Hydrological Summary for Great Britain

AUGUST 1996

Rainfall

August was a warm but generally unsettled month. The GB rainfall total was close to the 1961-90 average but spatial variations were large, especially in southern and eastern regions where, locally, thunderstorms produced some notably high precipitation totals. From the 6-10th, widespread and heavy showers followed in the wake of a slow moving cold front. On the 12th a thunderstorm produced >100 mm in four hours (including 90 mm in two) in Folkestone, severe local flooding resulted. After a hot, dry interlude in mid-month low pressure dominated until month-end; parts of eastern England experienced notably wet conditions - Norwich recorded 80 mm over the 28/29th; Folkestone was again very wet. The unsettled end to the summer constituted a significant drought break in a few eastern localities but August rainfall totals were only around 50% of average in parts of the Midlands and Scotland. The June-August period - though twice as wet as 1995 in E & W - was relatively dry throughout Britain and long term deficiencies continued to build in most regions. August was only the third month with above average rainfall for E & W since February 1995; the April '95-Aug '96 total is the lowest for *any* 17-month sequence in the 228-year national series with the exception of 1975/76. Deficiencies remain most notable in northern England where 15-18 month accumulations are unprecedented in a number of reservoired catchments; in parts of north Wales the 1933/34 drought minima has been eclipsed. The drought also remains severe in much of the Midlands, East Anglia and parts of central southern England. In Scotland the Nov-Aug rainfall total was the second lowest this century and the 10-month rainfall deficiency is extreme in large parts of the north.

River Flow

As is often the case during an unsettled August significant, but very localised, flooding coexisted with generally depressed monthly runoff rates. In a few responsive southern catchments (e.g. the Mole) flows increased relative to July but most index gauging stations reported decreased monthly runoff. August runoff totals were typically only 30-60% of the long term average and low flows restricted abstractions in a number of river basins (in the Midlands particularly). Nonetheless, the August flows were mostly well above the corresponding figures for last year. Exceptions include a number of Midland rivers (e.g. the Derwent) and spring-fed rivers in East Anglia. The nationwide runoff for August was not exceptionally low but accumulated runoff totals for individual catchments underline the severity and regional character of the drought. The summer (Jun-Aug) runoff total was close to the lowest on record in many eastern catchments; unprecedented on the South Tyne, Yorkshire Derwent and the River Stringside (Norfolk). In the 8, 12 and 16-month timeframes depressed runoff totals are more spatially extensive but confirm the continuing focus of the drought in a zone from the North West through to the East Midlands - large deficiencies also exist in north Wales, parts of Kent and in northern Scotland - runoff totals for the year thus far are the lowest on record in the Ewe and Carron basins.

Groundwater

The spring and summer of 1996 has been much cooler and wetter than last year but, as a consequence of very limited recharge over the 1995/96 winter, groundwater levels are substantially lower than last year's minima throughout much of Britain away from the South-West. In a zone stretching from the Yorkshire Wolds to Kent early autumn levels in the Chalk are, typically, close to those registered in 1976 and during the terminal phase of the 1988-92 drought. Water-tables in the more westerly Chalk outcrops are also below average but still well within the normal range. Generally this is true of the Middle Jurassic and Lincolnshire Limestones also. By contrast, levels in the Permo-Triassic sandstones of north Wales and the Eden Valley are at or below the preceding minima (but records are of rather of limited length). Levels are also depressed in the Carboniferous Limestone of Derbyshire. The late-August storms dramatically reduced soil moisture deficits in a few eastern localities but over much of central England remaining deficits are the equivalent of around two months average rainfall, thus no early recovery in water-tables (or lowland runoff) may be anticipated.

General

Wetter and cooler conditions this summer have moderated water demand relative to last year and overall reservoir stocks are considerably greater than in 1995 (1989 and 1990 also). However, the short term resources outlook is fragile in a number of areas (northern England especially) and limited groundwater recharge over the coming winter would create much more widespread concern regarding prospects for next summer.

Institute of Hydrology

British Geological Survey

Data for this report have been provided principally by the regional divisions of the newly formed Environment Agency (England and Wales) and the Scottish Environment Protection Agency. For reasons of consistency and to provide greater spatial discrimination, the original regional divisions of the precursor organisations have been retained for use in the Hydrological Summaries. The majority of the areal rainfall figures have been provided by the Meteorological Office. Figure 3 is based on weather data collected by the Institute of Hydrology at Wallingford, Balquhidder (Central Region, Scotland) and Plynlimon. Reservoir contents information has been supplied by the Water Services Companies, the Environment Agency and, in Scotland, West of Scotland Water Authority and East of Scotland Water.

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, the Environment Agency, the Scottish Environment Protection Agency and the Office of Water Services (OFWAT).

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. The text of the monthly report, together with details of other National Water Archive facilities, is available on the World Wide Web: http://www.nwl.ac.uk:80/~nrfadata/nwa.html

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 raingauge 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 September 1996

TABLE 1 1995/96 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.

		Aug 1995	Sep	Oct	Nov	Dec	Jan 1996	Feb	Mar	Apr	May	Jun	Jul	Aug
England and Wales	mm	10	113	58	83	84	65	82	44	49	57	30	42	84
	%	13	147	68	92	89	74	130	61	82	89	46	68	111
North West	mm	18	97	105	76	42	55	105	36	71	56	48	62	84
	%	17	84	82	62	34	45	135	38	100	75	60	73	78
Northumbrian	mm	12	111	57	118	79	46	89	33	63	53	33	50	67
	%	15	152	75	137	98	55	151	47	113	85	54	77	83
Severn Trent	mm	9	94	39	65	81	45	66	42	49	48	30	33	61
	%	13	147	61	92	105	64	122	69	89	81	51	63	92
Yorkshire	mm	9	96	29	65	70	48	78	31	41	52	49	41	80
	%	12	141	40	81	84	61	134	46	69	87	82	70	107
Anglian	mm	8	101	15	42	69	34	49	20	15	23	19	41	76
	%	15	206	29	72	125	68	132	43	33	48	37	84	137
Thames	mm	4	117	34	64	96	52	63	35	35	34	18	42	66
	%	7	198	55	98	137	81	140	63	70	61	32	86	113
Southern	mm	5	140	33	65	95	69	70	42	23	51	18	42	82
	%	9	203	41	76	116	86	130	67	43	94	33	87	145
Wessex	mm	10	144	68	124	104	77	84	68	57	59	25	24	72
	%	15	200	86	149	112	89	129	97	108	97	44	47	109
South West	mm	16	136	104	134	126	157	118	73	78	99	34	31	84
	%	19	146	90	107	91	114	117	74	113	138	49	45	100
Welsh	mm	14	125	115	133	103	102	121	72	85	104	41	42	97
	%	14	109	84	94	67	71	125	67	106	127	51	54	96
Scotland	mm	34	198	228	126	55	90	140	59	107	77	57	62	53
	%	29	139	146	83	36	60	137	47	141	90	67	66	46
Highland	mm	45	251	246	160	48	61	149	55	110	83	65	76	57
	%	35	147	124	79	24	32	117	34	121	90	66	72	45
North East	mm	27	297	103	100	70	75	114	57	62	66	27	43	43
	%	31	341	106	101	75	76	175	73	103	96	41	59	49
Tay	mm	20	178	220	120	68	132	117	79	106	64	41	46	53
	%	21	156	169	99	54	92	123	72	171	77	56	60	56
Forth	mm	21	136	199	90	54	73	82	52	86	70	40	45	52
	%	22	124	173	80	49	62	104	55	146	95	58	60	55
Tweed	mm	23	123	134	97	64	72	104	30	78	63	29	44	47
	%	26	138	141	104	69	72	155	38	137	89	45	60	53
Solway	mm	23	102	249	113	52	134	157	73	133	80	80	62	63
	%	19	71	159	78	35	86	155	62	173	94	95	69	53
Clyde	mm	40	138	324	119	47	117	181	62	138	90	82	73	53
	%	30	77	168	66	26	62	153	42	164	99	88	67	40

Note: The monthly regional rainfall figures for England and Wales for July & August 1996 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, especially when snow is a significant component in the precipitation total. The figures for the Scottish regions (and also for Scotland) for July & August 1996 were derived by IH in collaboration with the SEPA regions. 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

