NRA Wales 66

NATIONAL RIVERS AUTHORITY

WELSH REGION

DROUGHT REPORT 1989

WELSH REGION

PL/SP/WR50/SP0790 - December 1991

"It is a capital mistake to theorize before one has data"

Sir Arthur Conan Doyle (1859-1930)

CONTENTS

SUMMARY

The dry spring of 1989 turned out to be the precursor of a dry summer, culminating in a severe drought over large areas of England and Wales; the latest in a series of droughts following 1975/76 (Ref 1) and 1984 (Ref 2).

This report describes the drought as it occurred within the Welsh Region, and provides, where applicable, comparisons with 1976 and 1984.

To attempt to compress all the data collected during the period into a meaningful report, although considered desirable from an historic perspective, would only have marginal benefits from a practicable viewpoint.

This report is therefore the culmination of a data selection process, whereby only salient data has been used to illustrate the relative severity of 1989 compared with previous droughts of recent memory.

The major conclusions reached from evidence contained in this report can be summarized as;

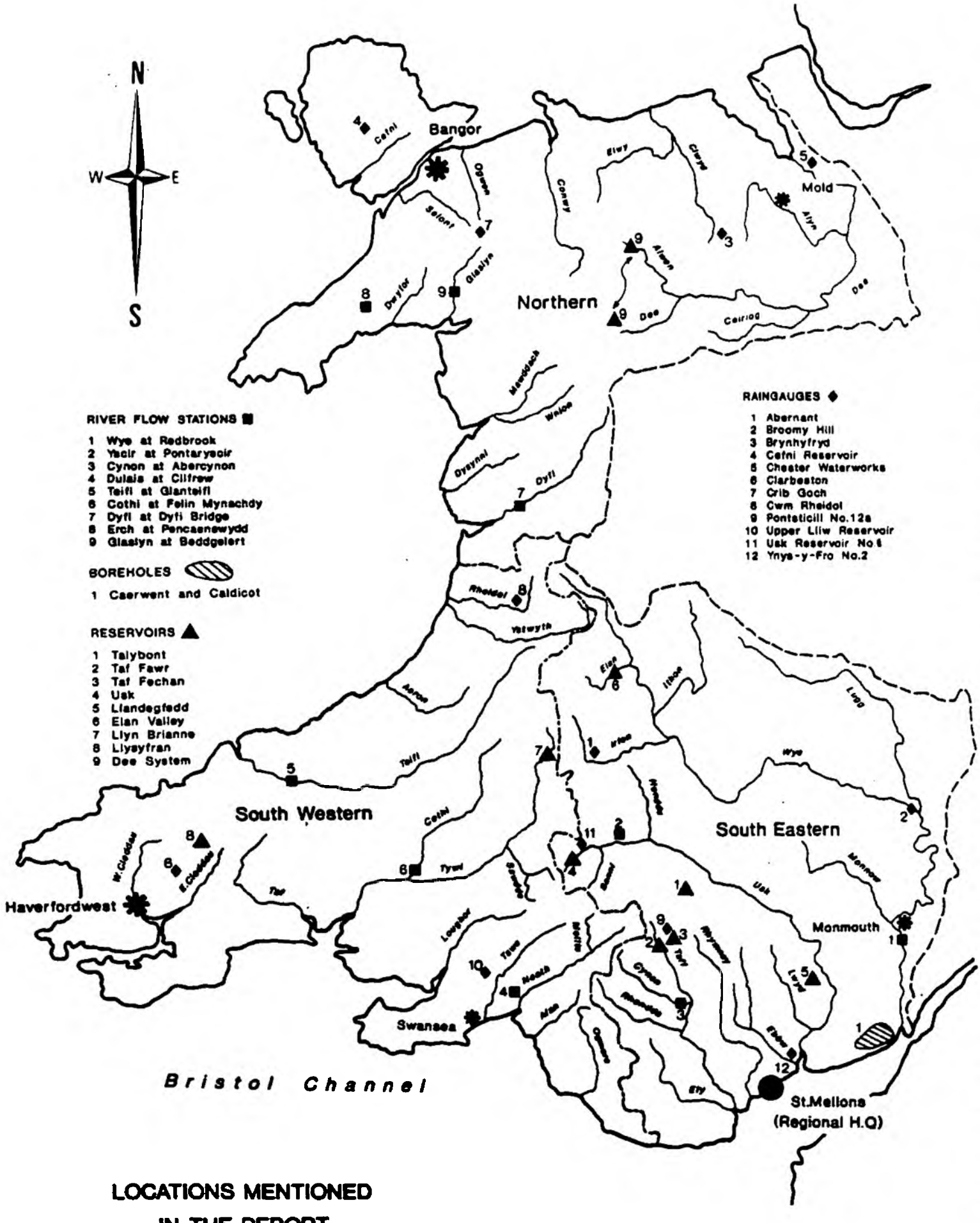
(a) Rainfall totals in 1989 were generally greater than either 1976 or 1984 for the periods January to September, but similar in both cases for the critical period April to September.

(b) 1984 produced the lowest consecutive period (March to July) of river flows (runoffs) than either 1976 or 1989, with 1976 producing the lowest single monthly runoffs in August. September and October 1989 were lower than both 1976 and 1984.

(c) 1989 produced a more severe depletion in reservoir storages than either 1976 of 1984.

(d) Insufficient information was obtained to arrive at any meaningful conclusions concerning groundwater variations throughout the Region, except to illustrate one small area in the south east. This showed that water levels were lower than normal, but not as low as in 1984.

NATIONAL RIVERS AUTHORITY (WELSH REGION)



LOCATIONS MENTIONED IN THE REPORT

Figure 1

1. INTRODUCTION

1.1 Aims

To illustrate, using selected data sets, the drought sequence that occured in 1989, from early spring to the break of the drought in mid October.

To compare 1989 data with previous droughts of 1976 and 1984.

1.2 Data

Data was collated from Divisions and from respected national sources. Where data has been obtained from the latter, full references have been provided. Wherever practicable, data has been illustrated by annotated graphics.

2. HYDROLOGY

2.1 Rainfall

The raingauges listed in the following table and shown in Figure 1 were selected as being representative of the areal variations in rainfall within the Region.

Division	Rainfall Stations	Key No.
South Eastern	Abernant	1
	Broomy Hill	2
	Pontsticill Res No.12a	9
	Upper Usk No.1	11
	Ynys-y-Fro Res No.2	12
South Western	Clarbeston	6
	Cwm Rheidol	8
	Upper Lliw	10
Northern	Brynhyfryd (Ruthin)	3
	Cefni Reservoir	4
	Chester Waterworks	5
	Crib Goch	7

The selected sites have complete data sets for 1976, 1984 and 1989. The data is shown for comparative purposes in the tables at the end of this section.

The severity of the 1989 drought has been assessed by computing cumulative monthly rainfall totals for the two periods, January to September and April to September and comparing with similar periods in 1976 and 1984. The results are shown in the following table.

Raingauge Sites (1989)		
Totals	Jan-Sep	Apr-Sep
> 1976	9	5
< 1976	3	7
> 1984	8	7
< 1984	4	5

Whilst they may not be statistically unbiased, the results give a 'feel' for the relative severity of 1989 compared to the other two drought periods. On this evidence alone, the 9 month totals, January to September 1989, exceeded those of 1976 in 9 of the sites selected and of 1984 by 8.

However, for the 6 months, April to September 1989, the total rainfall at the sites was almost evenly divided about the 1976 and 1984 figures, although the rainfall profiles on a month to month basis were different; as illustrated in Figure 2 for Pontsticill Reservoir No.12a.

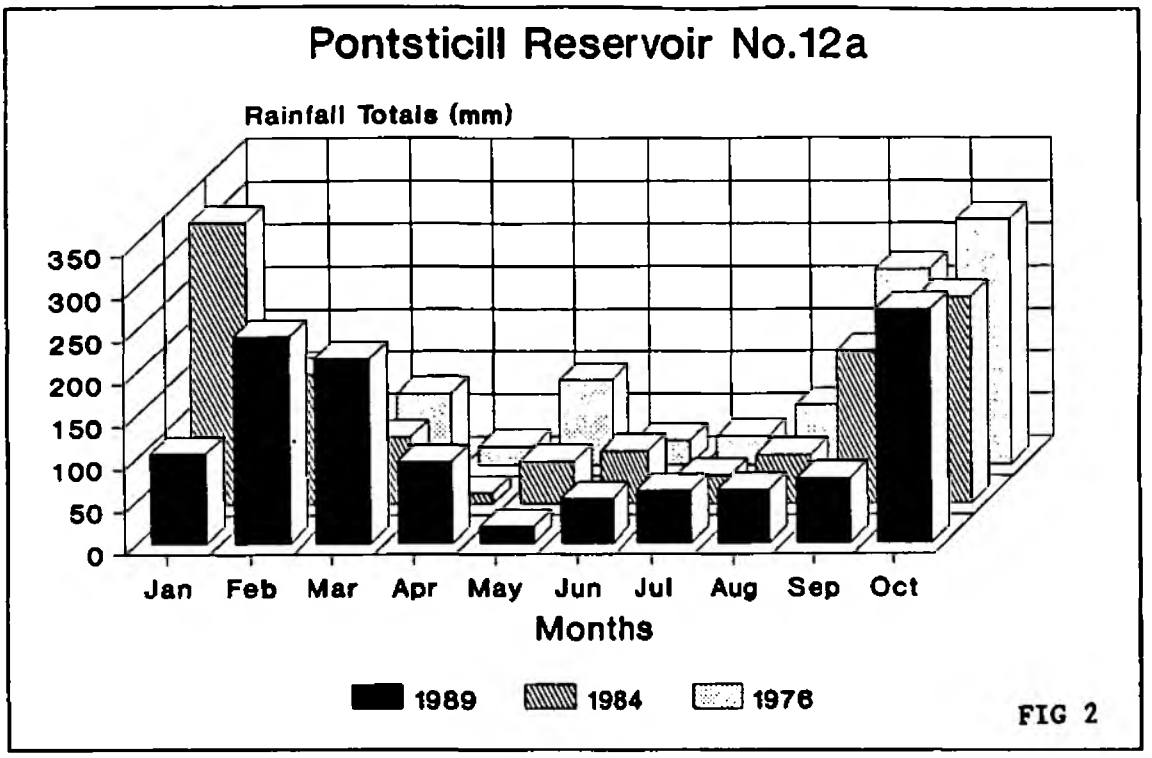


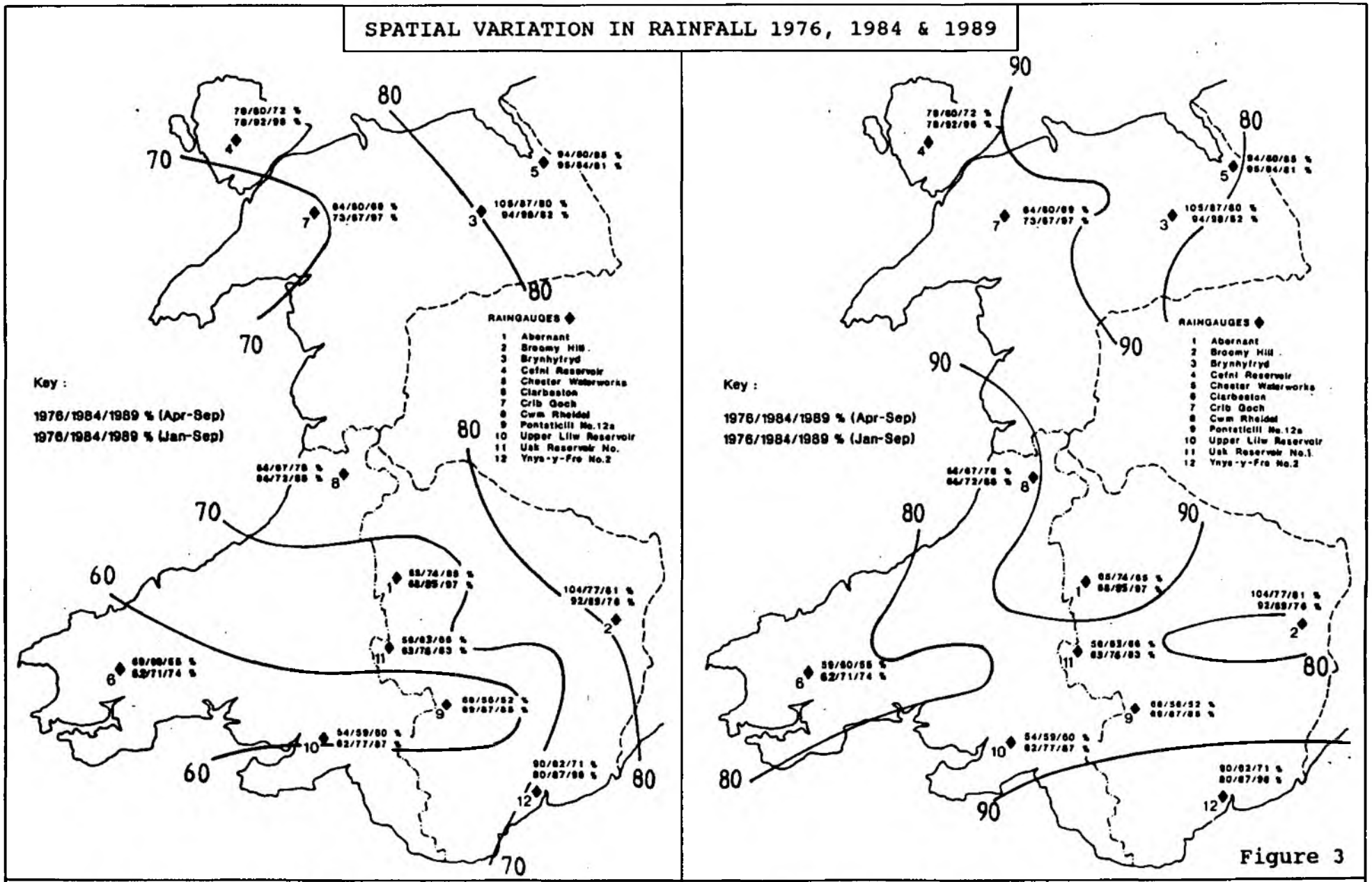
FIG 2

From the tables that follow, it will also be seen that using areal rainfall data for the Region, May to September 1989 (5 months) were below average rainfall totals.

