62	112	153	116	162	297	293	271	185	82	80
	%	39	151	58	88	89	59	80	151	156	213	114	90	87
North East	mm	16	55	40	47	89	87	85	90	136	83	72	63	75
	%	23	83	55	54	102	90	86	97	137	128	92	105	109
Tay	mm	22	89	47	81	56	115	151	197	184	188	125	32	93
	%	27	122	61	86	49	88	125	155	128	198	115	52	112
Forth	mm	21	75	59	80	56	90	127	203	150	167	91	30	62
	%	28	109	79	85	51	78	113	185	127	211	97	51	84
Tweed	mm	19	52	46	71	57	75	120	171	127	109	75	35	65
	%	27	80	63	81	64	79	129	184	127	163	95	61	92
Solway	mm	29	79	106	121	76	117	177	243	219	175	146	36	93
	%	34	94	118	102	53	75	123	164	140	173	125	47	109
Clyde	mm	38	143	97	142	98	128	186	312	258	248	192	47	80
	%	42	154	89	106	55	66	103	174	137	210	131	56	88

Note: The monthly rainfall figures for the NRA regions for April and May correspond to the MORECS areal assessments derived by the Meteorological Office. In northern England these initial assessments may have a particularly wide error band associated with them. The figures for the RPB regions for April and May 1995 were derived by IH in collaboration with the RPBs. The provisional figures for England and Wales and for Scotland are derived using a different raingauge network. 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

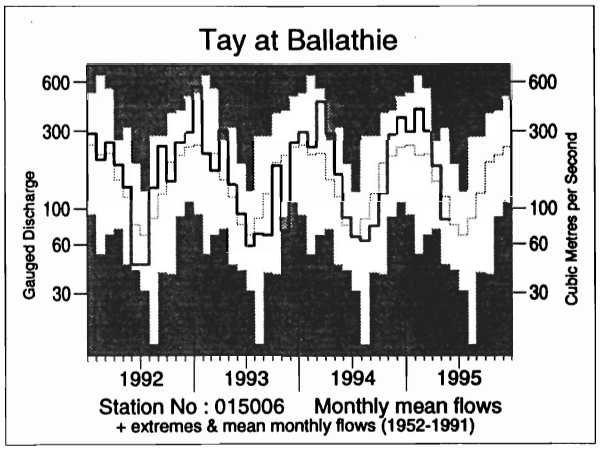
		Mar 95-May 95		Jan 95-May 95		Jun 94-May 95		Apr 93-May 95	
			Est Return Period, years		Est Return Period, years		Est Return Period, years		Est Return Period, years
England and Wales	mm	140		408		989		2254	
	% LTA	71	5-10	118	5-10	110	2-5	118	30-45
NRA REGIONS									
North West	mm	201		559		1366		2850	
	% LTA	83	2-5	127	5-10	114	5-10	112	5-10
Northumbria	mm	155		385		913		2080	
	% LTA	83	2-5	116	2-5	107	2-5	114	10-20
Severn Trent	mm	124		340		848		1929	
	% LTA	71	5-10	114	2-5	112	5-10	119	30-40
Yorkshire	mm	150		375		898		2030	
	% LTA	80	2-5	116	2-5	109	2-5	115	10-20
Anglian	mm	101		261		633		1543	
	% LTA	71	5-10	114	2-5	106	2-5	120	35-50
Thames	mm	106		325		723		1721	
	% LTA	65	5-10	120	5-10	105	2-5	116	10-20
Southern	mm	103		378		913		2099	
	% LTA	61	5-15	125	5-10	117	5-10	126	70-100
Wessex	mm	136		426		1003		2259	
	% LTA	74	5-10	127	5-10	120	5-10	126	70-100
South West	mm	185		578		1373		3211	
	% LTA	77	2-5	121	5-10	117	5-10	129	>200
Welsh	mm	202		618		1483		3282	
	% LTA	75	5-10	121	5-10	113	5-10	118	25-40
Scotland	mm	283		713		1594		3310	
	% LTA	99	2-5	132	30-45	111	5-10	109	5-10
RIVER PURIFICATION BOARDS									
Highland	mm	347		911		1961		3868	
	% LTA	101	2-5	138	40-60	111	5-10	104	2-5
North East	mm	210		429		922		2166	
	% LTA	101	2-5	116	5-10	95	2-5	104	2-5
Tay	mm	250		622		1358		2968	
	% LTA	98	2-5	126	5-10	110	2-5	114	10-20
Forth	mm	183		500		1190		2637	
	% LTA	81	2-5	118	5-10	107	2-5	112	10-15
Tweed	mm	175		411		1003		2331	
	% LTA	85	2-5	110	2-5	103	2-5	113	10-15
Solway	mm	275		669		1588		3328	
	% LTA	99	2-5	125	5-10	112	5-10	111	5-10
Clyde	mm	319		825		1931		3940	
	% LTA	99	2-5	131	20-35	114	5-10	110	5-10

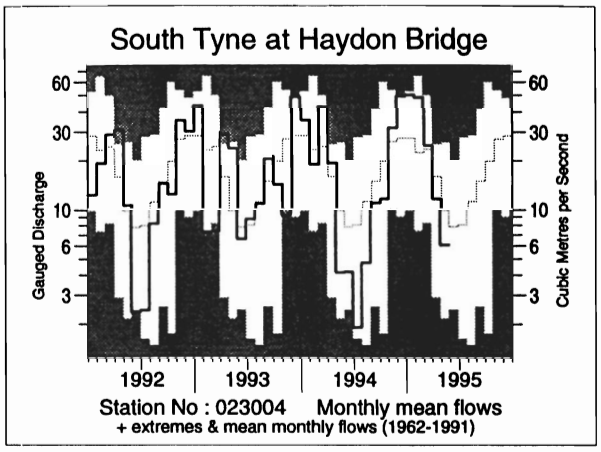
LTA refers to the period 1961-90.

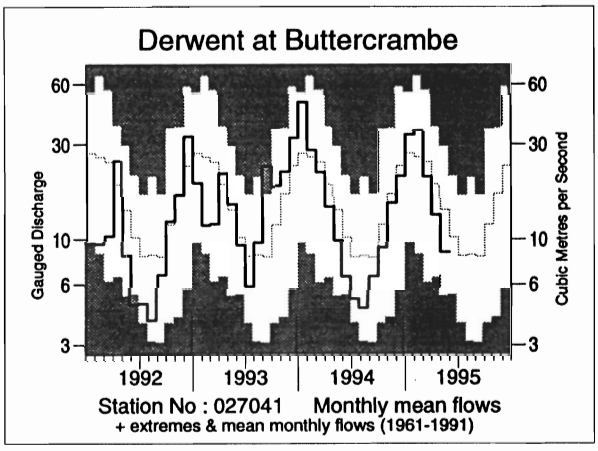
Return period assessments are based on tables provided by the Meteorological Office*. The tables reflect rainfall totals over the period 1911-70 only and the estimate assumes a sensibly stable climate. They assume a start in a specified month; return periods for a start in any month may be expected to be an order of magnitude less - for the longest durations the return period estimates converge. "Wet" return periods underlined.