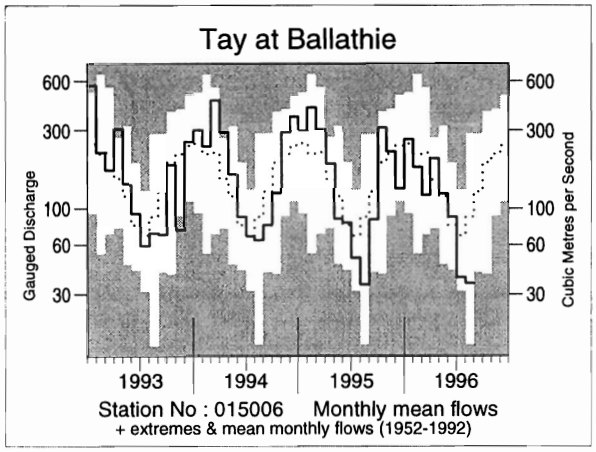
		Jun 96-Aug 96		Mar 96-Aug 96		Jan 96-Aug 96		Apr 95-Aug 96	
		Est Return Period, years		Est Return Period, years		Est Return Period, years		Est Return Period, years	
England and Wales	mm	155		305		450		937	
	% LTA	77	5-10	77	5-15	82	5-10	77	50-70
North West	mm	191		354		512		1047	
	% LTA	70	5-10	69	20-30	72	20-30	65	>200
Northumbria	mm	139		288		423		950	
	% LTA	68	5-15	73	10-20	79	5-15	81	20-30
Severn Trent	mm	125		264		374		779	
	% LTA	70	5-10	74	5-15	78	5-15	74	50-80
Yorkshire	mm	156		280		404		796	
	% LTA	81	2-5	74	5-15	78	5-15	70	>200
Anglian	mm	135		193		275		606	
	% LTA	87	2-5	65	25-40	72	20-30	72	80-120
Thames	mm	123		227		340		757	
	% LTA	76	2-5	70	5-15	79	5-10	79	15-25
Southern	mm	140		256		393		823	
	% LTA	88	2-5	78	5-10	85	2-5	79	15-25
Wessex	mm	127		311		471		1049	
	% LTA	72	5-10	86	2-5	92	2-5	93	2-5
South West	mm	150		400		674		1361	
	% LTA	68	5-10	87	2-5	96	2-5	89	5-10
Welsh	mm	186		447		670		1370	
	% LTA	72	5-10	85	2-5	87	2-5	79	25-40
Scotland	mm	180		423		652		1573	
	% LTA	61	25-35	72	35-45	78	20-25	83	30-40
Highland	mm	216		464		671		1755	
	% LTA	65	15-25	69	30-50	68	80-120	77	80-120
North East	mm	118		303		486		1329	
	% LTA	52	50-70	70	30-40	81	30-40	100	<2
Tay	mm	140		389		642		1482	
	% LTA	57	20-30	78	5-10	87	2-5	92	2-5
Forth	mm	140		348		502		1209	
	% LTA	59	20-30	75	30-40	76	15-25	82	20-30
Tweed	mm	122		293		465		1085	
	% LTA	54	30-40	68	25-35	78	10-15	82	15-25
Solway	mm	200		486		778		1564	
	% LTA	68	10	85	2-5	94	2-5	83	15-20
Clyde	mm	214		504		804		1790	
	% LTA	64	15-20	77	10-15	83	5-10	81	30-40

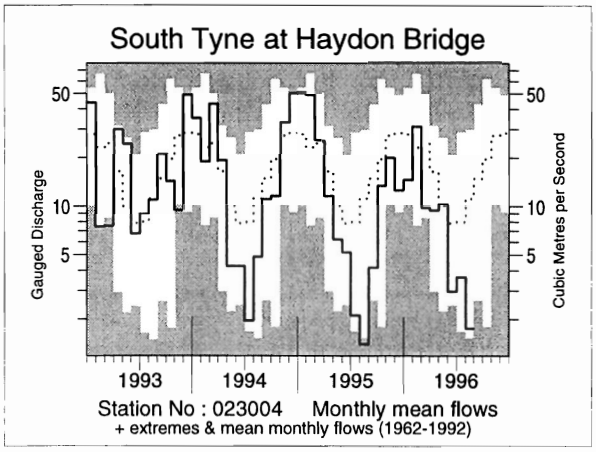
LTA refers to the period 1961-90.

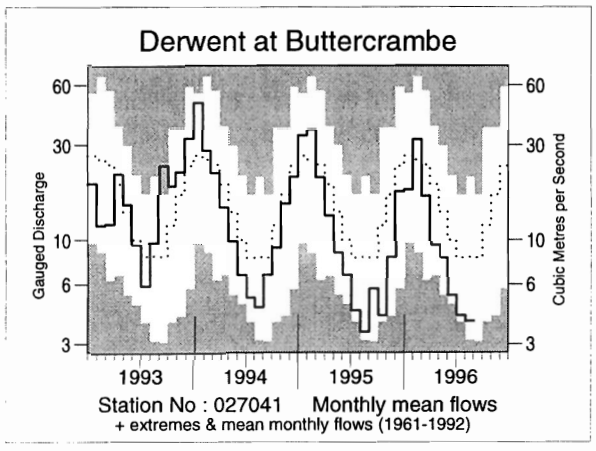
Return period assessments are based on tables provided by the Meteorological Office*. The tables reflect rainfall totals over the period 1911-70 only and the estimate assumes a sensibly stable climate. They assume a start in a specified month; return periods for a start in any month may be expected to be an order of magnitude less - for the longest durations the return period estimates converge. "Wet" return periods underlined. The ranking of accumulated rainfall totals for England & Wales and for Scotland can be affected by artifacts in the historical series - on balance these tend to exaggerate the relative wetness of the recent past.

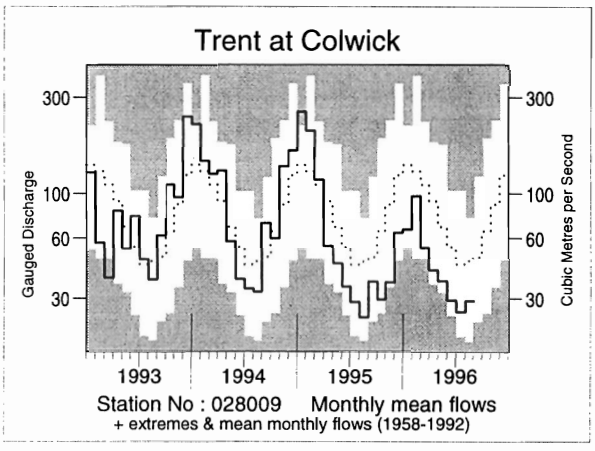
* Tabony, R.C., 1977, The Variability of long duration rainfall over Great Britain, Scientific Paper No. 37, Meteorological Office.