For each of the selected stations, the 9 month and 6 month rainfall totals ending in September 1976, 1984 and 1989 were calculated and expressed as a percentage of long term averages. The results are produced in the following table and shown spatially in Figure 3.

Percentage of L.A.A.R	6 mths Apr - Sep			9 mths Jan - Sep		
Station Name	1976	1984	1989	1976	1984	1989
Abernant	65	74	65	68	95	97
Broomy Hill	104	77	81	92	89	76
Brynhyfryd (Ruthin)	105	87	80	94	98	82
Cefni Reservoir	78	80	72	78	92	96
Chester Waterworks	94	80	85	95	84	81
Clarbeston	59	60	55	62	71	74
Crib Goch	64	60	69	73	67	97
Cwm Rheidol	54	67	78	64	72	88
Pontsticill Res No.12a	68	56	52	69	87	85
Upper Lliw	54	59	60	62	77	87
Upper Usk No.1	56	63	66	63	76	83
Ynys-y-Fro Res No.2	90	62	71	80	87	96

SPATIAL VARIATION IN RAINFALL 1976, 1984 & 1989



6 Months - April to September 1989

9 Months - January to September 1989

Figure 3

Referring to Figure 3, it would appear that for the shorter 6 months period (April to September), a narrow band between Haverfordwest and Merthyr Tydfil had less than 60% of average rainfall, whereas the extreme north east and south east had in excess of 80% of average. A different picture is presented by the statistics for the longer 9 month period (January to September); parts of Mid and South Glamorgan along with a broad corridor stretching from Anglesey to Brecon had received more than 90% of average rainfall, while for the north east, extreme south west and parts of Herefordshire, less than 80% was experienced.

Similar statistics can be shown for the Regional monthly rainfall totals for years 1976, 1984 and 1989. Data was obtained from Morecs {Ref 3}.

Comparison of Monthly Rainfall over Welsh Region (MORECS)

Mth	L.A.A.R (41-70) mm	1976 Rain (mm)	1976 %age LAAR	1984 Rain (mm)	1984 %age LAAR	1989 Rain (mm)	1989 %age LAAR
Jan	136			213.0	157	79.6	59
Feb	96			88.0	92	139.8	146
Mar	87			50.0	57	151.1	174
Apr	86			12.0	14	88.7	103
May	91			53.0	58	23.1	25
Jun	82			45.0	55	65.3	80
Jul	95	N/A		30.0	32	49.0	52
Aug	119			74.0	62	78.1	66
Sep	125			171.0	137	57.3	46
Oct	129			178.0	138	164.4	127
Nov	143			215.0	150	99.8	70
Dec	145			153.0	106	188.9	130
Total	1334	1065*	80 %	1282	96 %	1185	89 %

* Ref 6.

Regional Rainfall % of L.A.A.R

Period	1976	1984	1989	L.A.A.R
Jan - Sep	N/A	80 %	80 %	917 mm
Apr - Sep	N/A	64 %	60 %	598 mm

L.A.A.R - Long Term Average Annual Runoff (1941-1970)

It is interesting to see that 1984 and 1989 percentage rainfall for the two defined periods were quite similar, although the rainfall profiles were different (see Figure 2).

The monthly rainfall summaries for January to October 1976, 1984 and 1989, with cumulative statistics follow ;

ABERNANT Stat No. 467467 Altitude 195 m N.G.R SN 888463

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	127.50	210.50	214.00	92.30	32.40	68.20	48.30	91.10	70.10	202.50
1984	293.00	131.00	34.00	8.00	81.00	46.00	43.00	86.00	194.00	187.00
1976	117.00	85.00	69.00	33.00	85.00	17.00	71.00	28.00	167.00	173.00

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
158.00	114.00	97.00	93.00	96.00	85.00	93.00	120.00	132.00	139.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	80.70	184.65	220.62	99.25	33.75	80.24	51.94	75.92	53.11	145.68
1984	186.71	114.91	35.67	8.60	84.38	54.12	46.24	71.67	146.97	134.53
1976	74.05	74.56	71.13	35.48	88.54	20.00	76.34	23.33	126.52	124.46

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	80.70	184.65	220.62	99.25	33.75	80.24	51.94	75.92	53.11	145.68
2 Month	*	124.26	201.18	161.21	65.98	55.58	65.45	65.43	63.97	100.39
3 Month	*	*	149.39	170.00	118.45	70.40	54.34	69.66	60.72	93.02
4 Month	*	*	*	139.46	137.30	109.68	65.72	60.91	64.58	85.12
5 Month	*	*	*	*	121.27	127.30	98.10	68.23	58.95	84.39
6 Month	*	*	*	*	*	115.85	115.17	93.54	65.01	77.08

BRODNY HILL Stat No. 471316 Altitude 73 m N.G.R SO 496397

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	25.60	28.40	44.40	67.10	16.30	28.60	70.60	38.50	43.50	160.70
1984	99.00	23.00	32.00	4.00	58.80	42.00	6.00	50.70	89.00	79.80
1976	16.00	37.00	44.00	9.00	47.00	21.00	31.00	42.00	191.00	108.00

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
62.00	44.00	45.00	44.00	58.00	46.00	50.00	68.00	61.00	59.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	41.29	64.55	98.67	152.50	28.10	62.17	141.20	56.62	71.31	272.37
1984	159.68	52.82	115.56	9.09	101.38	91.30	12.00	74.56	145.90	133.25
1976	25.81	84.09	97.78	20.45	81.03	45.65	62.00	61.76	313.11	185.05

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	41.29	64.55	98.67	152.50	28.10	62.17	141.20	56.62	71.51	272.37
2 Month	*	50.94	81.80	125.28	81.76	43.17	103.33	92.46	63.57	170.17
3 Month	*	*	65.17	105.19	86.94	75.68	75.00	83.96	85.25	129.10
4 Month	*	*	*	84.87	81.78	81.04	92.22	69.37	80.53	131.64
5 Month	*	*	*	*	71.66	77.97	93.42	83.12	69.79	120.39
6 Month	*	*	*	*	*	70.37	88.99	83.37	80.92	104.74

PONTSTICILL RESERVOIR 12A Stat No. 489277 Altitude 315 m N.G.R SO 060115

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	105.60	242.30	216.70	95.70	19.50	52.20	60.90	62.80	75.80	273.50
1984	330.30	152.70	78.90	13.00	49.60	61.90	33.30	57.20	179.10	242.20
1976	115.10	78.60	85.50	21.30	98.80	28.40	33.40	69.20	229.00	287.20

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
164.00	120.00	109.00	103.00	112.00	99.00	109.00	142.00	141.00	156.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	64.39	201.92	198.81	92.91	17.41	52.73	55.87	44.23	53.76	175.32
1984	201.40	127.25	72.39	12.62	44.29	62.53	30.73	40.28	127.02	155.26
1976	70.18	65.50	76.61	20.68	88.21	28.69	30.64	48.73	162.41	184.10

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	64.39	201.92	198.81	92.91	17.41	52.73	55.87	44.23	53.76	175.32
2 Month	*	122.30	200.44	147.36	53.38	53.98	54.38	49.28	48.98	117.61
3 Month	*	*	143.66	167.08	102.44	53.51	41.44	50.26	50.89	93.87
4 Month	*	*	*	135.15	129.32	90.80	55.97	42.29	51.26	86.31
5 Month	*	*	*	*	111.81	115.56	85.65	51.52	44.98	81.17
6 Month	*	*	*	*	*	103.54	103.41	75.34	51.97	71.77

UPPER USK No.1	Stat No. 481666	Altitude 282 m	N.G.R SN 834289

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	129.10	190.60	140.30	68.80	45.70	80.10	56.40	144.10	74.00	274.00
1984	224.00	113.40	56.60	11.60	65.00	56.80	35.30	87.60	196.50	235.10
1976	122.30	91.10	91.90	24.90	107.00	29.40	38.50	23.90	174.90	240.10

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
169.00	123.00	114.00	104.00	111.00	95.00	110.00	140.00	150.00	162.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	76.39	154.96	123.07	66.15	41.17	84.32	51.27	102.93	49.33	169.14
1984	132.54	92.20	49.65	11.15	58.56	59.79	32.09	62.57	131.00	145.12
1976	72.37	74.07	80.61	23.94	96.40	30.95	35.00	17.07	116.60	148.21

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	76.39	154.96	123.07	66.15	41.17	84.32	51.27	102.93	49.33	169.14
2 Month	*	109.49	139.62	93.92	53.26	61.07	66.59	80.20	75.21	111.54
3 Month	*	*	113.30	117.21	77.45	62.77	57.66	81.33	88.63	108.87
4 Month	*	*	*	103.69	98.54	78.99	59.76	71.56	71.64	97.60
5 Month	*	*	*	*	92.31	96.07	73.28	70.55	86.06	95.68
6 Month	*	*	*	*	*	91.42	88.57	79.44	86.07	87.80

YNYS-Y-FRO RESERVOIR No.2	Stat No. 486600	Altitude 43 m	N.G.R ST 285892

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	75.70	164.50	155.40	89.60	31.50	25.90	66.30	79.60	63.30	164.80
1984	235.10	91.50	34.90	6.20	59.80	36.70	11.80	54.10	146.20	157.70
1976	38.90	63.00	73.70	13.70	64.30	16.00	20.10	40.10	298.20	203.50

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
120.00	80.00	76.00	71.00	80.00	68.00	78.00	104.00	104.00	105.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	63.08	205.63	204.47	126.20	39.38	38.09	85.00	76.54	60.87	156.95
1984	195.92	114.13	45.92	8.73	74.75	53.97	15.13	52.02	140.58	150.19
1976	32.42	78.75	96.97	19.30	80.38	23.53	25.77	38.56	286.73	193.81

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	63.08	205.63	204.47	126.20	39.38	38.09	85.00	76.54	60.87	156.95
2 Month	*	120.10	205.06	166.67	80.20	58.78	63.15	80.16	68.70	109.14
3 Month	*	*	143.33	180.40	121.81	67.12	54.73	68.72	73.15	98.31
4 Month	*	*	*	139.85	143.65	102.51	71.82	61.61	66.41	95.65
5 Month	*	*	*	*	121.01	124.51	98.85	73.04	61.43	87.12
6 Month	*	*	*	*	*	109.62	117.70	93.98	70.53	80.04

UPPER LLIW	Stat No. 497879	Altitude 183 m	N.G.R SN 662058

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	132.00	193.00	219.90	72.00	41.80	68.90	67.90	121.00	92.80	275.60
1984	284.60	99.50	47.20	6.90	48.80	38.60	51.10	79.60	231.30	268.80
1976	100.70	107.00	92.60	26.50	125.80	39.50	46.80	25.20	156.70	265.30

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
164.00	110.00	108.00	103.00	111.00	112.00	125.00	163.00	163.00	168.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	80.49	175.45	203.61	69.90	37.66	61.52	54.32	74.23	56.24	164.05
1984	173.54	90.45	43.70	6.70	43.96	34.46	40.88	48.83	140.18	160.00
1976	61.40	97.27	85.74	25.75	113.33	35.27	37.44	15.46	94.97	157.92

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	80.49	175.45	203.61	69.90	37.66	61.52	54.32	74.23	56.24	164.05
2 Month	*	118.61	189.40	138.34	53.18	49.64	57.72	65.59	63.18	110.63
3 Month	*	*	142.64	151.06	103.63	56.04	51.32	64.43	62.19	98.67
4 Month	*	*	*	127.20	121.92	92.76	55.57	58.65	62.05	89.74
5 Month	*	*	*	*	110.52	109.49	84.17	60.52	58.05	83.43
6 Month	*	*	*	*	*	102.77	99.18	81.93	59.61	79.15

CWM RHEIDOL	Stat No. 520454	Altitude 33 m	N.G.R SN 709792

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	88.20	107.90	136.80	109.60	26.30	99.50	40.80	119.30	63.90	207.30
1984	152.80	69.90	38.90	12.00	39.80	59.70	30.00	72.90	179.20	147.90
1976	112.60	76.20	69.90	24.00	91.30	20.40	49.90	1.80	129.60	151.40

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
130.00	101.00	88.00	86.00	79.00	77.00	99.00	120.00	125.00	127.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	67.85	106.83	155.45	127.44	33.29	129.22	41.21	99.42	51.12	163.23
1984	117.54	69.21	44.20	13.95	50.38	77.53	30.30	60.75	143.36	116.46
1976	86.62	75.45	79.43	27.91	115.57	26.49	50.40	1.50	103.68	119.21