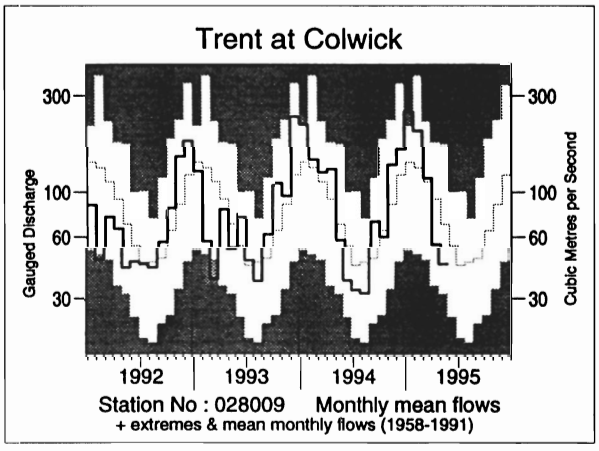
* Tabony, R.C., 1977, The Variability of long duration rainfall over Great Britain, Scientific Paper No. 37, Meteorological Office.

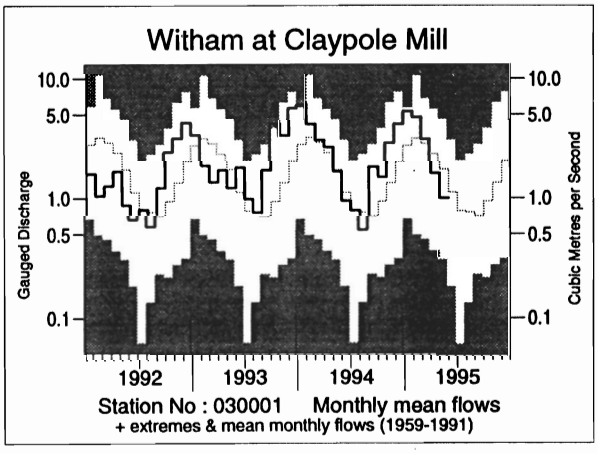
FIGURE 1 MONTHLY RIVER FLOW HYDROGRAPHS

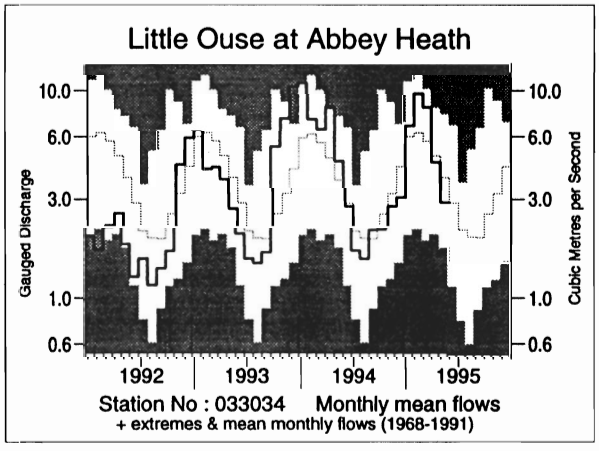


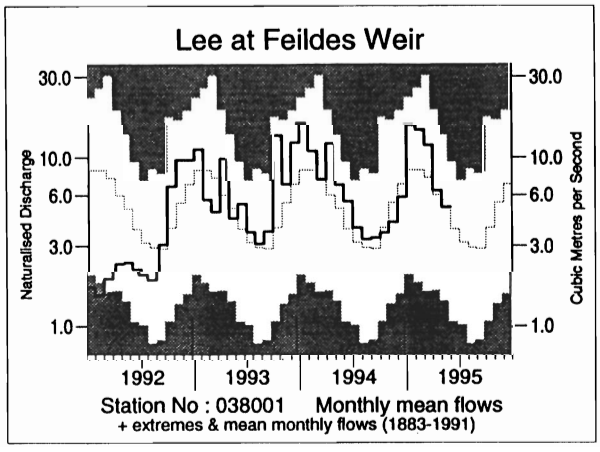


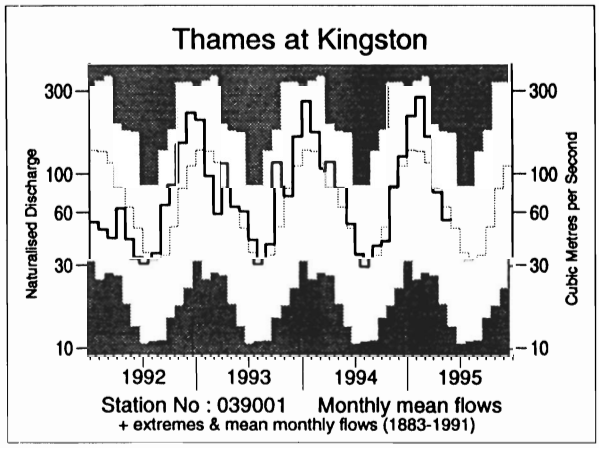


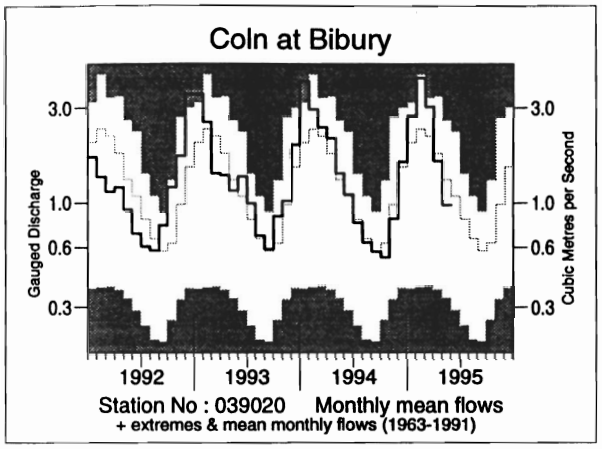


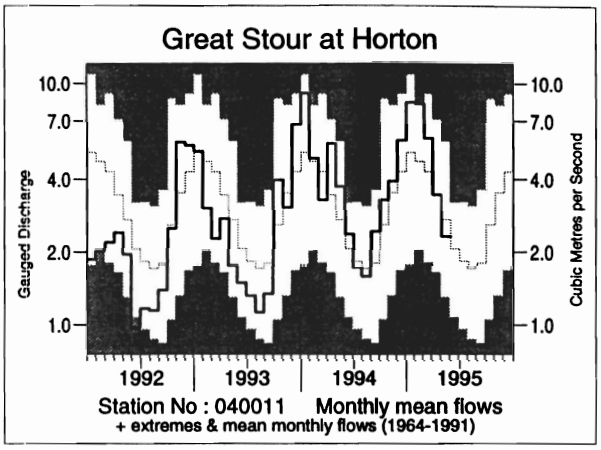


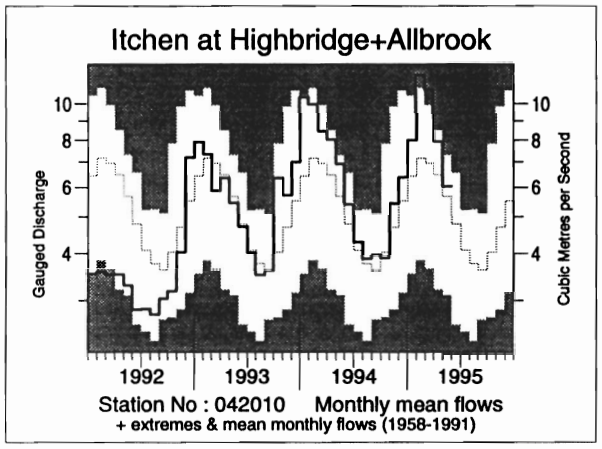


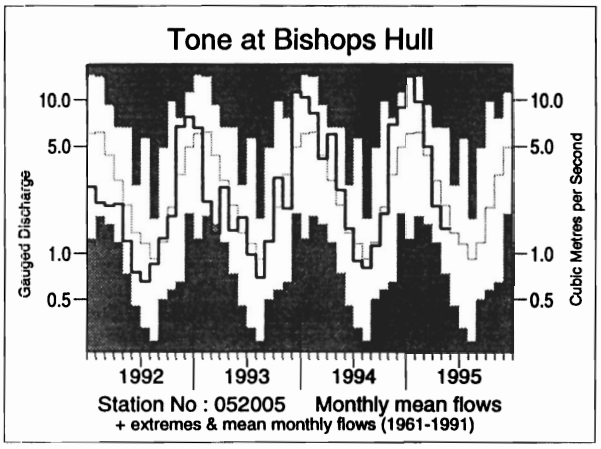


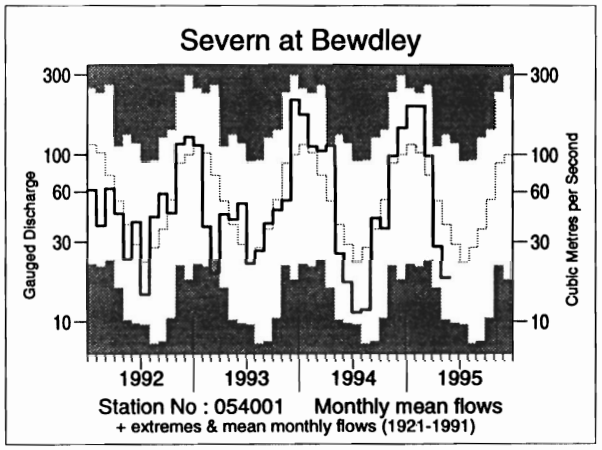


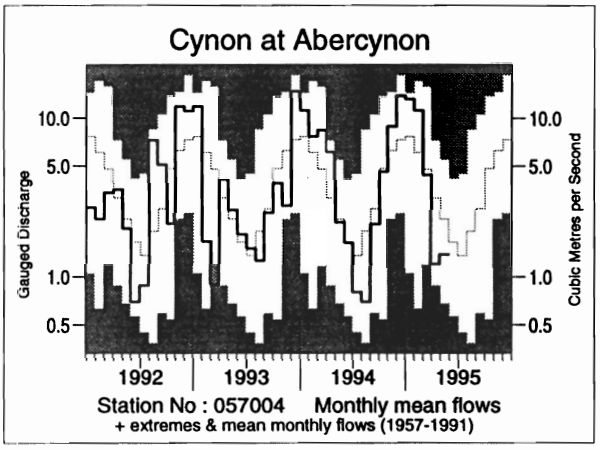

Coln at Bibury
Gauged Discharge
Cubic Metres per Second
3.0
1.0
0.6
0.3
1992
1993
1994
1995
Station No : 039020 Monthly mean flows
+ extremes & mean monthly flows (1963-1991)

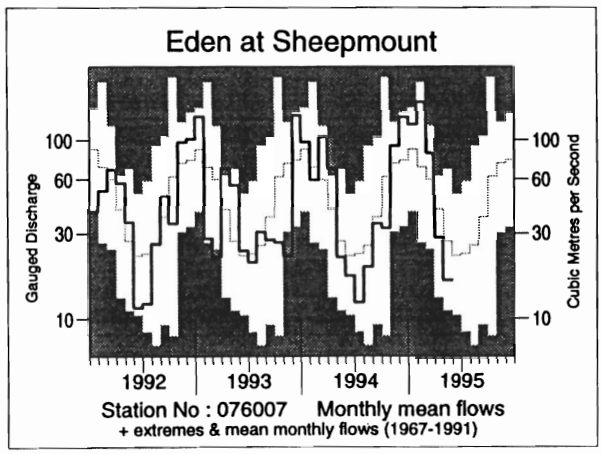

Great Stour at Horton
Gauged Discharge
Cubic Metres per Second
10.0
7.0
4.0
2.0
1.0
1992
1993
1994
1995
Station No : 040011 Monthly mean flows
+ extremes & mean monthly flows (1964-1991)


Itchen at Highbridge+Allbrook