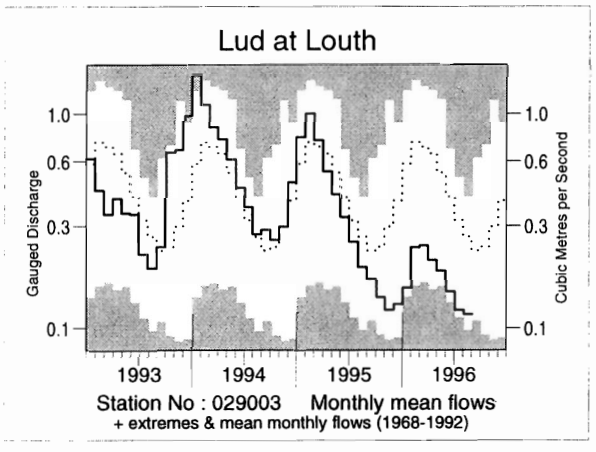
FIGURE 1 MONTHLY RIVER FLOW HYDROGRAPHS

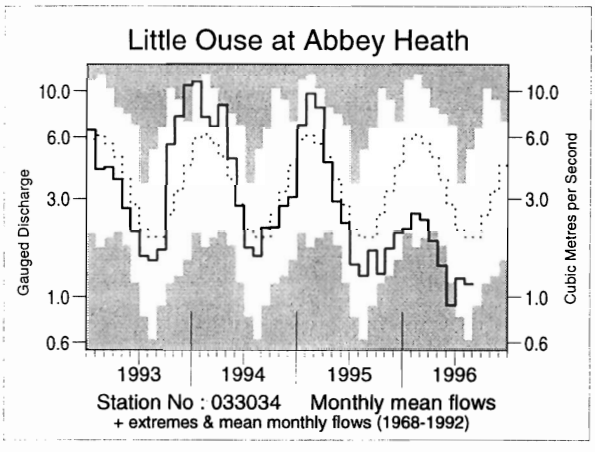


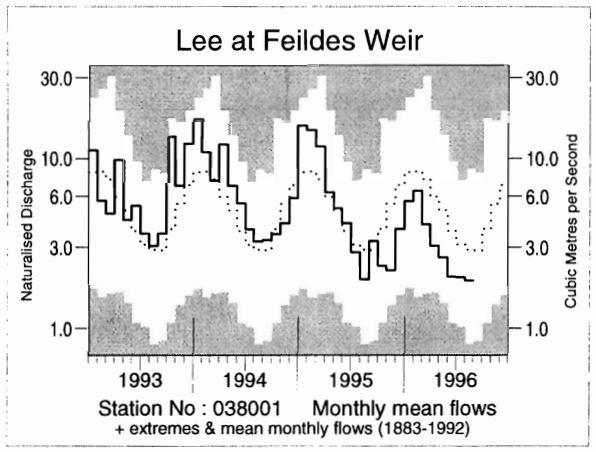


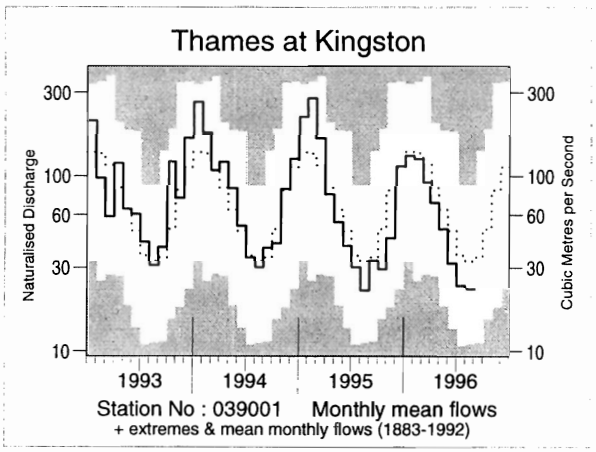


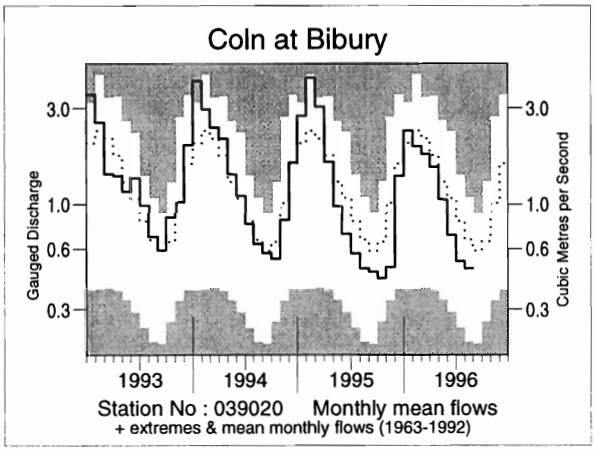


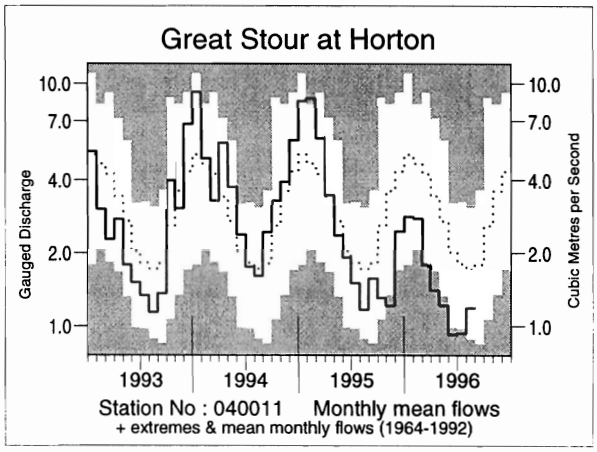


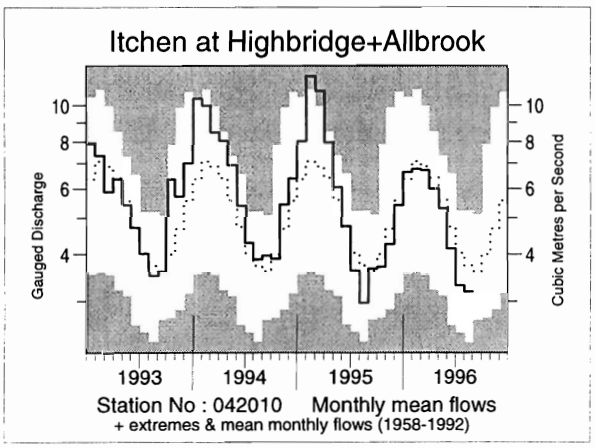


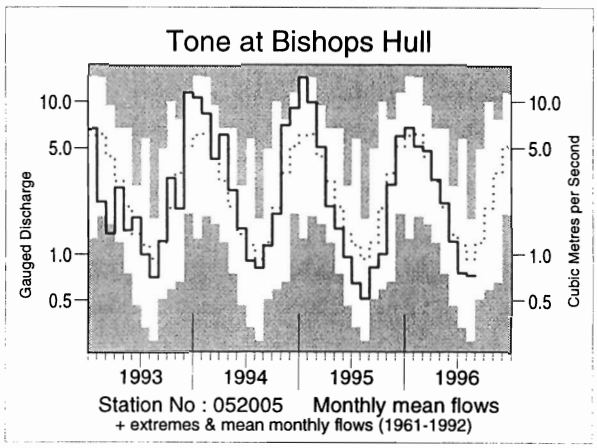


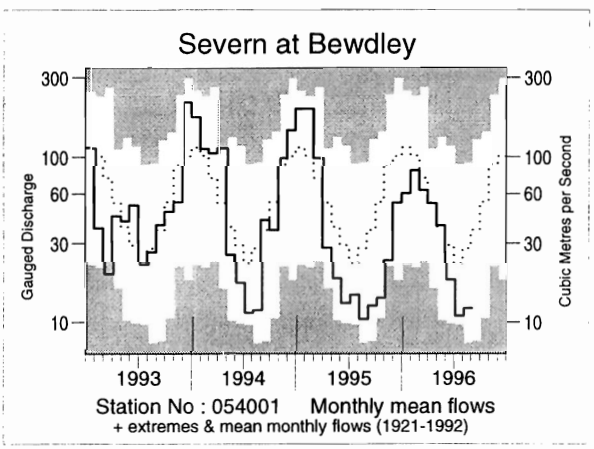


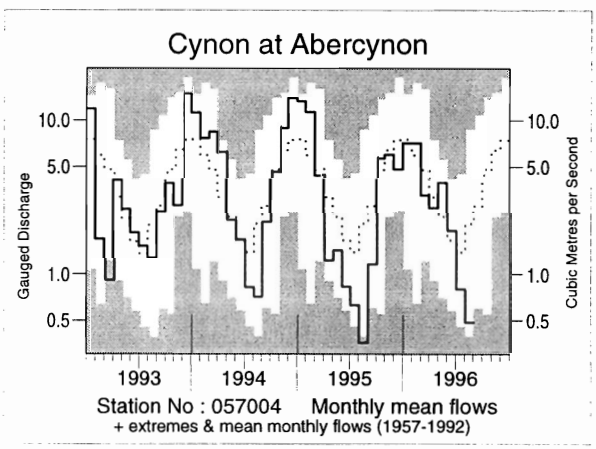

Coln at Bibury
Gauged Discharge
Cubic Metres per Second
3.0
1.0
0.6
0.3
1993
1994
1995
1996
Station No : 039020 Monthly mean flows
+ extremes & mean monthly flows (1963-1992)

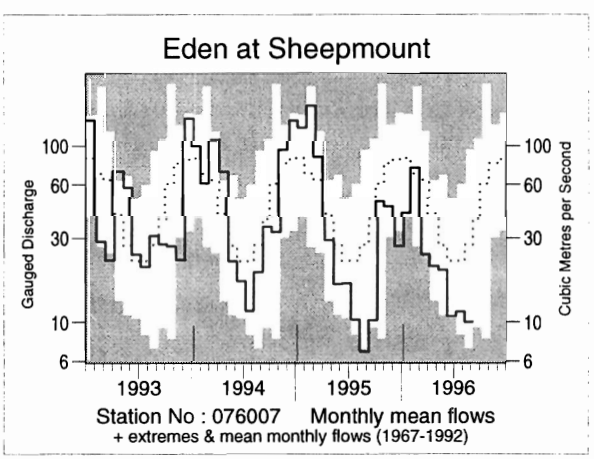

Great Stour at Horton
Gauged Discharge
Cubic Metres per Second
10.0
7.0
4.0
2.0
1.0
1993
1994
1995
1996
Station No : 040011 Monthly mean flows
+ extremes & mean monthly flows (1964-1992)