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	67.85	106.83	155.45	127.44	33.29	129.22	41.21	99.42	51.12	163.23
2 Month	*	84.89	129.47	141.61	82.36	80.64	79.72	73.11	74.78	107.62
3 Month	*	*	104.36	128.84	107.79	97.27	65.33	87.70	65.12	104.97
4 Month	*	*	*	109.26	107.51	112.79	81.00	76.24	76.84	91.57
5 Month	*	*	*	*	96.86	111.39	96.27	85.79	69.96	96.86
6 Month	*	*	*	*	*	101.30	98.28	96.96	78.40	88.85

CLARBESTON	Stat No. 509436	Altitude 96 m	N.G.R SN 034219

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	90.00	104.20	147.30	82.20	9.20	48.50	32.70	73.90	72.10	139.30
1984	167.80	69.40	53.10	11.50	34.30	32.20	32.80	62.60	171.20	186.80
1976	72.80	57.90	90.70	14.80	71.70	23.00	22.60	.00	207.30	275.40

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
148.00	88.00	87.00	85.00	85.00	81.00	87.00	110.00	127.00	133.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	60.81	118.41	169.31	96.71	10.82	59.88	37.59	67.16	56.77	104.74
1984	113.38	78.86	61.03	13.53	40.35	39.75	37.70	56.91	134.80	140.43
1976	49.19	65.80	104.25	17.41	84.35	28.40	25.98	.00	163.39	207.07

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	60.81	118.41	169.31	96.71	10.82	59.88	37.59	67.16	56.77	104.74
2 Month	*	82.29	143.71	133.43	53.76	54.76	48.33	54.11	61.60	81.31
3 Month	*	*	105.79	128.35	92.88	55.74	35.73	55.79	55.15	77.11
4 Month	*	*	*	103.85	99.39	84.97	51.07	45.26	56.10	69.38
5 Month	*	*	*	*	87.81	91.88	75.27	55.02	48.24	68.12
6 Month	*	*	*	*	*	83.87	82.67	73.61	55.41	60.30

BRYNHYFRYD (RUTHIN)	Stat No. 538481	Altitude 76 m	N.G.R SJ 133584

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	29.90	55.30	64.30	91.10	32.10	41.30	34.30	48.40	38.80	88.40
1984	97.40	53.90	64.30	11.50	51.10	30.00	19.00	83.10	114.20	74.40
1976	69.10	40.70	18.20	29.80	52.50	11.50	24.90	8.70	247.30	99.40

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
71.00	58.00	48.00	50.00	59.00	46.00	61.00	67.00	72.00	71.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	42.11	95.34	133.96	182.20	54.41	86.04	56.23	72.24	53.89	124.51
1984	137.18	92.93	133.96	23.00	86.61	62.50	31.15	124.03	158.61	104.79
1976	97.32	70.17	37.92	59.60	88.98	23.96	40.82	12.99	343.47	140.00

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	42.11	93.34	133.96	182.20	54.41	86.04	56.23	72.24	53.89	124.31
2 Month	*	66.03	112.83	158.57	113.03	68.60	69.36	64.61	62.73	88.93
3 Month	*	*	84.46	133.06	119.43	104.78	64.11	70.45	60.75	83.62
4 Month	*	*	*	103.99	112.93	111.61	91.19	66.43	65.63	77.45
5 Month	*	*	*	*	95.35	108.02	98.91	88.74	63.49	78.75
6 Month	*	*	*	*	*	94.01	98.27	93.54	80.11	74.95

CHESTER WATERWORKS Stat No. 548681 Altitude 20 m N.G.R SJ 416666

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	17.80	45.90	32.60	80.40	34.40	41.10	41.90	54.40	37.50	62.40
1984	71.90	35.60	24.30	10.90	37.60	29.70	14.30	79.90	96.40	68.40
1976	52.80	45.50	37.20	15.00	56.90	20.60	9.80	1.10	215.60	93.70

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
57.00	44.00	39.00	42.00	58.00	49.00	65.00	66.00	60.00	59.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	31.23	104.32	84.10	191.43	59.31	83.88	64.46	82.42	62.50	105.76
1984	126.14	80.91	62.31	25.95	64.83	60.61	22.00	121.06	164.00	115.93
1976	92.63	103.41	95.38	35.71	101.55	42.04	15.08	1.67	359.33	158.81

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	31.23	104.32	84.10	191.43	59.31	83.88	64.46	82.42	62.50	105.76
2 Month	*	63.07	94.82	139.75	114.80	70.56	72.81	73.51	72.94	83.95
3 Month	*	*	68.93	127.28	106.19	104.63	68.26	76.33	70.05	83.41
4 Month	*	*	*	97.20	103.74	100.37	92.43	72.18	72.88	78.48
5 Month	*	*	*	*	88.04	101.12	91.15	90.07	70.23	79.36
6 Month	*	*	*	*	*	87.34	93.10	89.34	85.21	76.11

CRIB GOCH Stat No. 527192 Altitude 713 m N.G.R SH 623550

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	373.00	448.00	748.00	243.00	107.00	248.00	75.00	494.00	158.00	708.00
1984	555.00	221.00	80.00	48.00	49.00	197.00	120.00	154.00	583.00	678.00
1976	445.00	290.00	203.00	122.00	311.00	70.00	210.00	64.00	451.00	478.00

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
462.00	322.00	280.00	270.00	233.00	273.00	336.00	376.00	428.00	422.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	80.74	139.13	267.14	90.00	45.53	90.84	22.32	131.38	36.92	167.77
1984	120.13	68.63	28.57	17.76	20.85	72.16	35.71	40.96	136.21	160.66
1976	96.32	90.06	72.50	45.19	132.34	25.64	62.50	17.02	105.37	113.27

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	80.74	139.13	267.14	90.00	45.53	90.84	22.32	131.38	36.92	167.77
2 Month	*	104.72	198.67	180.18	69.31	69.88	53.04	79.92	81.09	101.88
3 Month	*	*	147.48	165.02	139.87	76.66	50.95	82.94	63.77	110.93
4 Month	*	*	*	135.83	139.66	127.22	80.41	75.74	69.00	91.87
5 Month	*	*	*	*	122.31	130.00	101.94	78.32	63.66	91.72
6 Month	*	*	*	*	*	117.64	108.92	108.19	69.08	86.47

GLYNI RESERVOIR Stat No. 531385 Altitude 27 m N.G.R SH 444772

Monthly Rainfall Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	69.00	128.00	130.00	74.00	21.00	76.00	26.00	117.00	16.00	120.00
1984	175.00	50.00	48.00	21.00	45.00	36.00	33.00	79.00	138.00	133.00
1976	107.00	33.00	43.00	36.00	72.00	26.00	38.00	10.00	178.00	130.00

1941-70 Average Monthly Rainfall (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
105.00	71.00	61.00	84.00	67.00	63.00	72.00	90.00	105.00	103.00

Monthly Rainfall as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	79.05	180.28	213.11	115.63	31.34	116.92	38.89	130.00	15.24	116.50
1984	166.67	70.42	78.69	32.81	67.16	55.38	45.83	87.78	150.48	131.07
1976	101.90	46.48	70.49	56.25	107.46	40.00	52.78	11.11	169.52	145.63

Rainfalls of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	79.05	180.28	213.11	115.63	31.34	116.92	38.89	130.00	15.24	116.50
2 Month	*	119.89	195.45	163.20	72.52	73.48	73.91	89.51	68.21	65.38
3 Month	*	*	143.88	169.39	117.19	87.24	61.27	97.36	60.30	84.90
4 Month	*	*	*	137.87	134.22	117.12	74.23	82.31	71.39	73.93
5 Month	*	*	*	*	118.48	130.78	100.00	88.27	64.68	82.07
6 Month	*	*	*	*	*	118.24	114.25	106.44	71.71	75.30

2.2 Evaporation

From data obtained from Norecs (Ref 3), potential and actual evaporation values for grass, for the Region during July 1989 have been extracted and reproduced here. Note that the highest potential was reached in the south east and highest actual in the north and parts of South Wales.

Potential Evaporation (mm)

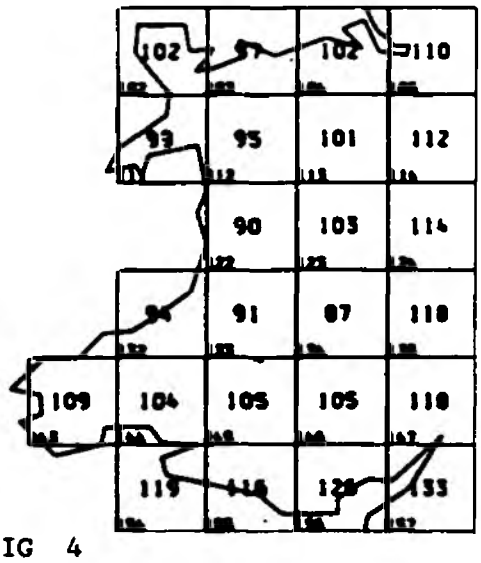


FIG 4

Actual Evaporation (mm)

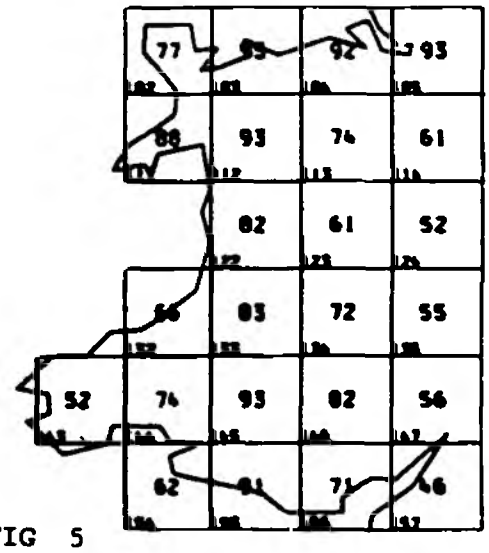


FIG 5

2.3 Soil Moisture Deficits

The following tables, extracted from MORECS (Option 1) (Ref 3), are areal data values representative of the Welsh Region.

1989 Month	S.M.D (R.L.U) mm *1	S.M.D (Grass) mm *2	Total Rainfall mm
Jan	1.8	2.4	79.6
Feb	2.0	1.7	139.8
Mar	.3	.3	151.1
Apr	2.3	5.0	88.7
May	9.3	8.2	23.1
Jun	57.4	70.9	65.3
Jul	66.3	71.2	49.0
Aug	81.3	100.4	78.1
Sep	77.2	92.6	57.3
Oct	63.3	78.6	164.4
Nov	10.1	11.1	99.8
Dec	8.2	7.5	188.9

*1 - Data valid for 1st week of month
*2 - Data valid on 1st of month

Comparison is made between Real Land Use (R.L.U) and Grass deficits.

The data are also illustrated in graphical form for ease of interpretation; refer to Figures 6 and 7 below.