Gauged Discharge
Cubic Metres per Second
10
8
6
4
1992
1993
1994
1995
Station No : 042010 Monthly mean flows
+ extremes & mean monthly flows (1958-1991)


Tone at Bishops Hull
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1992
1993
1994
1995
Station No : 052005 Monthly mean flows
+ extremes & mean monthly flows (1961-1991)


Severn at Bewdley
Gauged Discharge
Cubic Metres per Second
300
100
60
30
10
1992
1993
1994
1995
Station No : 054001 Monthly mean flows
+ extremes & mean monthly flows (1921-1991)


Cynon at Abercynon
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1992
1993
1994
1995
Station No : 057004 Monthly mean flows
+ extremes & mean monthly flows (1957-1991)


Eden at Sheepmount
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1992
1993
1994
1995
Station No : 076007 Monthly mean flows
+ extremes & mean monthly flows (1967-1991)

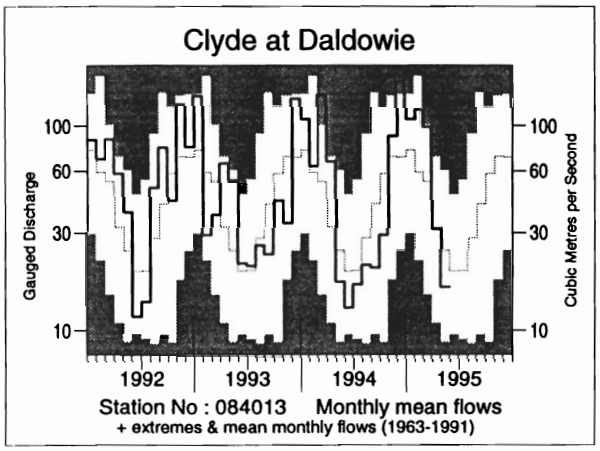

Clyde at Daldowie
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1992
1993
1994
1995
Station No : 084013 Monthly mean flows
+ extremes & mean monthly flows (1963-1991)