Itchen at Highbridge+Allbrook
Gauged Discharge
Cubic Metres per Second
10
8
6
4
1993
1994
1995
1996
Station No : 042010 Monthly mean flows
+ extremes & mean monthly flows (1958-1992)


Tone at Bishops Hull
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1993
1994
1995
1996
Station No : 052005 Monthly mean flows
+ extremes & mean monthly flows (1961-1992)


Severn at Bewdley
Gauged Discharge
Cubic Metres per Second
300
100
60
30
10
1993
1994
1995
1996
Station No : 054001 Monthly mean flows
+ extremes & mean monthly flows (1921-1992)


Cynon at Abercynon
Gauged Discharge
Cubic Metres per Second
10.0
5.0
1.0
0.5
1993
1994
1995
1996
Station No : 057004 Monthly mean flows
+ extremes & mean monthly flows (1957-1992)


Eden at Sheepmount
Gauged Discharge
Cubic Metres per Second
100
60
30
10
6
1993
1994
1995
1996
Station No : 076007 Monthly mean flows
+ extremes & mean monthly flows (1967-1992)

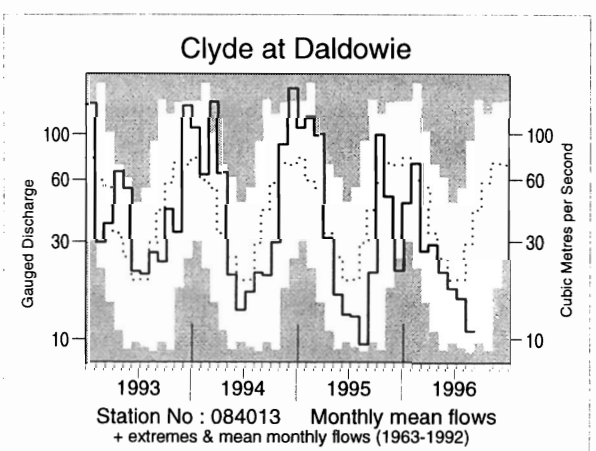

Clyde at Daldowie
Gauged Discharge
Cubic Metres per Second
100
60
30
10
1993
1994
1995
1996
Station No : 084013 Monthly mean flows
+ extremes & mean monthly flows (1963-1992)

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	Apr	May	Jun	Jul	Aug 1996		6/96 to 8/96		1/96 to 8/96		9/95 to 8/96		9/94 to 8/96	
	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	114	49	28	19	13	6	61	4	550	16	962	20	1658	13
Park	143	78	78	71	44	/24	66	/24	110	/24	120	/23	104	/22
Tay at	115	72	50	22	20	5	93	5	604	11	1038	13	2351	26
Ballathie	128	104	111	56	41	/44	69	/44	87	/44	91	/43	103	/42
Tweed at	40	42	26	16	13	5	54	6	381	7	629	5	1502	11
Boleside	73	98	97	62	35	/36	62	/36	84	/36	83	/35	98	/34
Whiteadder Water at	20	31	10	8	7	7	25	6	230	10	335	9	590	6
Hutton Castle	53	116	63	64	47	/27	59	/27	88	/27	87	/27	76	/26
South Tyne at	32	37	10	13	6	3	29	1	289	1	466	1	1361	5
Haydon Bridge	56	101	39	47	16	/33	33	/33	65	/33	60	/31	86	/29
Wharfe at	20	30	10	13	22	16	46	6	222	1	289	1	1093	1
Flint Mill Weir	37	83	43	53	58	/41	53	/41	52	/41	41	/40	76	/39
Derwent at	15	14	9	7	7	6	22	1	161	7	220	7	513	8
Buttercrambe	50	60	54	53	49	/35	53	/35	73	/35	68	/34	79	/33
Trent at	14	13	10	9	10	7	30	2	133	2	192	2	609	11
Colwick	45	54	55	59	66	/38	60	/38	56	/38	54	/37	86	/36
Lud at	10	9	7	6	6	3	18	3	67	4	94	3	358	8
Louth	32	35	36	38	44	/29	40	/28	34	/28	37	/28	71	/27
Witham at	10	8	4	3	3	4	11	2	75	4	99	4	344	15
Claypole Mill	52	51	43	46	49	/38	46	/38	55	/37	54	/37	92	/36
Little Ouse at	7	5	3	5	4	6	12	2	51	1	76	2	253	5
Abbey Heath	38	38	33	59	61	/29	50	/29	42	/28	45	/28	75	/27
Colne at	5	4	3	2	3	13	8	4	52	7	73	7		
Lexden	40	50	50	53	77	/37	59	/37	56	/37	54	/35		
Mimram at	9	8	6	6	6	7	18	7	64	7	98	7	265	25
Panshanger Park	69	64	55	64	66	/44	62	/44	71	/44	78	/43	105	/42
Lee at	8	7	5	5	5	25	15	15	70	18	100	22	300	43
Feildes Weir (natr.)	50	53	53	64	66	/111	61	/111	62	/110	61	/109	92	/107
Thames at	18	13	8	6	6	28	21	24	143	39	202	36	508	59
Kingston (natr.)	82	77	65	67	69	/114	67	/114	83	/114	82	/113	103	/112
Coln at	37	27	17	13	12	4	42	4	254	9	323	9	760	12
Bibury	87	83	65	64	73	/33	67	/33	85	/33	82	/32	96	/31
Great Stour at	10	9	7	7	9	9	23	2	99	1	149	1	518	9
Horton	40	45	46	52	71	/32	56	/31	51	/30	51	/29	89	/27
Itchen at	43	39	30	25	24	8	78	7	307	10	432	13	982	25
Highbridge+Allbrook	93	94	87	82	86	/38	85	/38	93	/38	94	/37	106	/36
Stour at	33	21	12	9	8	6	29	10	262	11	376	10	923	18
Throop Mill	93	91	82	79	78	/24	81	/24	97	/24	94	/23	115	/22
Exe at	45	53	21	9	12	14	42	8	400	7	645	5	1721	22
Thorverton	79	144	86	46	46	/41	60	/41	82	/40	77	/40	103	/39
Taw at	41	32	13	4	6	9	23	11	299	6	473	3	1377	17
Umberleigh	92	114	76	30	31	/38	47	/38	76	/38	68	/37	98	/36
Tone at	39	28	15	10	9	11	35	11	315	15	452	12	1142	30
Bishops Hull	101	106	89	67	79	/36	80	/36	98	/35	95	/35	119	/34
Severn at	31	24	11	7	7	13	25	8	205	9	268	3	806	20
Bewdley	99	103	62	49	44	/76	52	/76	73	/75	60	/75	89	/74
Teme at	36	24	10	5	4	5	19	9	241	9	301	5	776	13
Knightsford Bridge	110	126	77	62	43	/27	64	/27	97	/26	82	/26	106	/25
Cynon at	65	99	46	20	12	5	77	9	670	14	1108	9	2656	19
Abercynon	84	171	116	59	24	/38	64	/38	94	/38	87	/36	105	/34
Dee at	74	112	42	29	41	10	112	5	675	2	1019	1	3094	2
New Inn	68	166	72	44	46	/28	52	/27	69	/27	57	/27	86	26
Eden at	23	23	12	13	12	3	37	1	242	1	393	1	1258	7
Sheepmount	48	71	49	54	38	/29	47	/29	59	/29	56	/28	89	/27
Clyde at	39	29	24	22	15	5	61	4	327	4	593	4	1574	14
Daldowie	83	82	92	85	39	/33	67	/33	74	/33	75	/32	99	/31
Carron at	108	55	85	102	83	4	270	4	702	1	1452	1	4064	1
New Kelso	72	59	105	87	53	/18	77	/18	50	/18	58	/17	79	/16
Ewe at	71	65	110	124	61	6	296	17	695	1	1484	2	3894	5
Poolewe	49	66	147	141	56	/26	108	/26	59	/26	69	/25	90	/24

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 1995. For the long periods (at the right of this table), the end date for the long term is 1996.