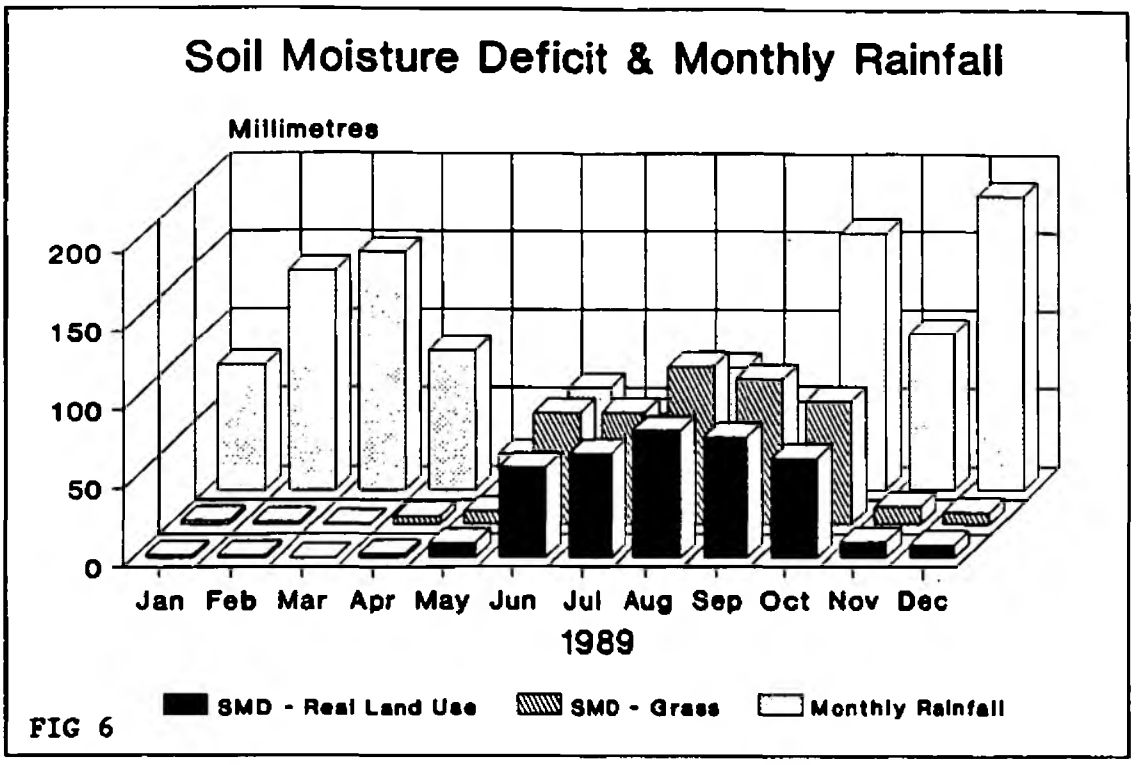


FIG 6

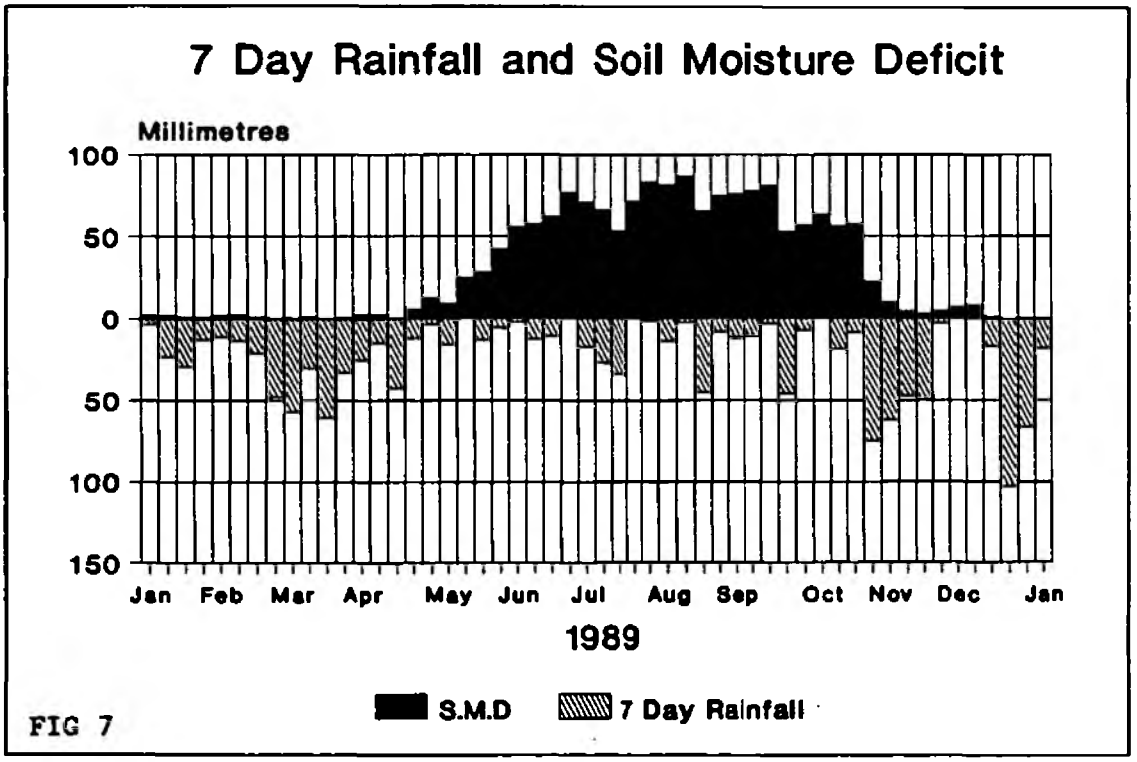


FIG 7

The following table shows that for the Welsh Region, Soil Moisture Deficit (Real Land Use) was zero in mid March, only returning to equilibrium towards the end of December.

Week No	Soil Moisture Deficit (R.L.U) Date	mm		Min		Max	Rainfall (7 days) Date	mm
1	4/ 1/89	1.8			N		3/ 1/89	3.6
2	11/ 1/89	1.6					10/ 1/89	23.2
3	18/ 1/89	1.0			O		17/ 1/89	29.3
4	25/ 1/89	1.1					24/ 1/89	12.6
5	1/ 2/89	2.0			T		31/ 1/89	11.1
6	8/ 2/89	2.3					7/ 2/89	13.5
7	15/ 2/89	1.1					14/ 2/89	21.2
8	22/ 2/89	.2					21/ 2/89	48.0
9	1/ 3/89	.3			A		28/ 2/89	57.1
10	8/ 3/89	.9					7/ 3/89	30.5
11	15/ 3/89	.0	*		V		14/ 3/89	60.8
12	22/ 3/89	.1					21/ 3/89	33.2
13	29/ 3/89	2.0			A		28/ 3/89	25.8
14	5/ 4/89	2.3					4/ 4/89	15.2
15	12/ 4/89	.1			I		11/ 4/89	42.7
16	19/ 4/89	5.6					18/ 4/89	12.1
17	26/ 4/89	12.5			L		25/ 4/89	3.7
18	3/ 5/89	9.3					2/ 5/89	16.0
19	10/ 5/89	24.9			A		9/ 5/89	.0
20	17/ 5/89	28.2					16/ 5/89	13.1
21	24/ 5/89	42.4			B		23/ 5/89	5.5
22	31/ 5/89	55.7					30/ 5/89	2.2
23	7/ 6/89	57.4			L		6/ 6/89	12.3
24	14/ 6/89	62.2					13/ 6/89	10.9
25	21/ 6/89	76.4			E		20/ 6/89	.0
26	28/ 6/89	70.4					27/ 6/89	17.3
27	5/ 7/89	66.3		12		112	4/ 7/89	26.9
28	12/ 7/89	53.3		7		98	11/ 7/89	34.0
29	19/ 7/89	71.5					18/ 7/89	.1
30	26/ 7/89	82.6		41		119	25/ 7/89	1.5
31	2/ 8/89	81.3		46		120	1/ 8/89	13.5
32	**9/ 8/89**	**86.8**	**Max**	**47**		**122**	**8/ 8/89**	**2.5**
33	16/ 8/89	65.3		4		117	15/ 8/89	45.5
34	23/ 8/89	74.6		5		121	22/ 8/89	8.2
35	30/ 8/89	75.5		0		104	29/ 8/89	12.1
36	6/ 9/89	77.2		7		122	5/ 9/89	10.5
37	13/ 9/89	80.8					12/ 9/89	2.8
38	20/ 9/89	53.0		0		104	19/ 9/89	46.3
39	27/ 9/89	56.9		2		113	26/ 9/89	7.3
40	4/10/89	63.3		10		117	3/10/89	.0
41	11/10/89	56.6		0		117	10/10/89	18.8
42	18/10/89	57.7		2		119	17/10/89	8.5
43	25/10/89	22.6		0		82	24/10/89	74.9
44	1/11/89	10.1		0		67	31/10/89	62.1
45	8/11/89	4.4		0		53	7/11/89	47.2
46	15/11/89	3.1		1		29	14/11/89	49.6
47	22/11/89	4.7		0		30	21/11/89	2.9
48	29/11/89	6.9		3		32	28/11/89	.1
49	6/12/89	8.2		4		33	5/12/89	.0
50	13/12/89	1.5		0		27	12/12/89	17.0
51	20/12/89	.0	*	0		1	19/12/89	103.1
52	27/12/89	.1		0		1	26/12/89	66.6

Maximum deficits were estimated for early August, with a value of 122 mm in parts of Herefordshire (Morecs square 147), with a Regional value of 86.8 mm.

As could be expected, maximum soil moisture deficits generally occurred in the north east and south east of the Region, with minima in the Snowdon area as shown in Figure 8.

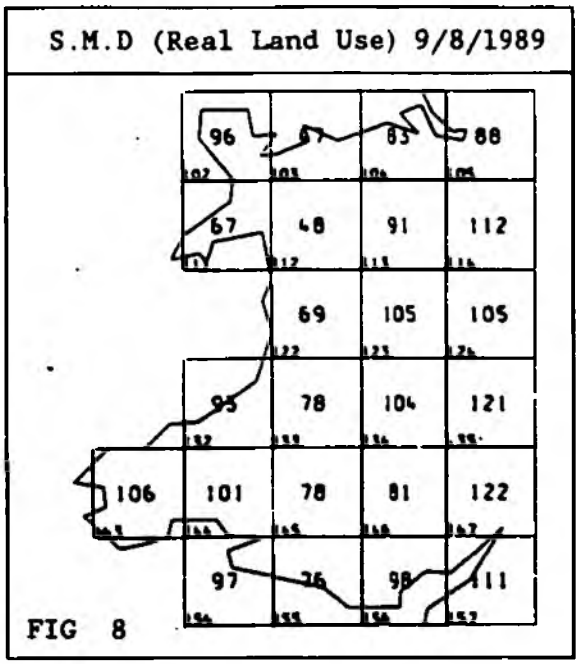


FIG 8

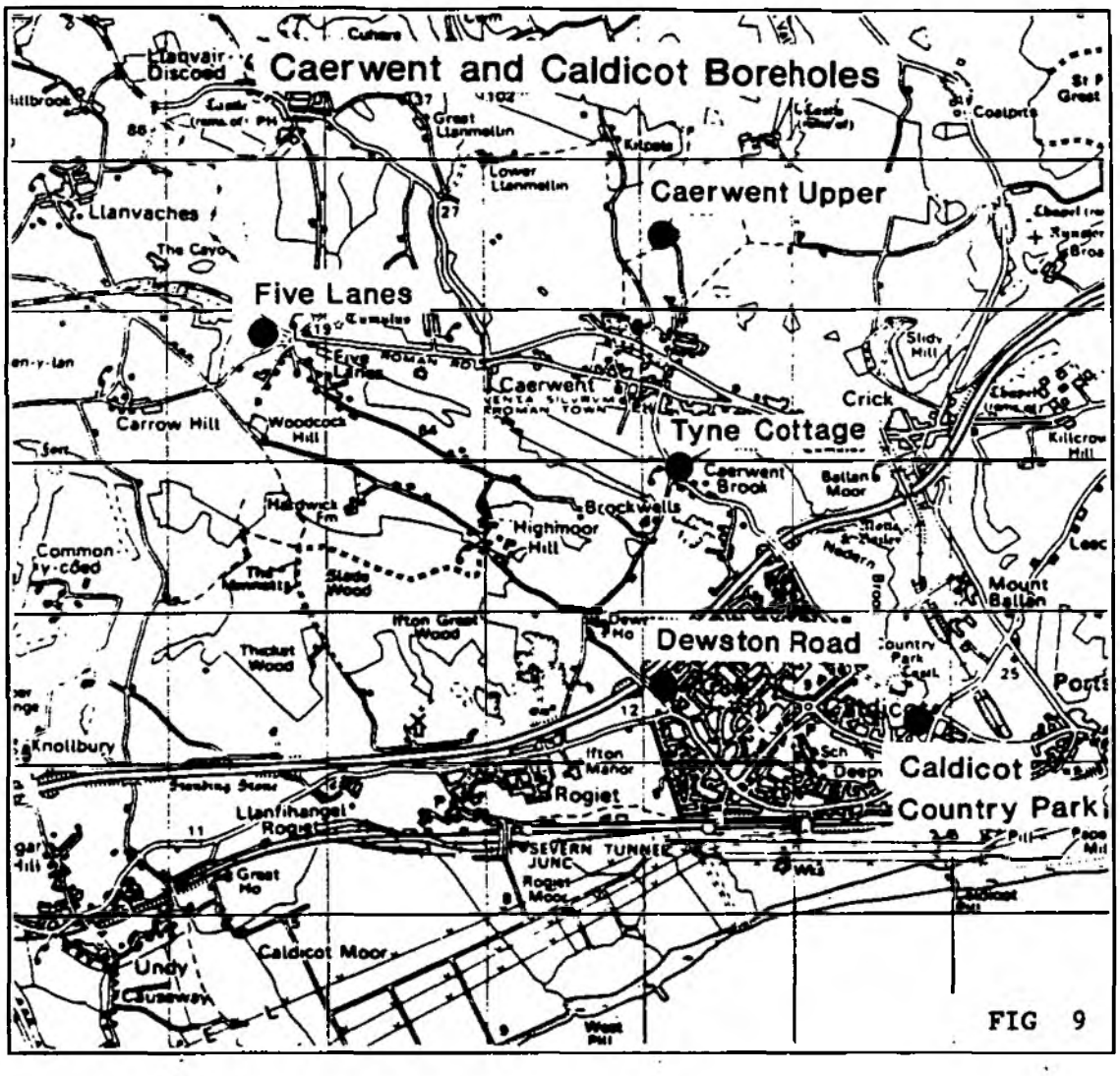
2.4 Groundwater

A number of boreholes are monitored within the Region, and one group has been selected to illustrate the changes in groundwater levels that featured in 1989.

The observation boreholes are located just inland of the north coast of the Severn Estuary, between Newport and Chepstow (see Figure 9). Data for four of these sites has been collected since mid 1985 whilst Caerwent Upper Borehole has a record starting in 1984.

Inspection of the drawdown graphs included on the following pages, reveals a distinct trend of increasing summer drawdowns, with the exception of 1988. Recovery during the winter months appears complete. The record however, is too short to draw any real conclusions.

The plot for Caerwent Upper Borehole indicates that water levels were lower at this site in 1984 than in 1989. It should be noted that water levels are below sea level as a result of pumping by British Rail from the Severn Tunnel (east of Caldicot Country Park Borehole).



Geological sections of the four boreholes has been extracted from the logs and is produced here for completeness as Figure 10.