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	Jan 1995	Feb	Mar	Apr	May 1995		3/95 to 5/95		1/95 to 5/95		6/94 to 5/95		6/93 to 5/95	
	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 Park	81 87	98 136	84 88	67 84	55 88	13 /23	206 87	10 /23	385 95	9 /23	681 86	4 /22	1672 105	14 /21
Tay at Ballathie	174 116	217 189	176 134	105 118	50 72	15 /43	331 114	30 /43	723 129	39 /43	1342 117	37 /42	2636 115	34 /41
Tweed at Boleside	162 152	160 209	133 163	36 66	24 55	11 /35	193 107	22 /35	515 140	34 /35	944 123	33 /34	1863 122	32 /33
Whiteadder Water at Hutton Castle	43 71	47 100	24 49	19 50	13 48	5 /26	56 50	4 /26	146 67	5 /26	250 64	5 /25	753 96	10 /24
South Tyne at Haydon Bridge	181 177	158 216	92 105	40 69	22 60	12 /33	154 85	12 /33	493 136	33 /33	904 115	24 /31	1756 111	23 /29
Wharfe at Flint Mill Weir	163 164	152 204	91 119	26 47	13 35	4 /40	130 77	14 /40	445 129	36 /40	828 114	30 /39	1657 114	34 /38
Derwent at Buttercrambe	57 124	55 142	35 88	22 70	15 63	7 /34	71 76	8 /34	182 102	20 /34	296 91	15 /33	701 108	21 /32
Trent at Colwick	91 181	66 158	42 108	19 60	16 66	10 /37	77 81	12 /37	234 124	30 /37	423 118	28 /36	895 125	34 /35
Lud at Louth	38 126	45 136	44 129	25 83	20 80	12 /27	89 99	13 /27	172 112	15 /27	288 115	17 /26	676 136	22 /25
Witham at Claypole Mill	49 190	40 154	28 113	14 69	9 59	13 /37	52 85	15 /36	141 124	25 /36	254 136	29 /36	574 154	35 /35
Little Ouse at Abbey Heath	26 112	33 158	32 150	17 93	11 78	10 /28	60 110	19 /27	119 120	18 /27	180 105	17 /27	439 129	23 /26
Mimram at Panshanger Park	15 124	19 162	24 178	19 148	17 136	35 /43	59 152	40 /43	92 148	39 /43	176 140	41 /42	387 154	41 /41
Lee at Feildes Weir (natr.)	40 186	34 174	31 157	16 105	13 102	70 /110	60 126	84 /109	134 150	97 /109	209 128	83 /108	466 143	99 /106
Thames at Kingston (natr.)	58 156	67 204	44 143	20 91	15 84	52 /113	79 112	73 /113	204 144	101 /113	312 127	91 /112	650 132	103 /111
Coln at Bibury	69 129	97 180	77 145	39 93	24 75	8 /32	141 109	20 /32	306 129	28 /32	457 115	23 /31	960 120	27 /30
Great Stour at Horton	65 161	58 178	46 144	26 100	18 86	14 /31	90 114	21 /30	213 139	27 /30	376 128	25 /29	726 124	24 /27
Itchen at Highbridge+Allbrook	60 123	80 165	81 159	57 123	45 107	22 /37	183 130	36 /37	323 135	36 /37	567 123	33 /36	1140 124	34 /35
Stour at Throop Mill	120 192	122 212	70 142	26 73	16 70	7 /23	112 104	13 /23	354 152	23 /23	560 140	20 /22	1167 146	21 /21
Exe at Thorverton	239 181	171 167	101 120	29 50	20 54	13 /40	150 84	13 /39	560 134	38 /39	1092 130	36 /39	2290 137	38 /38
Taw at Umberleigh	208 177	145 172	85 126	21 47	11 39	7 /37	118 84	13 /37	471 136	36 /37	914 130	32 /36	2018 144	35 /35
Tone at Bishops Hull	189 235	117 162	66 118	26 67	19 72	13 /35	111 92	16 /35	417 150	34 /34	704 147	33 /34	1382 145	33 /33
Severn at Bewdley	121 170	109 192	61 131	17 53	11 49	13 /75	89 87	29 /74	320 138	71 /74	540 119	57 /74	1135 126	71 /73
Teme at Knightsford Bridge	118 180	83 163	53 113	10 31	6 29	1 /26	69 70	7 /25	270 124	22 /25	443 121	23 /25	907 124	23 /24
Cynon at Abercynon	334 171	257 190	111 92	29 37	35 60	14 /37	175 69	10 /37	766 129	33 /37	1582 124	32 /35	3179 125	33 /33
Dee at New Inn	390 163	292 180	144 79	38 35	45 67	13 /26	227 64	7 /26	909 119	22 /26	1999 110	18 /25	4015 111	20 /24
Eden at Sheepmount	143 138	172 239	99 139	32 65	19 58	6 /25	150 98	12 /25	466 139	24 /25	860 123	20 /23	1600 116	17 /21
Clyde at Daldowie	152 135	152 203	139 174	43 90	23 64	12 /32	205 124	23 /32	509 143	30 /32	1002 126	29 /31	1973 124	29 /30
Carron at New Kelso	383 119	445 213	289 99	188 127	61 64	8 /17	538 100	12 /17	1366 126	14 /17	2629 102	10 /16	4878 94	4 /15
Ewe at Poolewe	379 140	369 198	274 133	222 154	92 93	15 /25	587 129	21 /25	1335 145	22 /25	2483 115	18 /24	4518 104	14 /23

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 is rank 1.
(iii) %LT means percentage of long term average from the start of the record to 1992. For the long periods (at the right of this table), the end date for the long term is 1995.

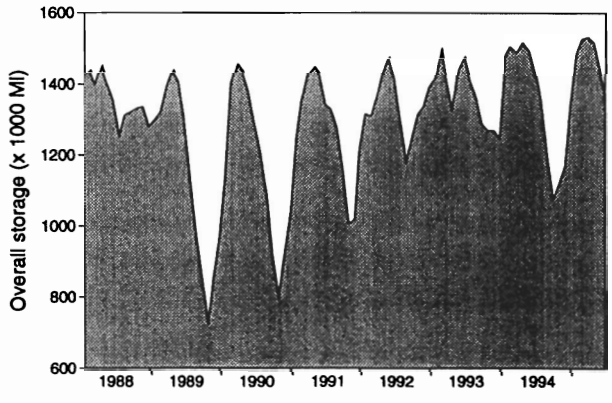
TABLE 4 START-MONTH RESERVOIR STORAGES UP TO JUNE 1995

Area	Reservoir (R)/ Group (G)		Capacity • (Ml)	1995 Jan	Feb	Mar	Apr	May	June	1994 June
North West	N.Command Zone[1]	(G)	133375	91	100	100	99	86	73	85
	Vyrnwy	(R)	55146	100	99	100	97	89	81	87
Northumbria	Teesdale[2]	(G)	87936	97	100	100	99	95	89	83
	Kielder	(R)	199175*	100*	100*	100*	97*	89*	90*	92*
Severn-Trent	Clywedog	(R)	44922	100	100	94	97	96	96	93
	Derwent Valley[3]	(G)	39525	100	100	100	100	97	86	90
Yorkshire	Washburn[4]	(G)	22035	92	100	100	98	88	78	89
	Bradford supply[5]	(G)	41407	88	99	99	98	89	70	83
Anglian	Grafham	(R)	58707	93	92	93	95	96	95	96
	Rutland	(R)	130061	95	96	95	91	87	83	95
Thames	London[6]	(G)	207569	92	94	95	97	95	96	88
	Farmoor [7]	(G)	13843	95	95	96	97	97	97	89
Southern	Bewl	(R)	28170	89	96	99	99	97	94	100
	Ardingly	(R)	4685	93	100	100	100	100	99	100
Wessex	Clatworthy	(R)	5364	100	100	100	100	85	69	88
	Bristol W [8]	(G)	38666*	88*	99*	99*	99*	94*	86*	94*
South West	Colliford	(R)	28540	81	90	96	97	93	88	96
	Roadford[9]	(R)	34500	79	91	97	96	92	85	92
	Wimbleball[10]	(R)	21320	100	100	100	100	95	89	99
	Stithians	(R)	5205	77	100	100	96	86	77	93
Welsh	Celyn + Brenig	(G)	131155	100	100	100	100	100	96	97
	Brianne	(R)	62140	100	100	100	100	97	85	96
	Big Five[11]	(G)	69762	92	97	100	99	86	79	93
	Elan Valley[12]	(G)	99106	100	100	100	95	99	90	95
Lothian	Edin./Mid Lothian[13]	(G)	97639	95	99	100	99	98	90	93
	East Lothian[14]	(G)	10206	91	98	100	100	100	96	95
Strathclyde	Loch Katrine	(G)	111363	98	97	99	100	92	85	86
	Daer	(R)	22412	100	100	100	96	91	85	70
	Loch Thom	(G)	11840	99	100	100	100	92	84	83