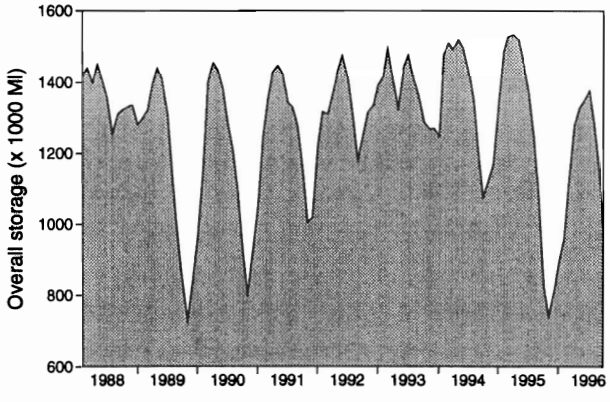
TABLE 4 START-MONTH RESERVOIR STORAGES UP TO SEPTEMBER 1996

Area	Reservoir (R)/ Group (G)		Capacity● (Ml)	Apr	May	Jun	Jul	Aug	Sep	1995 Sep
North West	N.Command Zone[1]	(G)	133375	78	80	80	75	64	45	24
	Vyrnwy	(R)	55146	64	70	74	66	56	43	36
Northumbria	Teesdale[2]	(G)	87936	77	81	81	68	62	42	38
	Kielder	(R)	199175*	96	93	96	91	89	83	85
Severn-Trent	Clywedog	(R)	44922	86	93	100	97	81	67	42
	Derwent Valley[3]	(G)	39525	54	54	56	53	43	36	34
Yorkshire	Washburn[4]	(G)	22035	70	76	87	82	75	69	34
	Bradford supply[5]	(G)	41407	59	60	70	63	56	55	21
Anglian	Grafham	(R)	58707	94	95	95	89	83	78	71
	Rutland	(R)	130061	92	94	93	88	83	78	66
Thames	London[6]	(G)	206399	94	95	95	88	77	67	62
	Farmoor [7]	(G)	13843	99	97	99	98	95	97	64
Southern	Bewl	(R)	28170	99	94	88	80	72	65	72
	Ardingly	(R)	4685	100	100	100	86	68	47	48
Wessex	Clatworthy	(R)	5364	100	94	97	89	70	62	31
	Bristol W [8]	(G)	38666*	95	97	95	87	76	66	48
South West	Colliford	(R)	28540	63	66	69	67	59	52	54
	Roadford[9]	(R)	34500	37	41	48	49	46	42	40
	Wimbleball[10]	(R)	21320	78	81	86	81	64	53	40
	Stithians	(R)	5205	99	97	98	93	79	68	31
Welsh	Celyn + Brenig	(G)	131155	72	75	82	77	66	55	57
	Brianne	(R)	62140	100	100	100	95	85	77	55
	Big Five[11]	(G)	69762	94	94	97	90	73	54	29
	Elan Valley[12]	(G)	99106	98	99	97	90	81	67	46
East of Scotland	Edin./Mid Lothian[13]	(G)	97639	96	98	98	95	89	77	69
	East Lothian[14]	(G)	10206	99	98	99	95	86	76	71
West of Scotland	Loch Katrine	(G)	111363	94	100	99	91	76	62	50
	Daer	(R)	22412	96	100	96	93	85	66	41
	Loch Thom	(G)	11840	98	97	94	90	82	70	59

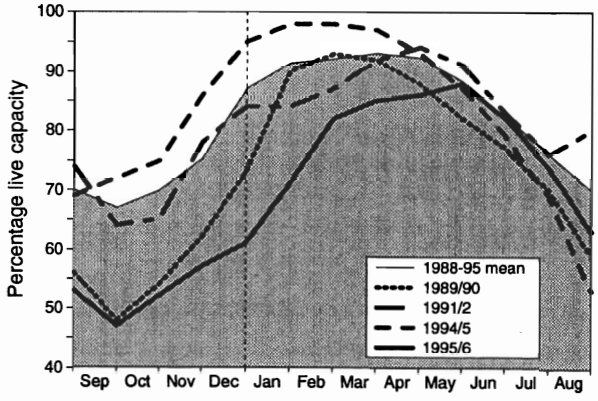
● Live or usable capacity (unless indicated otherwise) * Gross storage/percentage of gross storage

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



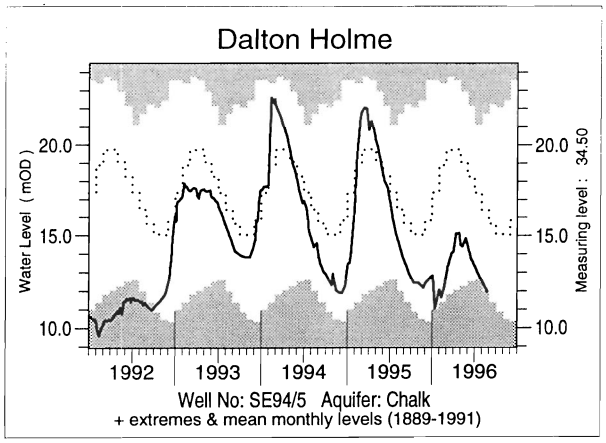
A COMPARISON BETWEEN OVERALL RESERVOIR STOCKS FOR ENGLAND AND WALES IN RECENT YEARS

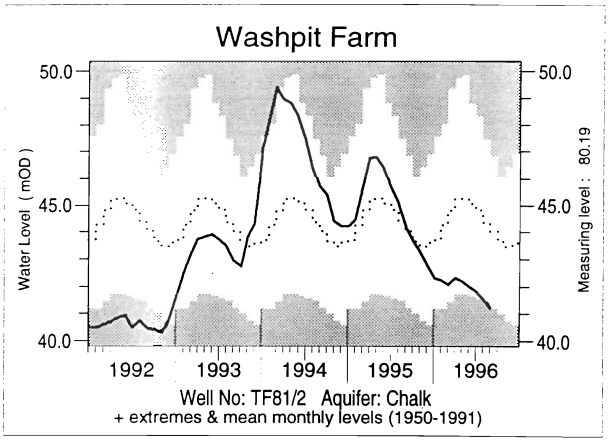


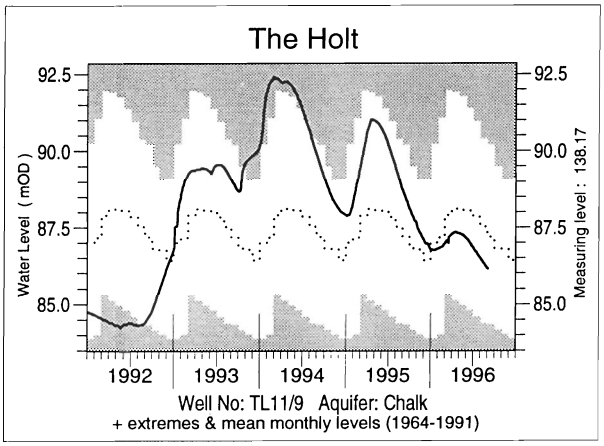
These plots are based on the reservoirs featured in Table 4 only

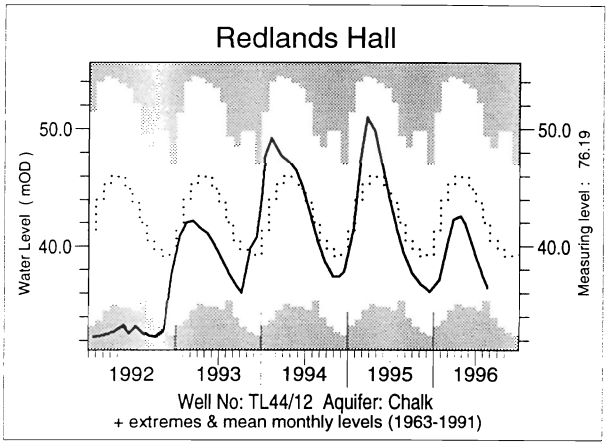
Note: Variations in storage depend on the balance between inputs (from catchment rainfall and any pumping) and outputs (to supply, compensation flow, HEP, amenity). There will be additional losses due to evaporation, especially in the summer months. Operational strategies for making the most efficient use of water stocks will further affect reservoir storages. Table 4 is intended to provide a link between the hydrological conditions described elsewhere in the report and the water resources situation. The reservoirs featured may not be representative of storage conditions across the individual regions; this can be particularly important during drought conditions (eg, in the Severn-Trent region during 1995/96).