Caerwent and Caldicot Boreholes - Geological Sections

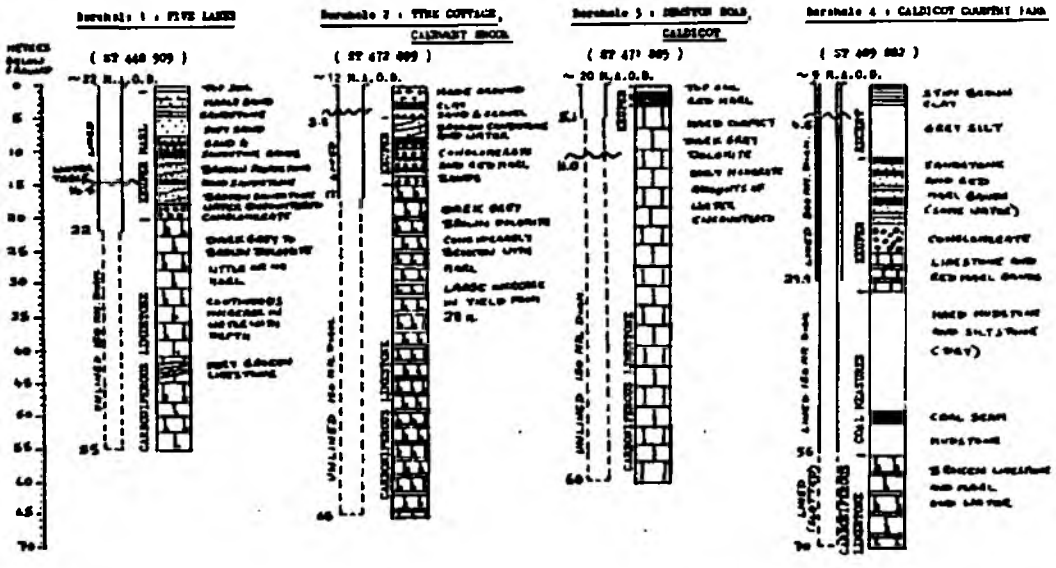
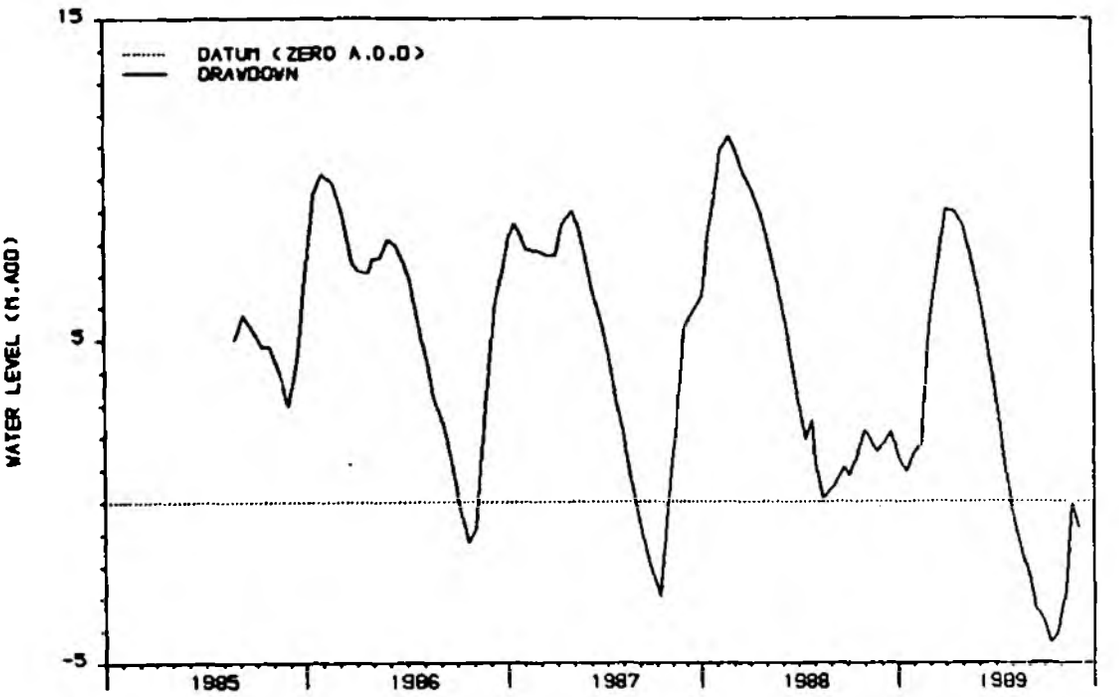
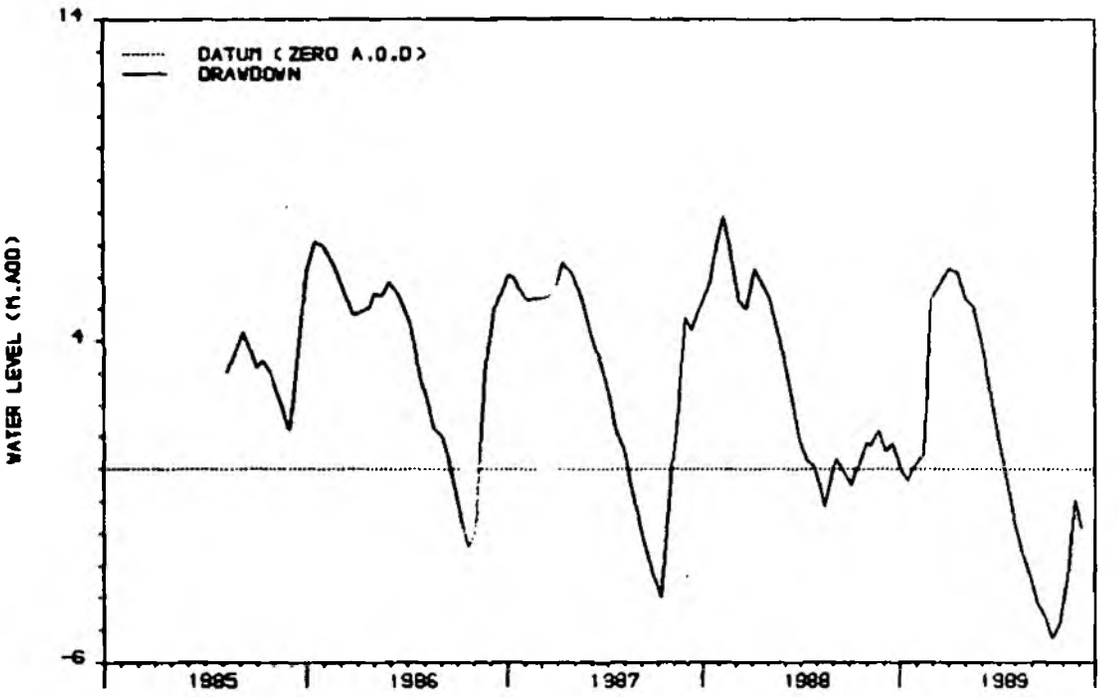


FIG 10

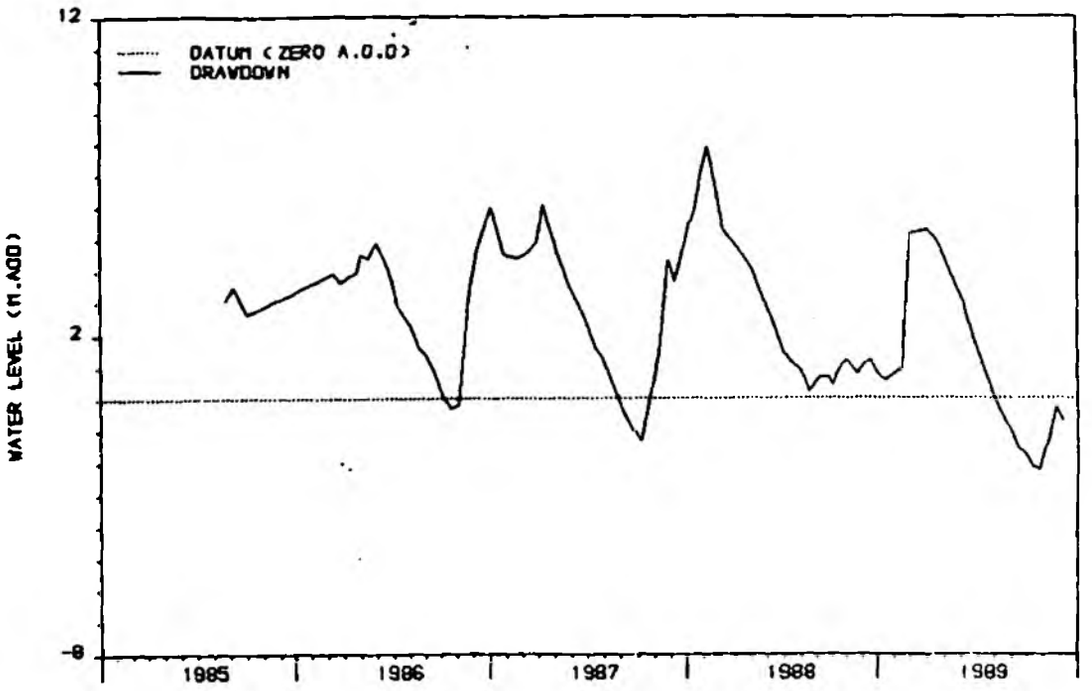
FIVELANES BOREHOLE - GROUNDWATER



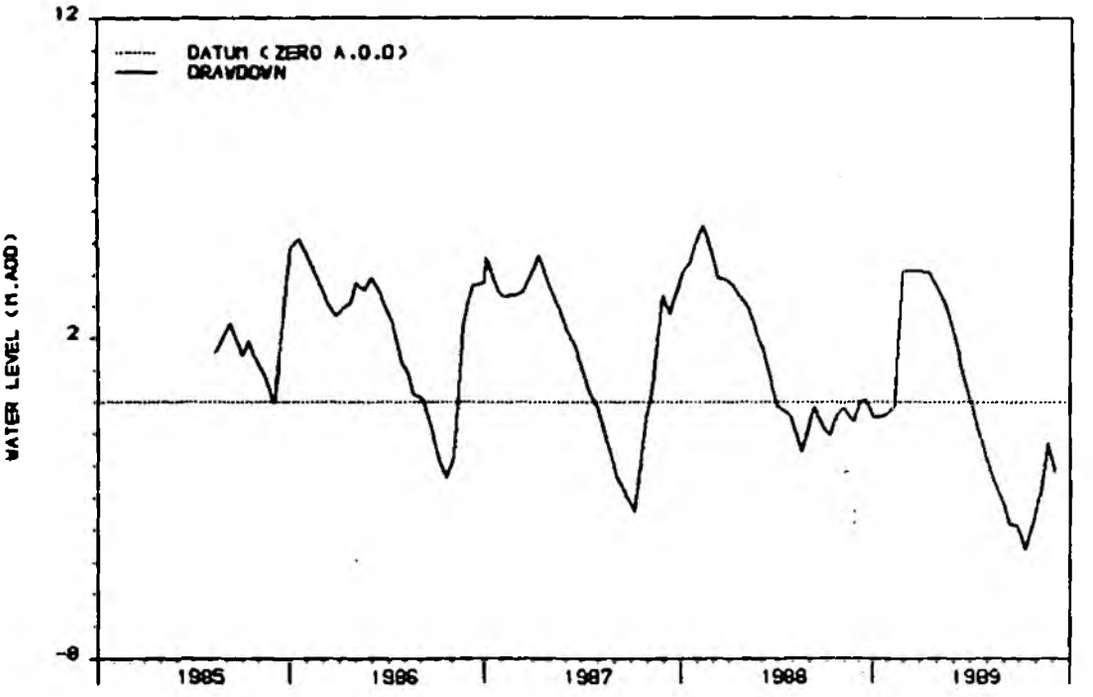
TYNE COTTAGES BOREHOLE - GROUNDWATER



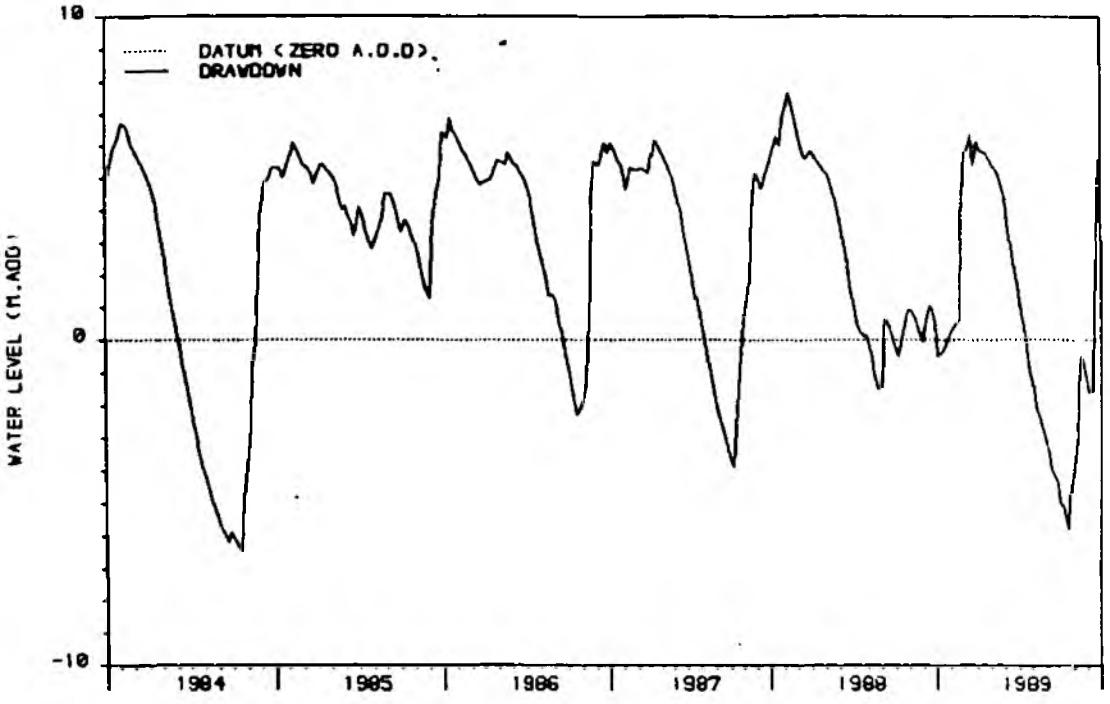
DEWSTON ROAD BOREHOLE - GROUNDWATER



CALDICOT C.P BOREHOLE - GROUNDWATER



CAERWENT UPPER BOREHOLE - GROUNDWATER



2.5 River Flows

Nine flow measurement stations have been chosen to represent the Region, complete with comparative data for the previous drought events of 1976 and 1984; three per Division. Long Term Averages (L.T.A) are included for the period of record, again these locations can be found on Figure 1.