• Live or usable capacity (unless indicated otherwise) * Gross storage/percentage of gross storage

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. Roadford began filling in November 1989.
10. Shared between South West (river regulation for abstraction) and Wessex (direct supply).
11. Usk, Talybont, Llandegfedd (pumped stroage), Taf Fechan, Taf Fawr.
12. Claerwen, Caban Coch, Pen-y-garreg and Craig Goch.
13. Megget, Talla, Fruid, Gladhouse, Torduff, Clubbiedean, Glencorse,Loganlea and Morton (upper and lower).
14. Thorters, Donolly, Stobshiel, Lammerloch, Hopes and Whiteadder

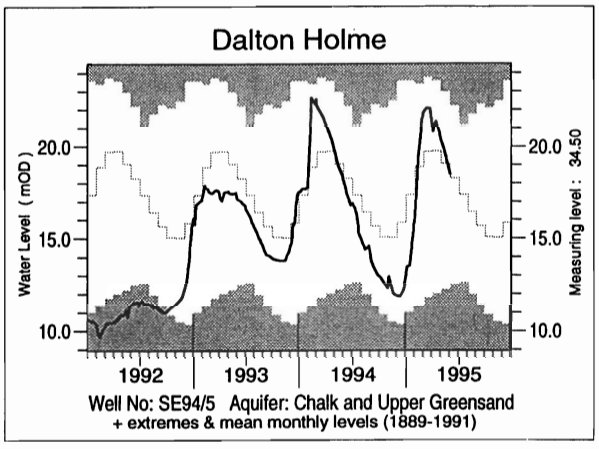
A GUIDE TO THE VARIATION IN OVERALL RESERVOIR STOCKS FOR ENGLAND AND WALES

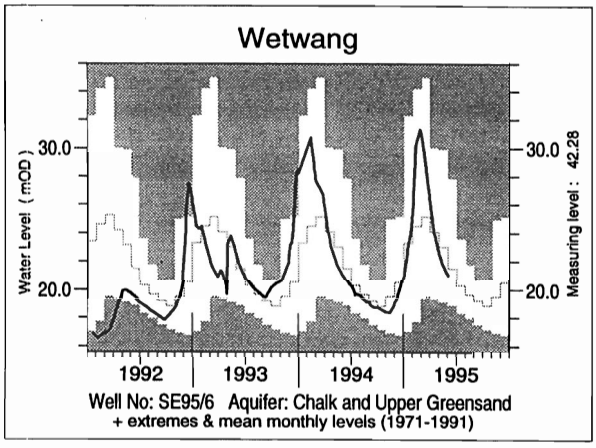


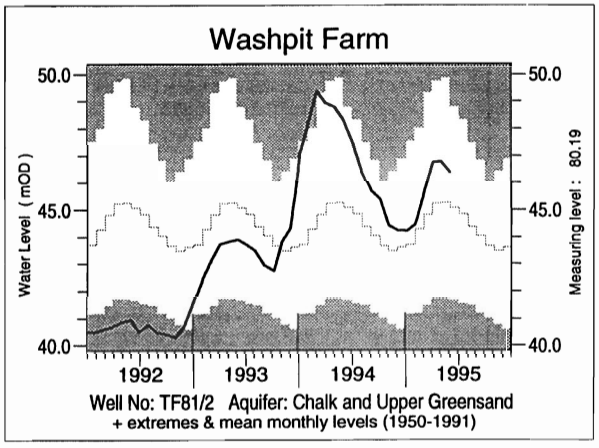
This plot is based on the reservoirs featured in Table 4 only.

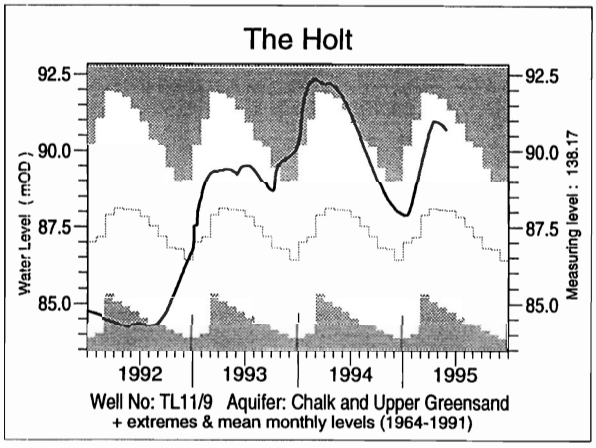
Note: Variations in storage depend on the balance between inputs (from catchment rainfall and any pumping) and outputs (to supply, compensation flow, HEP, amenity). There will be additional losses due to evaporation, especially in the summer months. Operational strategies for making the most efficient 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.