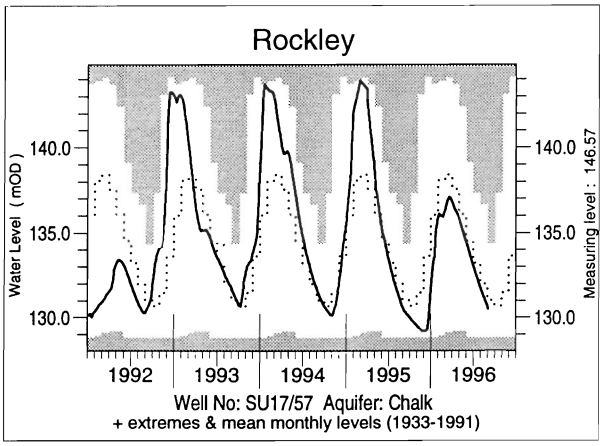
FIGURE 2 GROUNDWATER LEVEL HYDROGRAPHS

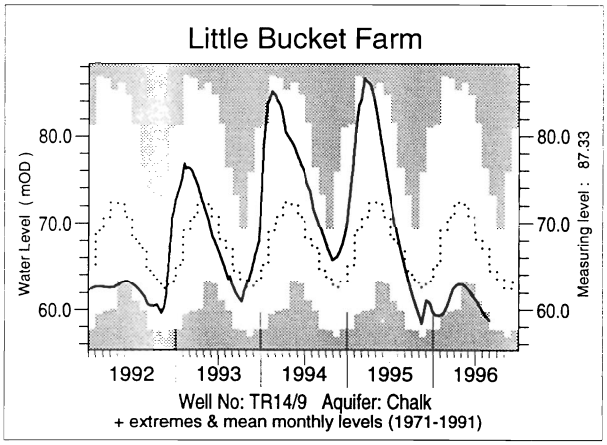


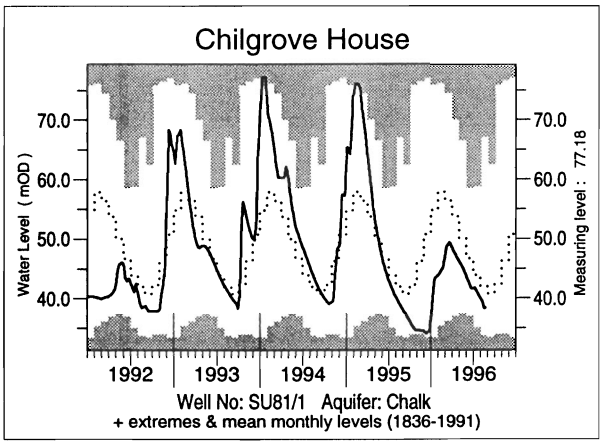


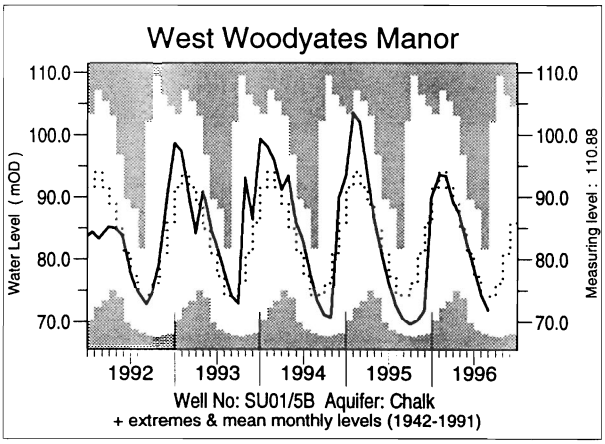


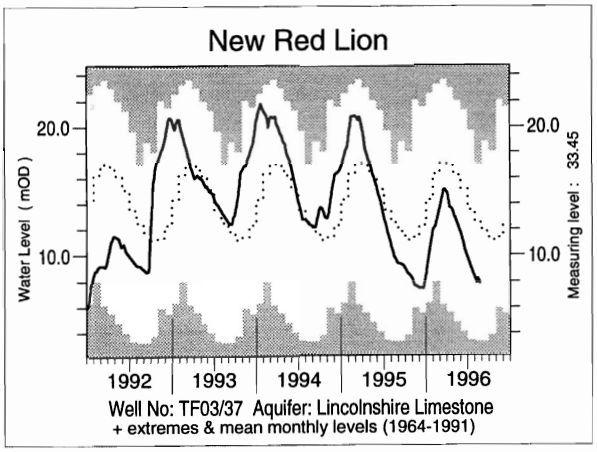


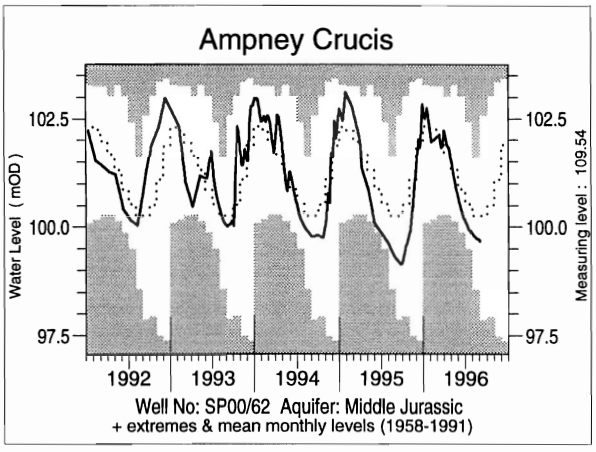


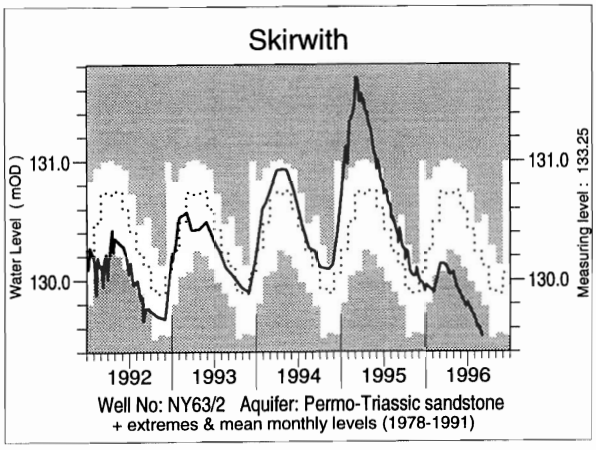


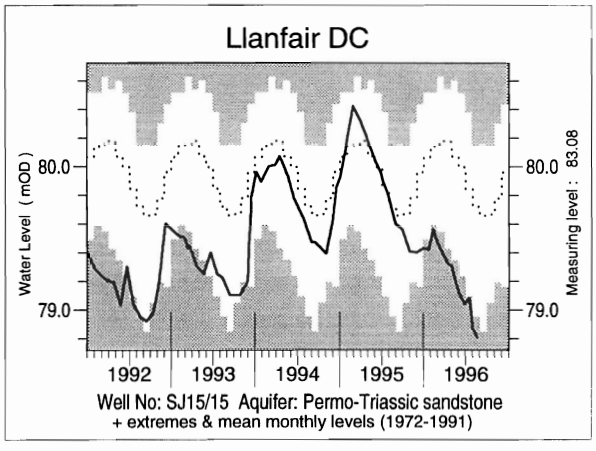


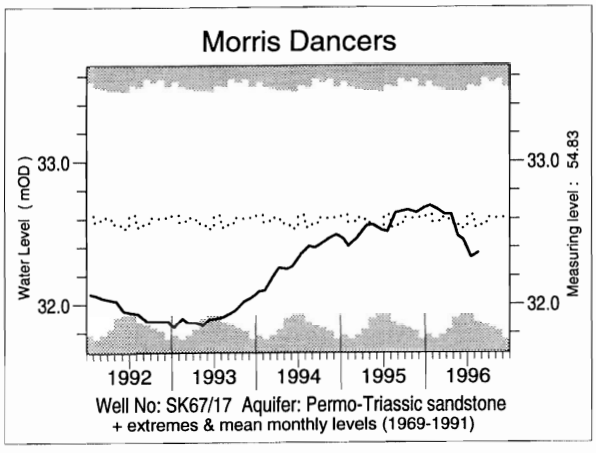


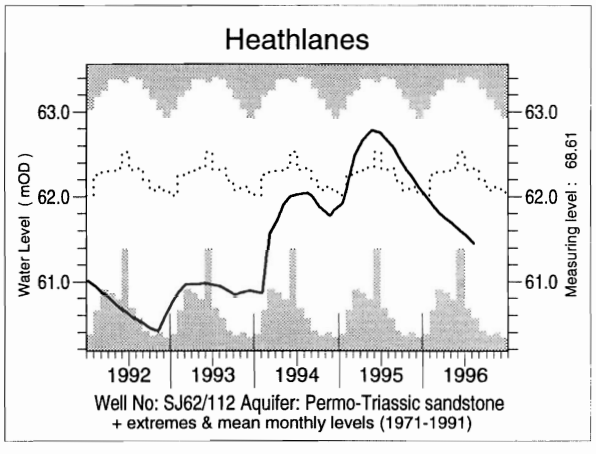

New Red Lion
Water Level (mOD)
20.0
10.0
Measuring level : 33.45
1992
1993
1994
1995
1996
Well No: TF03/37 Aquifer: Lincolnshire Limestone
+ extremes & mean monthly levels (1964-1991)