To make the data more readily understood, it has been normalized by expressing the daily mean flows in terms of depth of runoff, in units of millimetres.

Flow profiles for the selected stations are included under Appendix A at the end of this report. Two plots for each station have been included, one showing the complete year 1989, together with 1976 and 1984 flows overlaid for comparison. The second, for the restricted period April to October, as above but with the estimated Q95 flow plotted as well.

The Q95 flow has been estimated from each station record up to and including 1989 (Ref 4).

A common feature of the plots, is that the 1989 recession started in April, whilst the two previous drought started in March.

As for rainfall (see Section 2.1), the monthly runoffs for 1976, 1984 and 1989 have been computed and expressed as a percentage of long term average runoffs for each of the 3 drought years, for each station record.

Also calculated are the cumulative monthly runoffs for periods of 1 to 6 months ending January to October. In a similar way to the

handling of rainfall data, the cumulative total for two periods January to September (9 months) and April to September (6 months) have been determined and expressed as a percentage of long term average runoffs for the station records. Examination of the two sets of data produced enable a examination of the severity of the 1989 drought to be made; together with comparisons against 1976 and 1984 for similar periods. The results appear in the following tables. Where monthly runoff was a station record low, the data has been highlighted with an "*".

Percentage of L.T.A	6 mths Apr - Sep			9 mths Jan - Sep		
Station Name	1976	1984	1989	1976	1984	1989
Wye @ Redbrook	42	46	72	40	82	87
Yscir @ Pontaryscir	41	42	59	54	86	91
Cynon @ Abercynon	46	34	47	52	86	94
Dulais @ Cilfrew	42	35	55	48	68	98
Teifi @ Glanteifi	35	36	50	55	68	88
Cothi @ Felin Mynachdy	30	35	41	48	68	81
Dyfi @ Dyfi Bridge	39	33	51	64	66	91
Erch @ Pencaenewydd	64	45	64	66	66	85
Glaslyn @ Beddgelert	73	43	58	81	63	97

Examination of the plots (see Appendix A), reveals that in most cases 1989 flows were not as severe as in 1976 or 1984. Where the drought extended beyond September and into October 1989, flows were lower than in both 1976 and 1989, although well above the absolute minimum at each station.

An interesting statistic that gives an insight into the possible treatment of abstraction licence restrictions during drought, is shown by the following table, which lists for each station the longest period when flows fell below Q95 (based on station data up to and including 1989).

Number of Consecutive Days Below Q95 Flows (cumecs)					DMF Minima	
Station Name	Q95	1976	1984	1989	Flow	1989
Wye @ Redbrook	11.440	67	37	33	4.440	10/9
Yscir @ Pontaryscir	0.182	54	20	14	0.134	7/9
Cynon @ Abercynon	0.536	40	29	27	0.252	12/9
Dulais @ Cilfrew	0.244	38	34	15	0.172	25/7
Teifi @ Glanteifi	2.860	80	57	34	1.501	28/7
Cothi @ Felin Mynachdy	0.851	51	34	31	0.424	8/8
Dyfi @ Dyfi Bridge	2.083	49	48	24	0.857	25/6
Erch @ Pencaenewydd	0.091	41	30	27	0.077	27/7
Glaslyn @ Beddgelert	0.532	31	34	17	0.253	7/8

From the table above it can be seen that the order of severity when considering just the number of consecutive days when flows fell below Q95 was 1976, 1984 and then 1989.

VYE AT REDBROOK Stat No. VYE055023 Catchment Area 4010.0 km2 N.G.R SO 528110

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	43.2	64.4	119.9	61.6	13.8	9.1	8.7	3.4	7.5*	30.6
1984	135.5	84.7	29.6	17.4	12.6	9.1	5.5	5.9	18.3	52.0
1976	37.8*	29.3*	25.0*	16.5*	11.0*	7.1*	5.0*	3.5*	18.9	89.4

1969-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
91.6	74.7	70.9	45.8	29.1	21.7	14.7	17.9	20.3	39.0

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	47.2	86.2	169.1	134.5	54.3	41.9	59.2	30.2	36.9	78.5
1984	147.9	113.4	41.7	38.0	43.3	41.9	37.4	33.0	91.1	133.3
1976	41.3	39.2	35.3	36.0	37.8	32.7	34.0	19.6	93.1	229.2

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	47.2	86.2	169.1	134.5	54.3	41.9	59.2	30.2	36.9	78.5
2 Month	*	64.7	126.6	155.5	103.3	49.0	48.9	45.3	33.8	64.2
3 Month	*	*	95.9	128.5	135.3	69.5	51.3	42.7	40.8	56.3
4 Month	*	*	*	102.2	118.7	123.2	85.5	46.8	41.2	56.8
5 Month	*	*	*	*	97.7	111.8	118.1	77.9	44.8	54.0
6 Month	*	*	*	*	*	94.1	108.8	110.2	72.3	54.0

YSCIR at PONTARYSCIR Stat No. USK056013 Catchment Area 62.8 km2 N.G.R SO 003304

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	91.6	130.5	181.6	79.6	18.3	10.2	10.7	7.9	10.8*	89.6
1984	247.3	131.5	36.4*	20.1	13.2	16.9	6.4*	5.7	36.9	113.8
1976	100.2	74.5	49.9	28.8	16.9	10.4	7.1	4.4*	27.3	129.1

1972-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
145.1	103.2	114.4	61.1	43.5	30.5	21.8	30.1	46.8	93.1

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	63.1	126.5	158.7	130.3	42.1	33.4	49.1	26.2	23.1	96.2
1984	170.4	127.4	31.8	32.9	30.3	55.4	29.4	18.9	78.8	122.2
1976	69.1	72.2	43.6	47.1	38.9	34.1	32.6	14.6	58.3	138.7

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	63.1	126.5	158.7	130.3	42.1	33.4	49.1	26.2	23.1	96.2
2 Month	*	89.4	143.4	148.8	93.6	38.5	40.0	35.8	24.3	71.8
3 Month	*	*	111.3	140.5	127.6	80.0	40.9	35.0	29.8	63.7
4 Month	*	*	*	114.0	127.3	116.1	75.7	37.4	30.7	62.0
5 Month	*	*	*	*	107.3	119.1	110.7	67.8	33.5	58.1
6 Month	*	*	*	*	*	102.8	115.1	102.3	58.8	55.5

CYNON AT ABERCYNON Stat No. TAF057004 Catchment Area 106.0 km2 N.G.R ST 079956

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	97.4	232.2	232.3	71.8	24.2	15.9	15.9	11.7	15.5	160.0
1984	332.6	163.2	51.5	25.4	18.4	18.6	11.3*	11.1	26.4	176.3
1976	95.7	71.4	80.1	35.6	29.1	16.9	11.8	9.8*	47.2	244.8

1957-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
186.6	131.1	120.1	76.1	60.7	40.7	34.1	50.6	68.5	122.7

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	52.2	177.1	193.4	94.3	39.9	39.1	46.6	23.1	22.6	130.4
1984	178.2	124.5	42.9	33.4	30.3	45.7	33.1	21.9	38.5	143.7
1976	50.2	54.5	66.7	46.8	47.9	41.5	34.6	19.4	68.9	199.5

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	52.2	177.1	193.4	94.3	39.9	39.1	46.6	23.1	22.6	130.4
2 Month	*	103.7	184.9	153.0	70.2	39.5	42.5	32.6	22.8	91.8
3 Month	*	*	128.3	163.9	127.8	65.0	41.3	34.7	28.1	77.4
4 Month	*	*	*	123.3	144.5	115.7	80.4	36.4	30.4	73.6
5 Month	*	*	*	*	114.3	134.5	108.6	55.2	32.7	69.2
6 Month	*	*	*	*	*	109.5	128.0	97.3	46.9	64.5

DULAIS AT CILFREW	Stat No. GOW058008	Catchment Area 43.0 km2	N.G.R SN 778008

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	146.9	227.9	263.6	90.7	27.7	19.9	20.1	26.0	41.6	181.4
1984	276.2	130.1	43.7*	21.6*	21.3	16.6*	9.9*	9.8*	65.2	207.3
1976	97.9	86.3	68.3	39.9	50.7	25.4	15.1	10.4	29.8	185.6

1972-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
185.9	133.6	150.0	80.0	68.6	49.9	48.0	71.1	92.1	143.7

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	79.0	170.6	175.7	113.4	40.4	39.9	41.9	36.6	45.2	126.2
1984	148.6	97.4	29.1	27.0	31.0	33.7	20.6	13.8	70.8	144.3
1976	52.7	64.6	45.5	49.9	73.9	50.9	31.5	14.6	32.4	129.2

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	79.0	170.6	175.7	113.4	40.4	39.9	41.9	36.6	45.2	126.2
2 Month	*	117.3	173.3	154.0	79.7	40.2	40.9	38.7	41.4	94.6
3 Month	*	*	136.0	160.1	127.9	69.7	40.7	39.1	41.5	81.1
4 Month	*	*	*	132.7	141.1	115.3	64.3	39.4	41.2	75.8
5 Month	*	*	*	*	122.4	130.6	106.4	58.1	41.0	71.4
6 Month	*	*	*	*	*	116.3	122.6	95.8	55.2	66.9

TEIFI AT GLANTEIFI	Stat No. WWS062001	Catchment Area 693.6 km2	N.G.R SN 244416

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	93.9	115.8	192.2	72.7	22.3	10.3	7.0	6.5	10.8	74.7
1984	166.8	108.5	41.1	21.8	12.7*	8.6*	5.5*	5.3	40.4	133.1
1976	92.0	86.2	63.8	38.8	20.6	10.3	5.6	3.4*	13.0	152.2

1959-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
141.7	103.3	96.1	65.4	53.0	32.3	24.9	36.6	48.8	106.9

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	66.3	112.1	200.0	111.2	42.1	31.9	28.1	17.8	22.1	69.9
1984	117.7	105.0	42.8	33.3	24.0	26.6	22.1	14.5	82.8	124.5
1976	64.9	83.4	66.4	59.3	38.9	31.9	22.5	9.3	26.6	142.4

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	66.3	112.1	200.0	111.2	42.1	31.9	28.1	17.8	22.1	69.9
2 Month	*	85.6	154.5	164.0	80.2	38.2	30.2	22.0	20.3	54.9
3 Month	*	*	117.8	143.8	133.9	69.9	35.9	25.4	22.0	47.8
4 Month	*	*	*	116.8	126.8	120.5	64.0	31.4	24.3	45.6
5 Month	*	*	*	*	108.1	118.1	112.1	56.0	29.1	43.8
6 Month	*	*	*	*	*	103.1	112.1	100.9	49.7	43.3

COTHI AT FELINNYNACHDY	Stat No. WWS060002	Catchment Area 297.8 km2	N.G.R SN 508225

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	95.3	135.6	222.0	77.7	18.9	8.4	5.7	7.5	16.8	126.0
1984	237.2	112.1	28.6	12.6*	7.5*	7.0*	3.5*	5.0	78.1	196.8
1976	87.7	90.2	66.7	30.6	26.2	11.6	5.6	3.3*	21.4	181.5

1962-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
161.8	113.9	117.2	75.7	60.0	38.0	31.3	57.0	67.1	126.4

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	58.9	119.1	189.4	102.6	31.5	22.1	18.2	13.2	25.0	99.7
1984	146.6	98.4	24.4	16.6	12.5	18.4	22.4	8.8	116.4	155.7
1976	54.2	79.2	56.9	40.4	43.7	30.8	17.9	5.8	31.9	270.5

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	58.9	119.1	189.4	102.6	31.5	22.1	18.2	15.2	25.0	99.7
2 Month	*	83.8	154.7	159.4	71.2	27.9	20.3	14.9	19.6	73.8
3 Month	*	*	115.5	141.9	126.0	60.4	25.5	17.1	19.3	60.0
4 Month	*	*	*	113.2	123.8	112.4	54.0	21.7	19.9	55.4
5 Month	*	*	*	*	104.0	114.3	103.3	45.1	22.6	51.4
6 Month	*	*	*	*	*	98.5	107.4	89.7	41.0	48.3

DYFI AT DYFI BRIDGE — Stat No. GWY064001 — Catchment Area 471.3 km2 — N.G.R SH 743019

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	131.2	196.2	286.5	95.6	23.5	18.1	22.1	23.5	33.9	154.3
1984	274.0	151.5	52.9*	14.4*	7.4*	8.9*	4.7*	12.7	96.0	222.0
1976	229.0	110.5	79.8	46.5	50.4	19.1	9.4	3.8*	39.3	168.9

1962-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
189.8	130.7	162.8	92.2	67.5	52.7	48.1	74.9	96.2	169.2

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	69.1	150.1	176.0	103.7	34.8	34.3	45.9	34.0	35.2	91.2
1984	144.4	115.9	20.2	15.6	11.0	16.9	9.8	17.0	99.8	131.2
1976	120.7	84.5	49.0	50.4	74.7	36.2	19.5	5.1	40.9	99.8