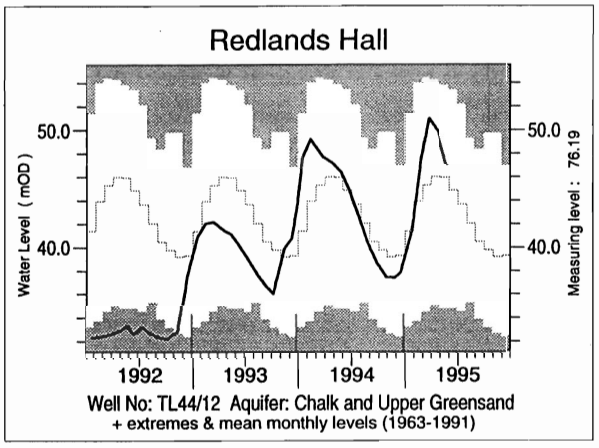
FIGURE 2 GROUNDWATER LEVEL HYDROGRAPHS

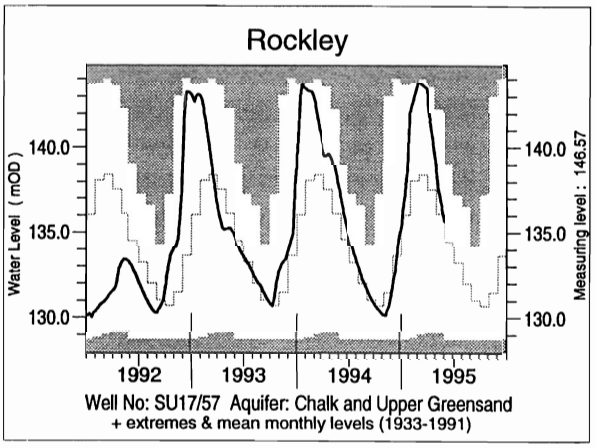


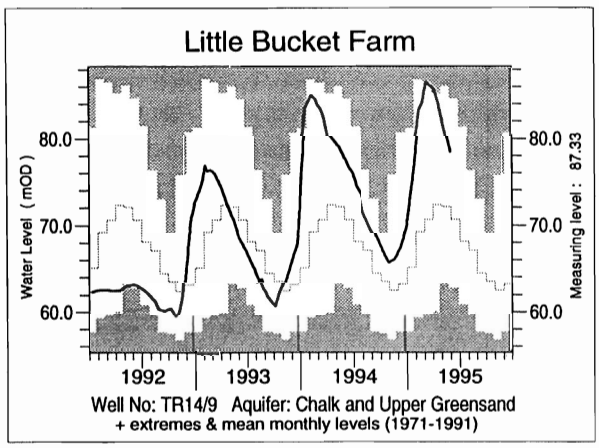


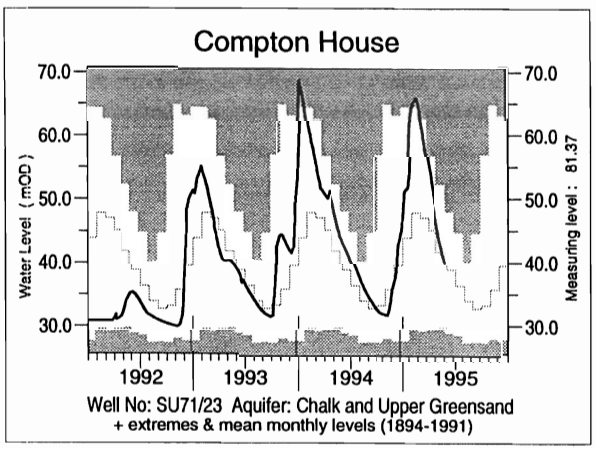


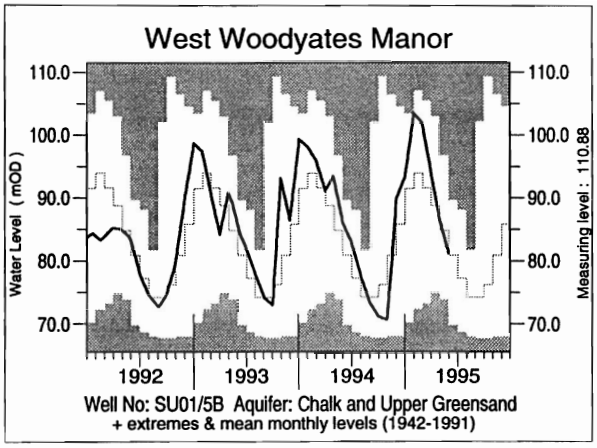


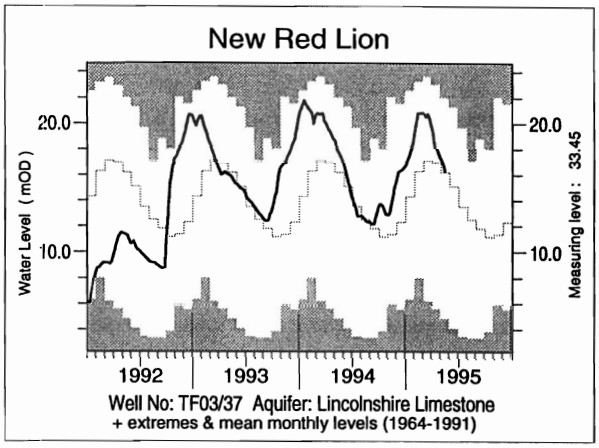


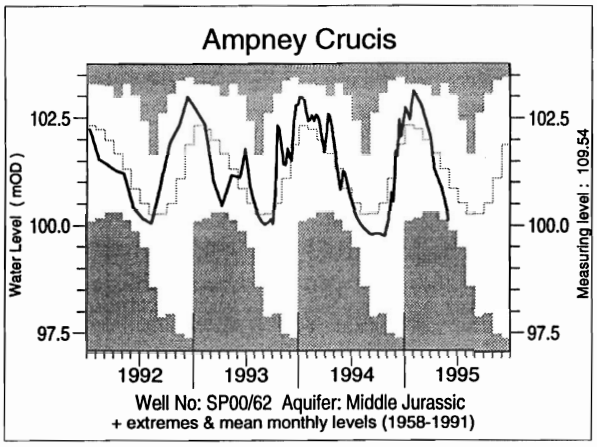


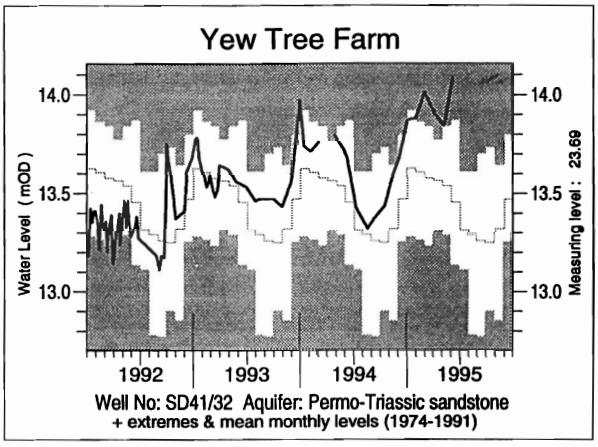


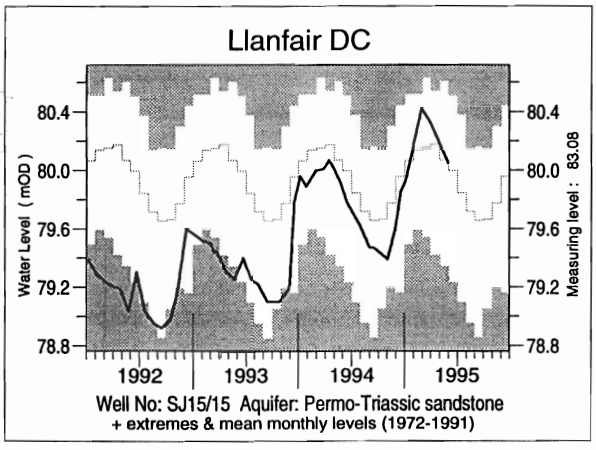


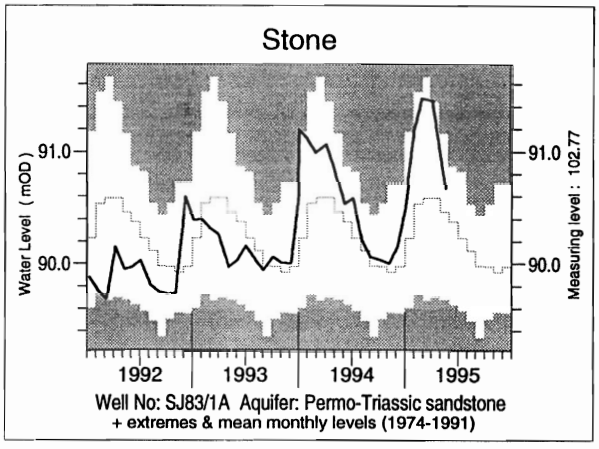

West Woodyates Manor
Water Level (mOD)
110.0
100.0
90.0
80.0
70.0
Measuring level : 110.88
1992
1993
1994
1995
Well No: SU01/5B Aquifer: Chalk and Upper Greensand
+ extremes & mean monthly levels (1942-1991)