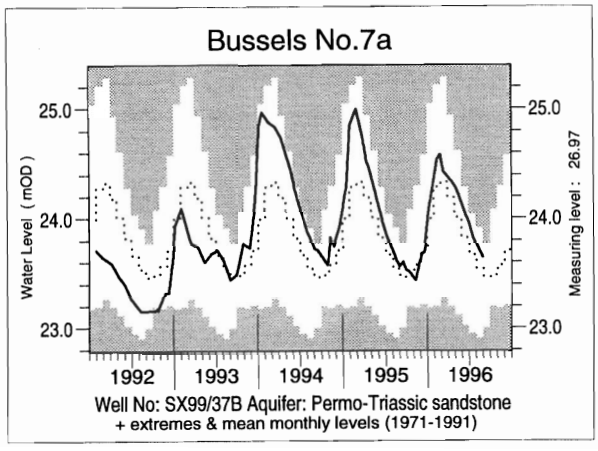

Ampney Crucis
Water Level (mOD)
102.5
100.0
97.5
Measuring level : 109.54
1992
1993
1994
1995
1996
Well No: SP00/62 Aquifer: Middle Jurassic
+ extremes & mean monthly levels (1958-1991)


Skirwith
Water Level (mOD)
131.0
130.0
Measuring level : 133.25
1992
1993
1994
1995
1996
Well No: NY63/2 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1978-1991)


Llanfair DC
Water Level (mOD)
80.0
79.0
Measuring level : 83.08
1992
1993
1994
1995
1996
Well No: SJ15/15 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1972-1991)


Morris Dancers
Water Level (mOD)
33.0
32.0
Measuring level : 54.83
1992
1993
1994
1995
1996
Well No: SK67/17 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1969-1991)


Heathlanes
Water Level (mOD)
63.0
62.0
61.0
Measuring level : 68.61
1992
1993
1994
1995
1996
Well No: SJ62/112 Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1991)


Bussels No.7a
Water Level (mOD)
25.0
24.0
23.0
Measuring level : 26.97
1992
1993
1994
1995
1996
Well No: SX99/37B Aquifer: Permo-Triassic sandstone
+ extremes & mean monthly levels (1971-1991)

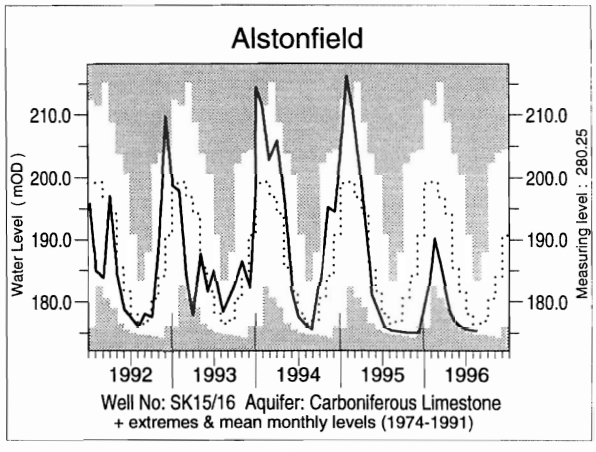

Alstonfield
Water Level (mOD)
210.0
200.0
190.0
180.0
Measuring level : 280.25
1992
1993
1994
1995
1996
Well No: SK15/16 Aquifer: Carboniferous Limestone
+ extremes & mean monthly levels (1974-1991)