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	69.1	150.1	176.0	103.7	34.8	34.3	45.9	34.0	35.2	91.2
2 Month	*	102.2	164.5	149.8	74.6	34.6	39.9	38.7	34.7	70.9
3 Month	*	*	127.0	149.9	125.8	64.6	37.8	37.4	37.2	62.8
4 Month	*	*	*	123.3	132.8	112.9	61.2	36.7	36.6	60.7
5 Month	*	*	*	*	114.0	122.5	105.5	55.1	36.3	57.6
6 Month	*	*	*	*	*	108.0	115.9	94.6	50.7	54.3

ERCH AT PENCAENEWYDD — Stat No. GWY063005 — Catchment Area 18.1 km2 — N.G.R SH 400404

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	105.7	97.2	171.5	78.7	33.9	19.2	14.0	17.6	14.7*	88.6
1984	138.4	98.7	46.0*	25.8	17.8*	16.2	12.1*	13.7	39.6	130.0
1976	120.7	68.0	63.5	50.8	43.5	22.0	15.8	9.1*	33.7	155.6

1973-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
146.5	108.5	113.1	69.2	48.3	30.7	27.2	46.1	58.6	113.0

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	72.2	89.6	149.0	113.7	69.9	62.3	51.5	38.2	25.1	59.7
1984	108.1	91.0	40.0	37.3	36.7	52.8	44.3	29.7	67.6	113.0
1976	82.4	62.7	55.2	73.4	93.8	71.7	58.1	19.7	60.9	135.5

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	72.2	89.6	149.0	113.7	69.9	62.5	51.3	38.2	25.1	59.7
2 Month	*	79.6	120.2	135.8	93.7	67.0	57.3	43.1	30.9	46.0
3 Month	*	*	101.2	118.6	122.0	88.8	63.1	48.8	35.1	45.9
4 Month	*	*	*	103.1	111.7	115.1	83.0	55.5	40.3	46.3
5 Month	*	*	*	*	99.8	107.7	109.2	73.7	47.1	46.3
6 Month	*	*	*	*	*	97.6	103.8	99.4	63.5	51.5

GLASLYN AT BEDDGELERT — Stat No. GWY065001 — Catchment Area 68.6 km2 — N.G.R SH 592478

Monthly Runoff Totals (mm)

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	225.8	290.2	373.4	141.2	57.2	64.8	48.9	173.8	69.5	301.1
1984	402.2	184.7	67.7*	35.6	12.7	44.3	19.3*	42.6	261.8	420.7
1976	345.9	192.8	136.3	124.2	188.9	104.3	36.0	12.0*	236.9	309.0

1961-89 Average Monthly Runoffs (mm)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
301.6	199.5	242.3	157.3	131.0	129.1	137.1	193.6	214.1	281.5

Monthly Runoff as % of Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1989	74.9	145.5	236.6	89.8	43.7	50.2	35.7	90.8	32.5	107.0
1984	133.4	92.6	27.9	22.6	9.7	34.3	14.1	22.0	122.3	149.4
1976	114.7	96.6	56.3	79.0	144.2	80.9	26.3	6.2	110.6	109.8

Runoffs of Different Durations Ending Month Shown as % Average

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1 Month	74.9	145.5	236.6	89.8	43.7	50.2	35.7	90.8	32.5	107.0
2 Month	*	103.0	193.5	178.8	68.8	46.9	42.7	67.9	60.2	74.8
3 Month	*	*	146.5	167.7	145.5	63.1	43.0	63.0	54.0	79.3
4 Month	*	*	*	136.6	145.5	128.8	56.3	58.7	55.3	72.0
5 Month	*	*	*	*	124.8	131.1	111.1	65.2	51.7	69.1
6 Month	*	*	*	*	*	116.5	118.0	107.2	57.9	66.0

3. WATER RESOURCES PERFORMANCE

3.1 Reservoir Storages

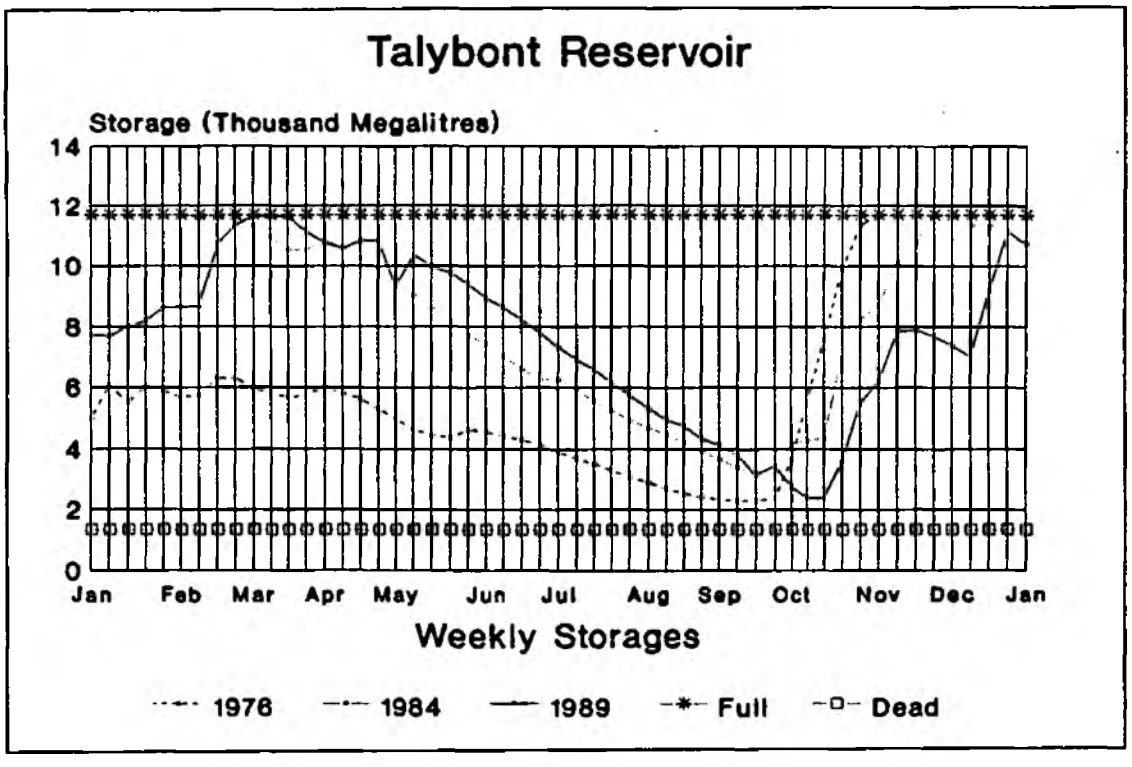
To illustrate the changes in storage evident during 1989, storage drawdown graphs have been included for the following major supply reservoirs in the Region.

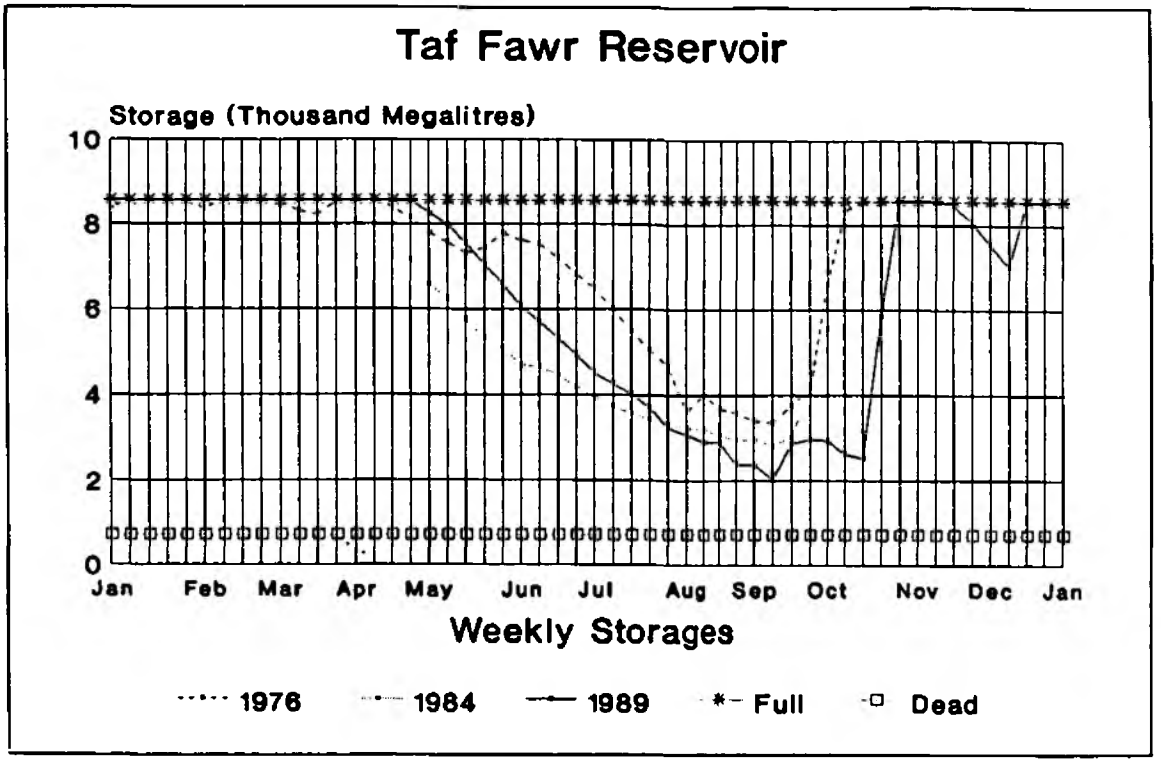
South Eastern	South Western	Northern
+ Talybont + Taf Fawr + Taf Fechan + Usk + Llandegfedd	Llysyfran Llyn Brianne	Dee System *

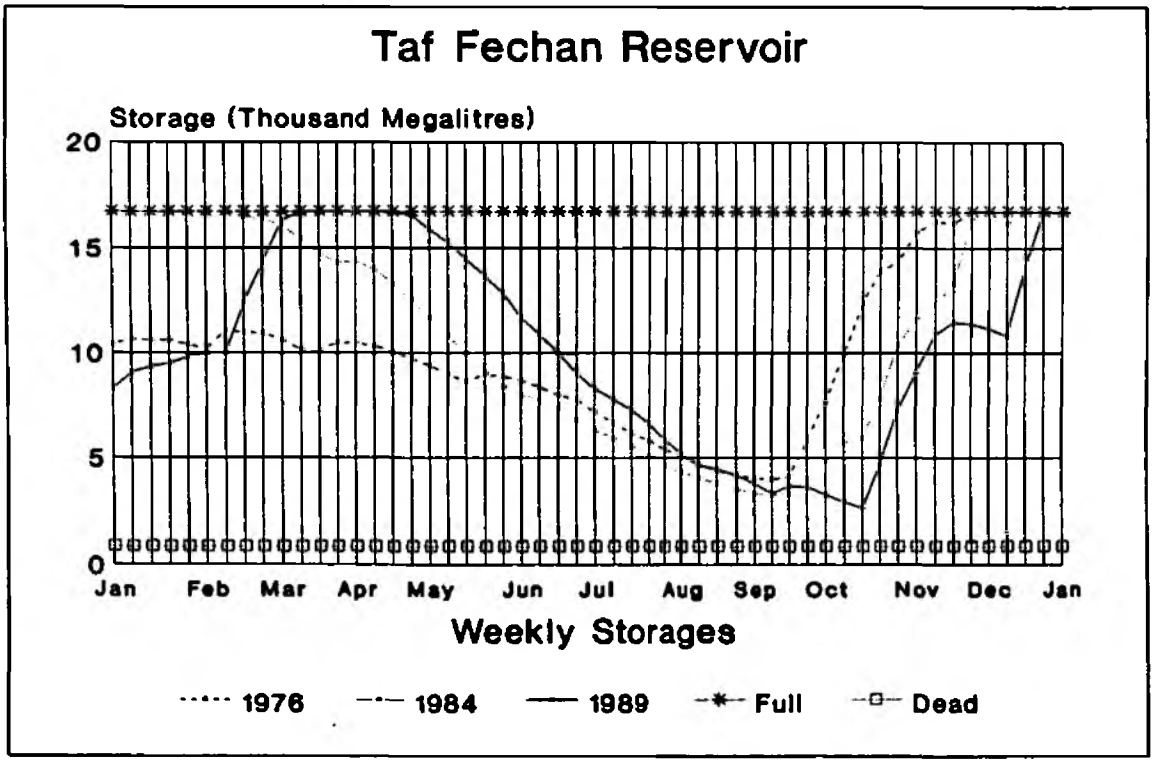
+ Collectively known as the "Big 5" (Ref 5). * Data for the Dee Storage System is cumulative (excluded Llyn Tegid); all other data was supplied by Welsh Water/Dŵr Cymru.