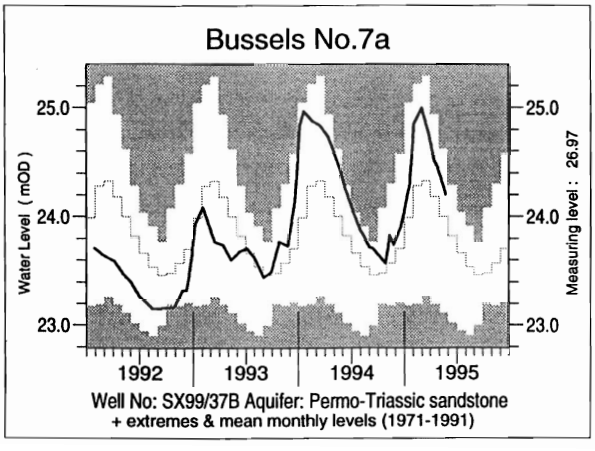

New Red Lion
Water Level (mOD)
20.0
10.0
Measuring level : 33.45
1992
1993
1994
1995
Well No: TF03/37 Aquifer: Lincolnshire Limestone
+ extremes & mean monthly levels (1964-1991)


Ampney Crucis
Water Level (mOD)
102.5
100.0
97.5
Measuring level : 109.54
1992
1993
1994
1995
Well No: SP00/62 Aquifer: Middle Jurassic
+ extremes & mean monthly levels (1958-1991)


Yew Tree Farm
Water Level (mOD)
14.0
13.5
13.0
Measuring level : 23.69
1992
1993
1994
1995
Well No: SD41/32 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1974-1991)


Llanfair DC
Water Level (mOD)
80.4
80.0
79.6
79.2
78.8
Measuring level : 83.08
1992
1993
1994
1995
Well No: SJ15/15 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1972-1991)


Stone
Water Level (mOD)
91.0
90.0
Measuring level : 102.77
1992
1993
1994
1995
Well No: SJ83/1A Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1974-1991)


Bussels No.7a
Water Level (mOD)
25.0
24.0
23.0
Measuring level : 26.97
1992
1993
1994
1995
Well No: SX99/37B Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1991)

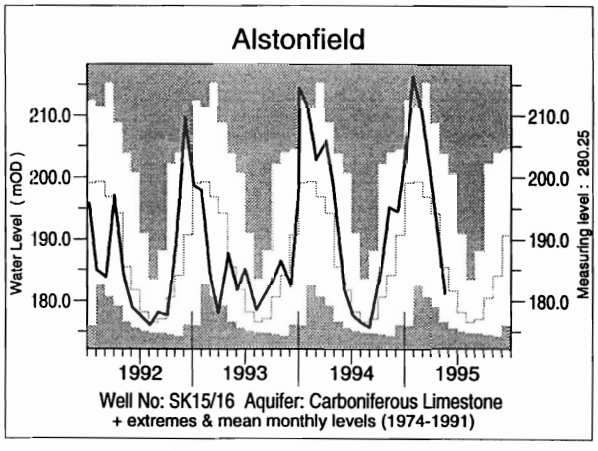

Alstonfield
Water Level (mOD)
210.0
200.0
190.0
180.0
Measuring level : 280.25
1992
1993
1994
1995
Well No: SK15/16 Aquifer: Carboniferous Limestone
+ extremes & mean monthly levels (1974-1991)

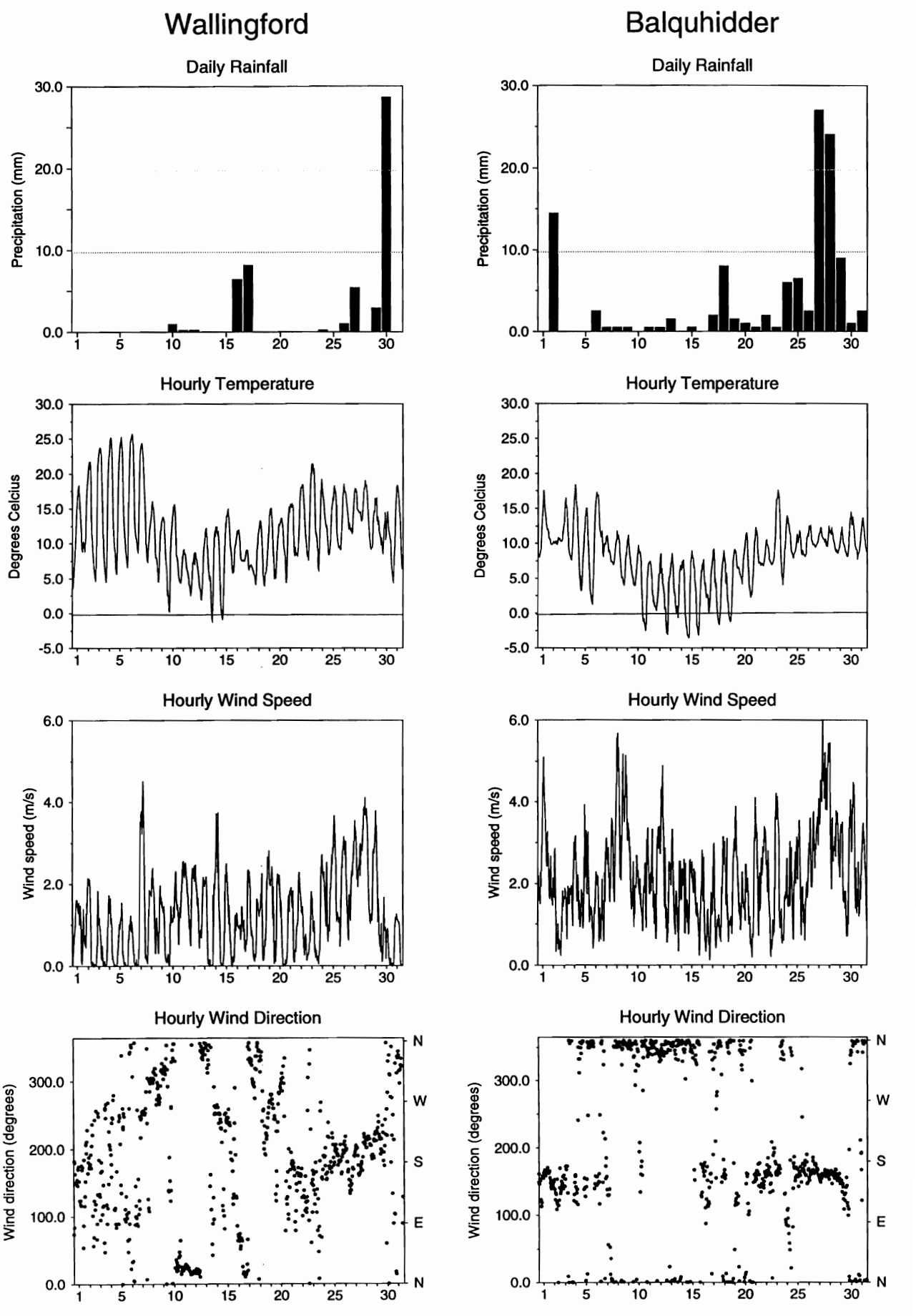
TABLE 5 A COMPARISON OF MAY GROUNDWATER LEVELS: 1994 AND 1995