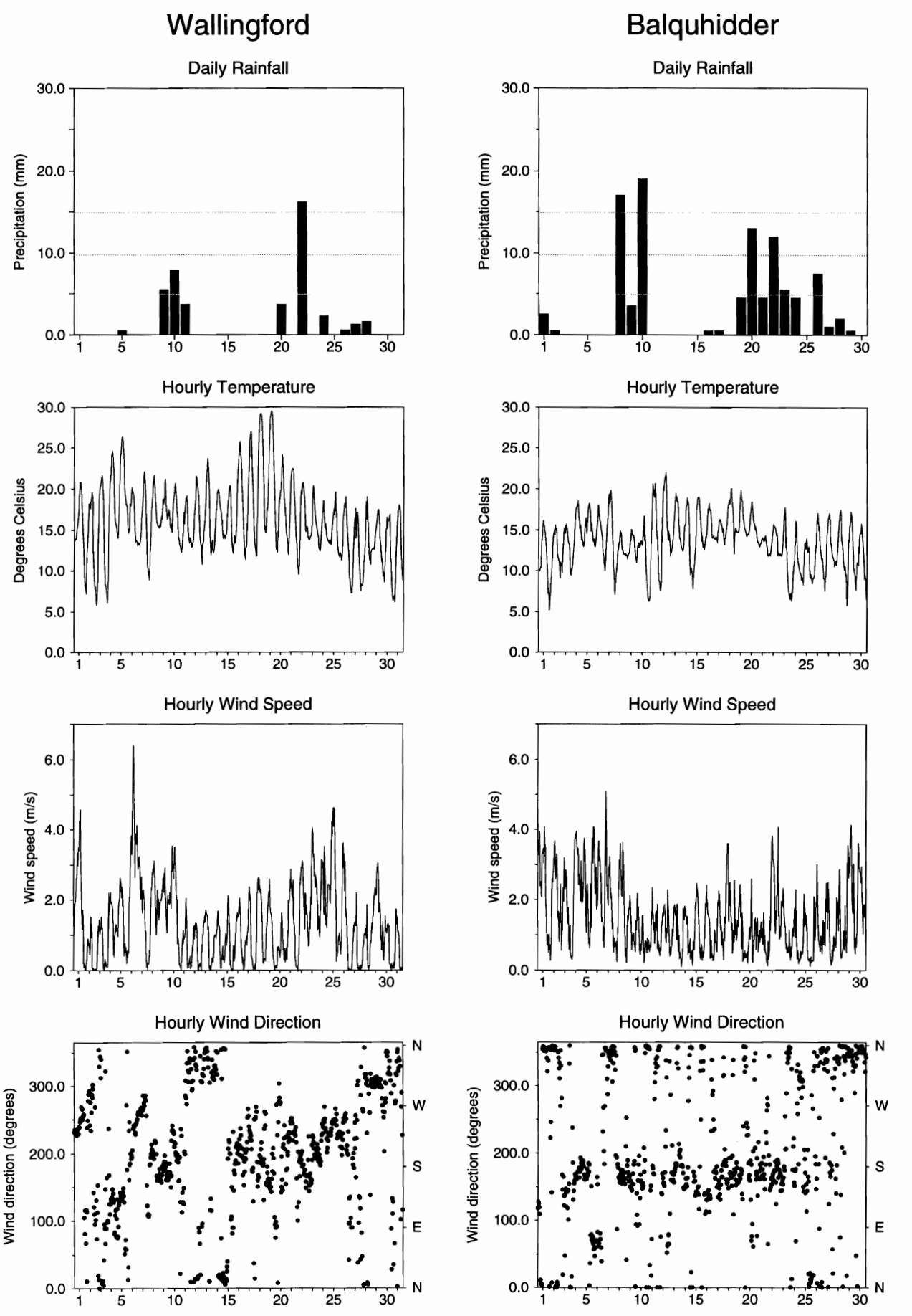
TABLE 5 AUGUST GROUNDWATER LEVELS 1996

Site	Aquifer	Records commence	Minimum Aug <1996	Average Aug <1996	Maximum Aug <1996	No. of years Aug /Sept level<1996	Aug /Sept 1996 day	Aug /Sept 1996 level
Dalton Holme	C & UGS	1889	11 .28	16.39	21.77	1	23/08	11 .98
Wetwang	C & UGS	1971	18.02	19.77	21.84	2	23/08	18.46
Keelby Grange	C & UGS	1980	3.45	10.64	14.66	1	19/08	4.92
Washpit Farm	C & UGS	1950	40.77	44.40	47.50	2	03/09	41.23
The Holt	C & UGS	1964	84.32	87.71	90.53	5	02/09	86.13
Therfield Rectory	C&UGS	1883	dry <71.60	81.08	98.97	>10	02/09	76.57
Redlands Hall	C & UGS	1964	32.73	41.30	49.47	2	20/08	36.45
Rockley	C & UGS	1933	dry<128.44	131.96	136.70	>10	02/09	130.51
Little Bucket Farm	C & UGS	1971	59.75	67.21	76.35	1	02/09	58.63
Compton House	C & UGS	1894	27.65	33.79	40.39	7	23/08	31.14
Chilgrove House	C & UGS	1836	33.68	41.68	67.06	>10	23/08	38.49
Westdean No.3	C & UGS	1940	1.01	1.45	1.98	>10	30/08	1.36
Lime Kiln Way	C & UGS	1969	123.86	125.11	125.78	>10	06/08	125.71
Ashton Farm	C & UGS	1974	63.80	65.72	68.17	8	30/08	65.33
West Woodyates Manor	C & UGS	1942	67.95	73.95	81.67	>10	30/08	71.91
Killyglen (NI)	C & UGS	1985	112.67	113.96	117.46	3	07/08	113.33
New Red Lion	LLst	1964	3.29	12.33	17.08	1	22/08	7.83
Ampney Crucis	Mid Jur	1958	98.58	100.21	101.64	4	02/09	99.67
Redbank	PTS	1981	7.36	7.90	8.52	2	02/09	7.50
Yew Tree Farm	PTS	1973	10.23	13.15	13.61	3	04/09	12.93
Skirwith	PTS	1978	129.66	130.19	130.53	0	02/09	129.53
Llanfair D.C	PTS	1972	78.95	79.60	80.15	0	20/08	78.81
Morris Dancers	PTS	1969	31.87	32.49	33.52	>10	16/08	32.36
Heathlanes	PTS	1971	60.54	62.18	63.38	5	08/08	61.45
Bussels No.7A	PTS	1972	22.90	23.55	23.91	>10	27/08	23.64
Rushyford NE	MgLst	1967	64.98	72.68	76.49	>10	23/08	75.61
Peggy Ellerton	MgLst	1968	31.17	34.00	36.68	7	20/08	32.92
Alstonfield	CLst	1974	174.70	176.88	183.39	6	16/08	175.29

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

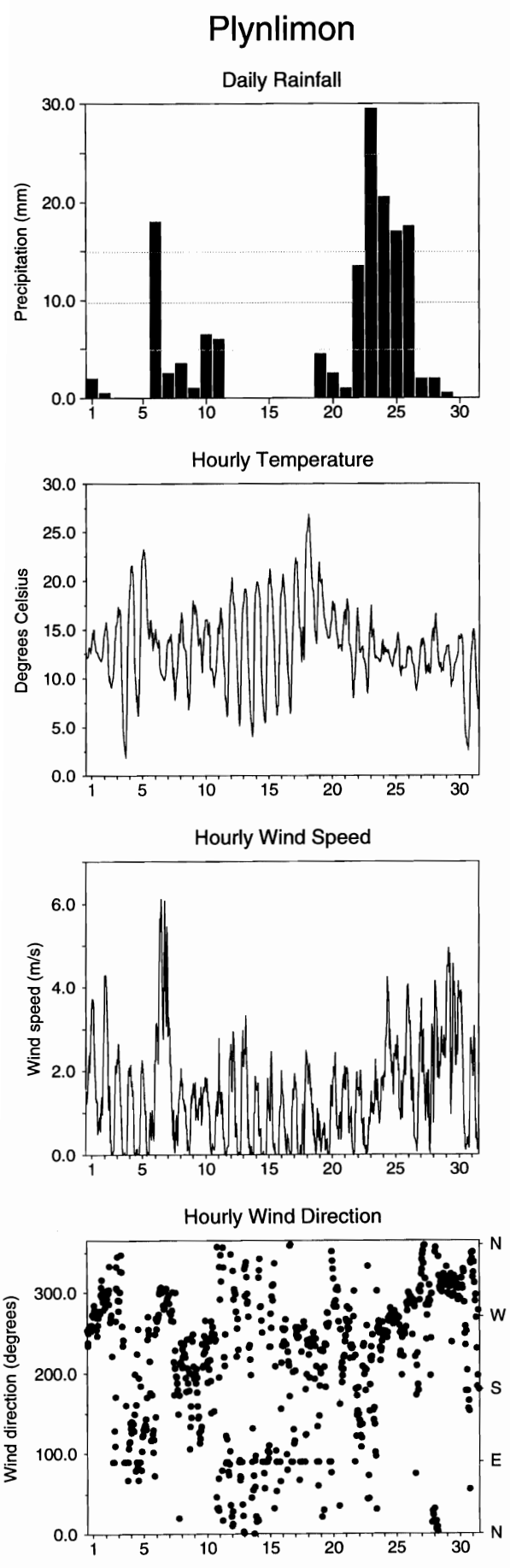
FIGURE 3 METEOROLOGICAL SUMMARY - AUGUST 1996



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

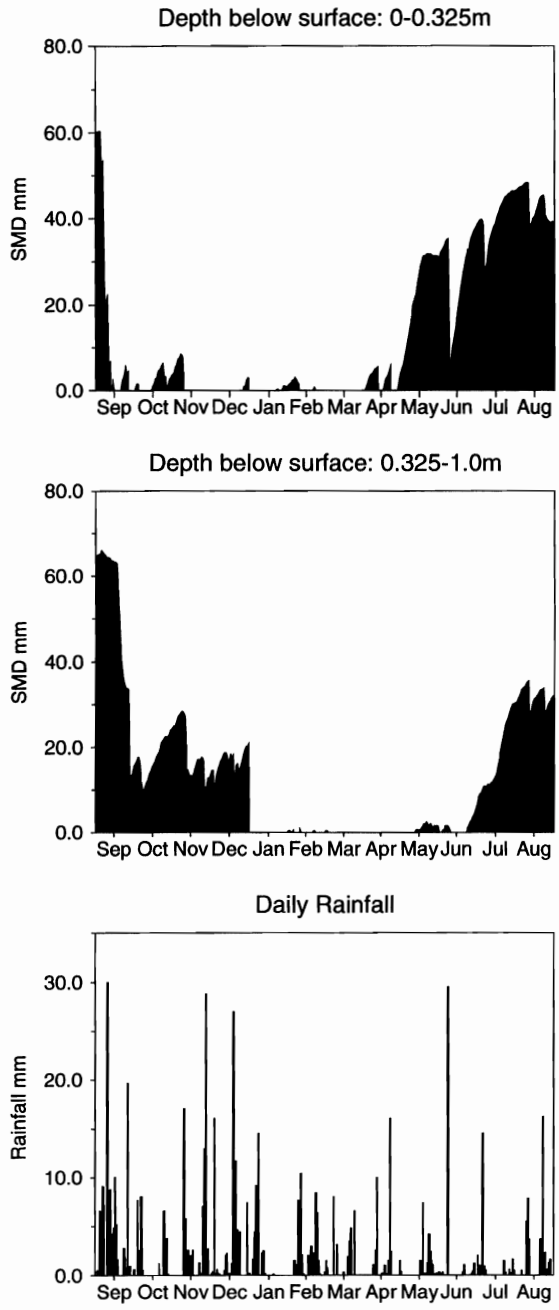
The Lower Kirkton automatic weather station (Balquhidder) occupies a relatively sheltered position at the mouth of the SSE trending Kirkton Glen. Station elevation is 270m aOD and average annual rainfall exceeds 2000mm; snow cover is expected for 10-30 days a year.

FIGURE 3 (continued)



The Dolydd automatic weather station at Plynlimon is sited in an exposed field with a forested area to the south. Surrounding land reaches a peak height of around 400m. Station elevation is 300m aOD and average annual rainfall exceeds 2300mm.

FIGURE 3a. WALLINGFORD SMD DATA 1995/6.



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. Two automatic soil water stations (ASWSs) deployed at Wallingford, which use capacitance soil water sensors installed at depths of 5,15 and 50 cm, are the sources of the data. Figure 3a shows deficits calculated from one of the stations for the depth ranges 0-0.325m (15cm probe) and 0.325-1.0m (50cm probe) at 0100 GMT on each day. At the end of January 1996, field capacity was re-estimated using recent data and the soil moisture deficit values for the previous months were recalculated accordingly.

Daily rainfall from the Wallingford meteorological station from August 1995 is presented.

FIGURE 4 LOCATION MAP OF GAUGING STATIONS AND GROUNDWATER INDEX WELLS