Site	Aquifer	Records commence	Minimum May	Average May	Maximum May	May 1994		May/June 1995	
			<1995	<1995	<1995	day	level	day	level
Dalton Holme	C & UGS	1889	10.77	19.11	22.99	27/05	18.41	01/06	18.46
Wetwang	C & UGS	1971	19.14	23.52	30.02	27/05	21.29	01/06	21.11
Washpit Farm	C & UGS	1950	40.87	45.35	49.90	03/05	48.81	01/06	46.43
The Holt	C & UGS	1964	84.26	88.30	92.18	31/05	91.88	29/05	90.77
Therfield Rectory	C & UGS	1883	dry <71.6	81.57	97.72	02/05	87.26	22/05	88.00
Redlands Hall	C & UGS	1964	33.34	45.03	53.89	27/05	46.37	26/05	47.07
Rockley	C & UGS	1933	129.16	136.10	142.36	31/05	137.25	29/05	135.66
Little Bucket Farm	C & UGS	1971	62.84	72.37	86.15	15/05	78.91	30/05	78.40
Compton House	C & UGS	1984	29.71	41.25	52.55	25/05	45.66	31/05	40.31
Chilgrove House	C & UGS	1836	37.49	47.37	66.52	25/05	53.48	31/05	47.47
Westdean No.3	C & UGS	1940	1.24	1.88	2.84	28/05	2.36	26/05	2.00
Lime Kiln Way	C & UGS	1969	124.02	125.42	126.17	19/05	125.84	17/05	126.18
Ashton Farm	C & UGS	1974	65.29	68.66	70.33	31/05	68.94	30/05	67.30
West Woodyates Manor	C & UGS	1942	73.74	84.57	96.74	31/05	85.97	30/05	81.24
Killyglen (NI)	C & UGS	1985	113.57	114.52	116.30	31/05	113.57	14/05	113.63
New Red Lion	LLst	1964	4.80	16.05	22.00	26/05	17.26	15/05	16.32
Ampney Crucis	Mid Jur	1958	100.12	101.26	103.30	31/05	101.25	02/06	100.11
Yew Tree Farm	PTS	1973	13.07	13.55	13.84	26/05	13.72	08/06	14.09
Llanfair D.C	PTS	1972	79.03	79.94	80.60	25/05	79.91	31/05	80.05
Morris Dancers	PTS	1969	31.85	32.47	33.50	13/05	32.25	15/05	32.56
Weeford Flats	PTS	1966	dry <88.61	90.04	91.61	04/05	90.31	23/05	90.60
Stone	PTS	1974	89.67	90.47	91.16	05/05	90.83	22/05	90.67
Skirwith	PTS	1978	130.20	130.65	130.98	15/05	130.92	01/06	130.93
Redbank	PTS	1981	7.92	8.32	8.80	no	level	29/05	7.32
Bussels No.7A	PTS	1972	23.11	23.98	24.62	25/05	24.42	24/05	24.20
Rushyford NE	MgLst	1967	65.31	72.72	76.75	31/05	76.63	24/05	76.59
Peggy Ellerton	MgLst	1968	31.45	34.55	37.24	25/05	34.33	12/05	34.72
Alstonfield	CLst	1974	176.53	186.64	203.79	03/05	196.86	19/05	181.25

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

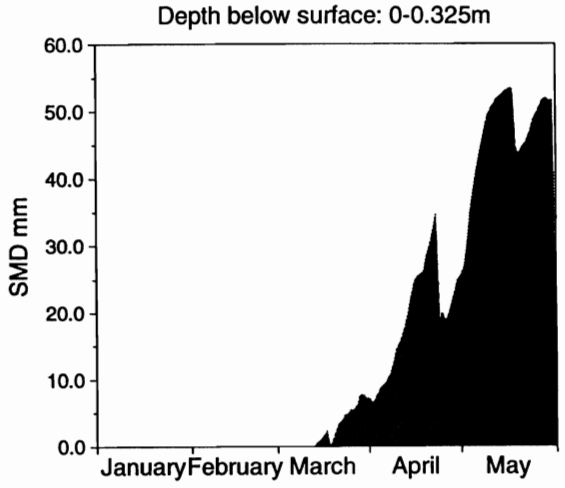
FIGURE 3 METEOROLOGICAL SUMMARY - MAY 1995

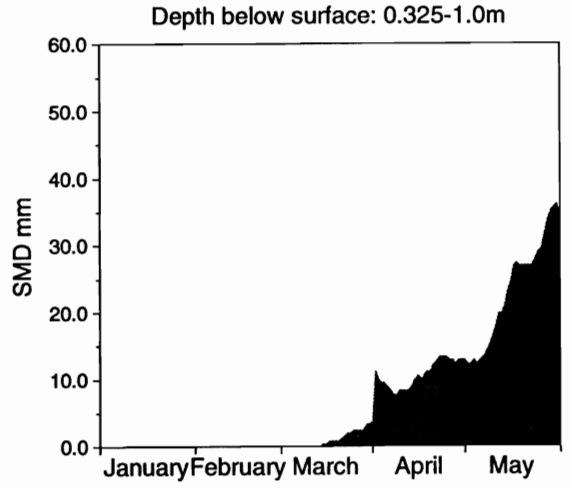


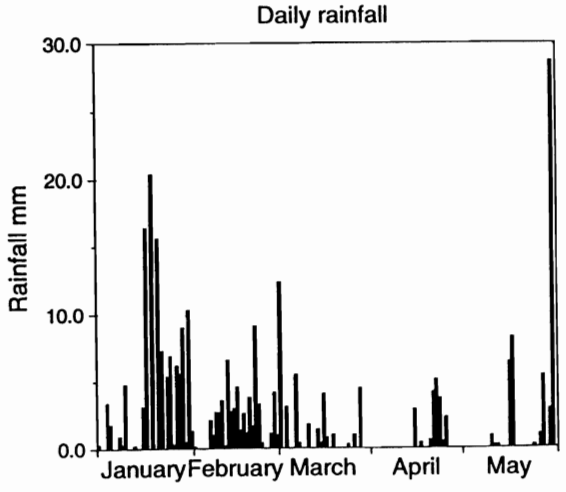
The Institute of Hydrology Meteorological Station occupies a relatively open site on the Thames floodplain about 5km NW of the Chilterns escarpment. Station elevation is 48m aOD and average annual rainfall is 590mm.

The Lower Kirkton automatic weather station (Balquhidder) occupies a relatively sheltered position at the mouth of the SSE trending Kirkton Glen. Station elevation is 270m aOD and average annual rainfall exceeds 2000mm; snow cover is expected for 10-30 days a year.

FIGURE 3a. WALLINGFORD SMD DATA 1995.







Note

Soil moisture deficit is defined as the amount by which the water stored in the soil is below the quantity held at field capacity. The data presented here are calculated from readings taken at the two automatic soil water stations (ASWSs) at Wallingford. They employ capacitance soil water sensors installed at depths of 5, 15 and 50 cm. Figure 3a shows deficits calculated from one of the stations for the depth ranges 0 - 0.325 m and 0.325 - 1.00 m at 0100 GMT on each day; slight discontinuities in the SMD trace can occur when switching between the ASWSs. The data presented give a good representative picture of soil moisture variations - avoiding the short term changes that can be dominant close to the surface.

Daily rainfall for the Wallingford meteorological station from Figure 3 is repeated here for comparison.

FIGURE 4 LOCATION MAP OF GAUGING STATIONS AND GROUNDWATER INDEX WELLS