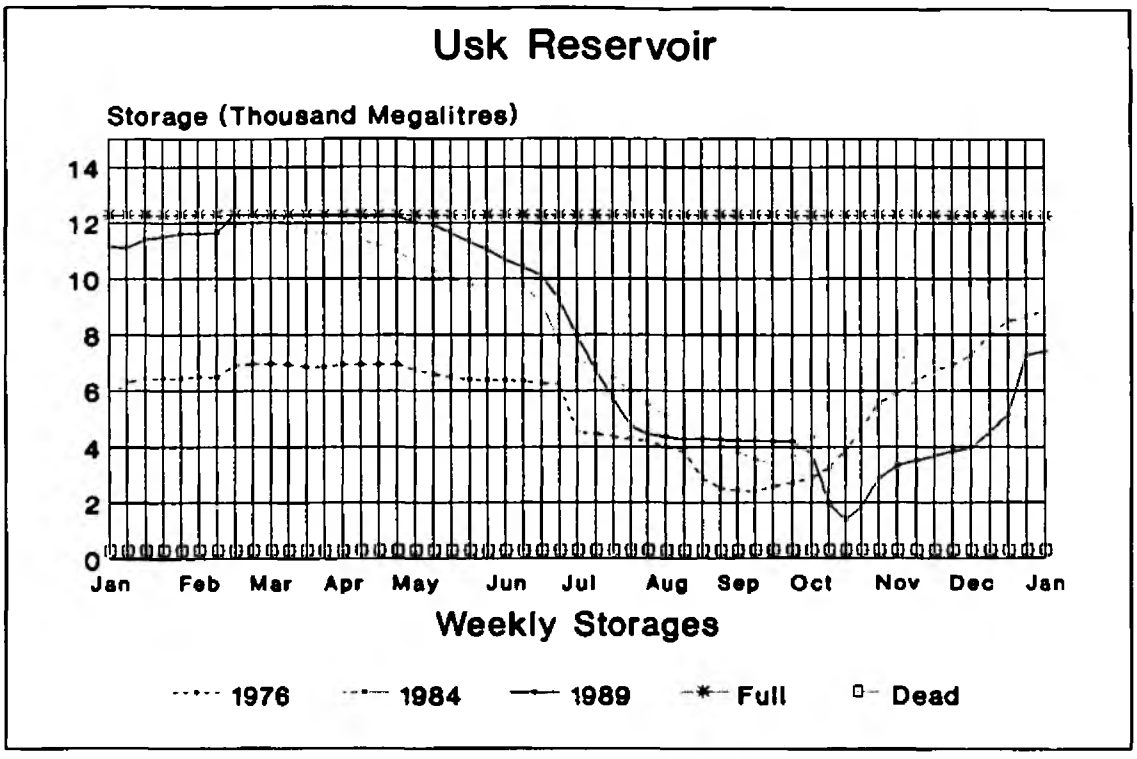
In addition, the cumulative storages for the five South Eastern Division reservoirs was computed and is also represented here.

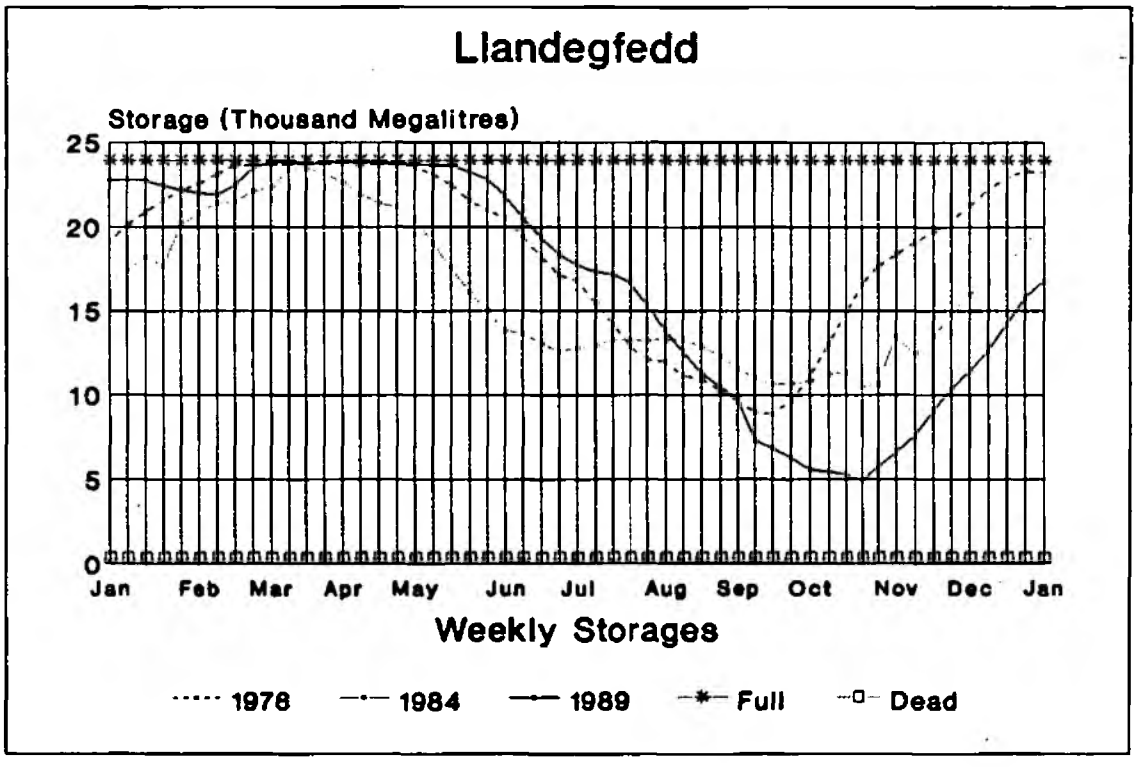
Although not directly comparable, the drawdowns that occurred in previous drought years 1976 and 1984 have been included, where available. When drawing conclusions, it should be borne in mind that restrictions applied by the major water company (Welsh Water/Dŵr Cymru) in the form of hosepipe bans, compensation reductions, relaxation of 'hands-off' flow conditions etc were not necessarily effective during the same periods in each drought year.

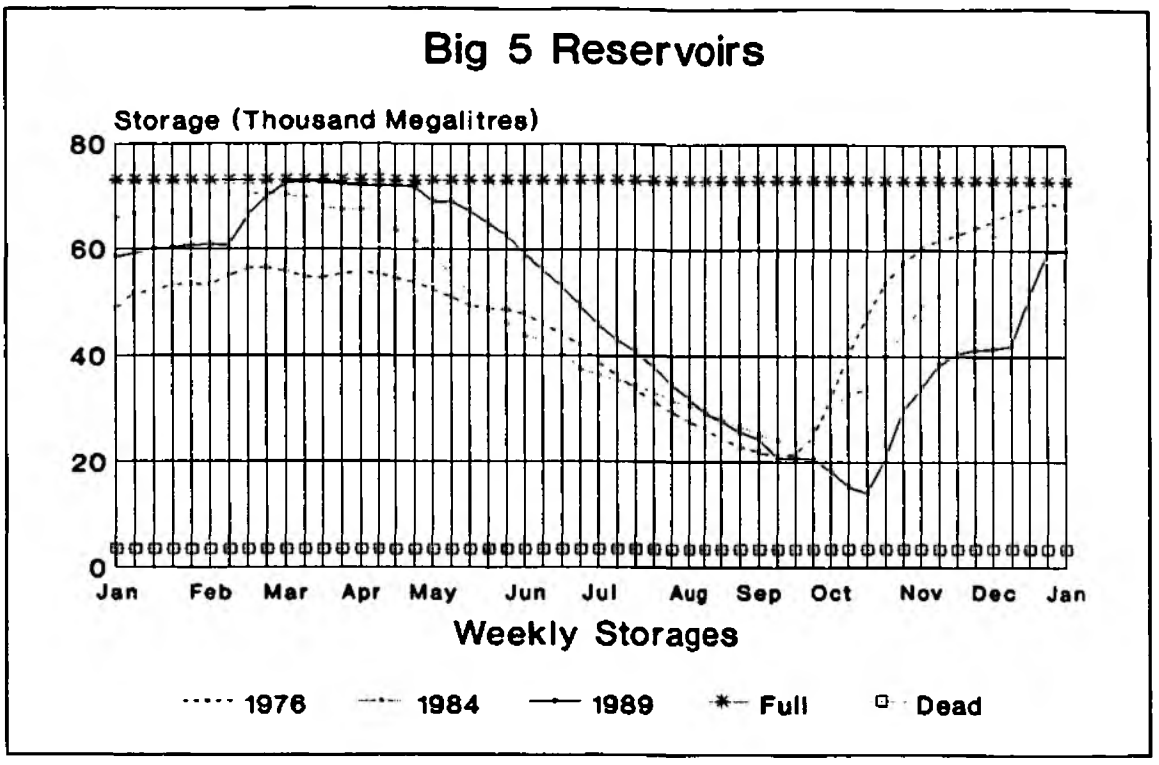


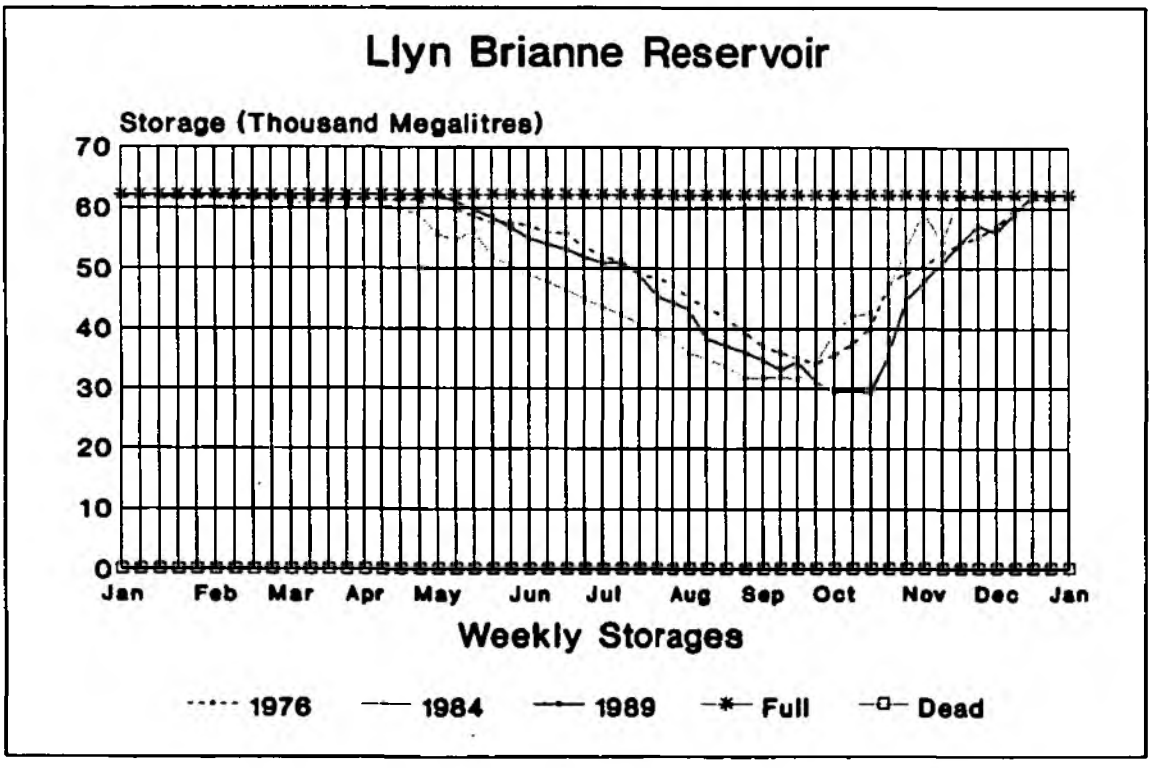

Taf Fawr Reservoir
Storage (Thousand Megalitres)
10
8
6
4
2
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Weekly Storages
1976
1984
1989
Full
Dead


Taf Fechan Reservoir
Storage (Thousand Megalitres)
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Weekly Storages
1976
1984
1989
Full
Dead

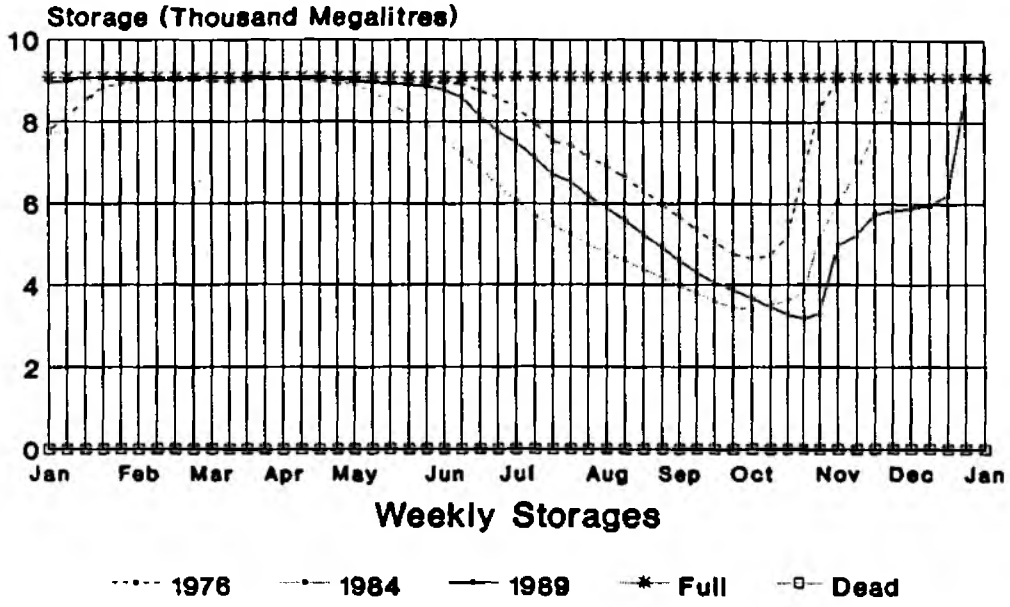

Usk Reservoir
Storage (Thousand Megalitres)
14
12
10
8
6
4
2
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Weekly Storages
1976
1984
1989
Full
Dead


Llandegfedd
Storage (Thousand Megalitres)
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Weekly Storages
1976
1984
1989
Full
Dead

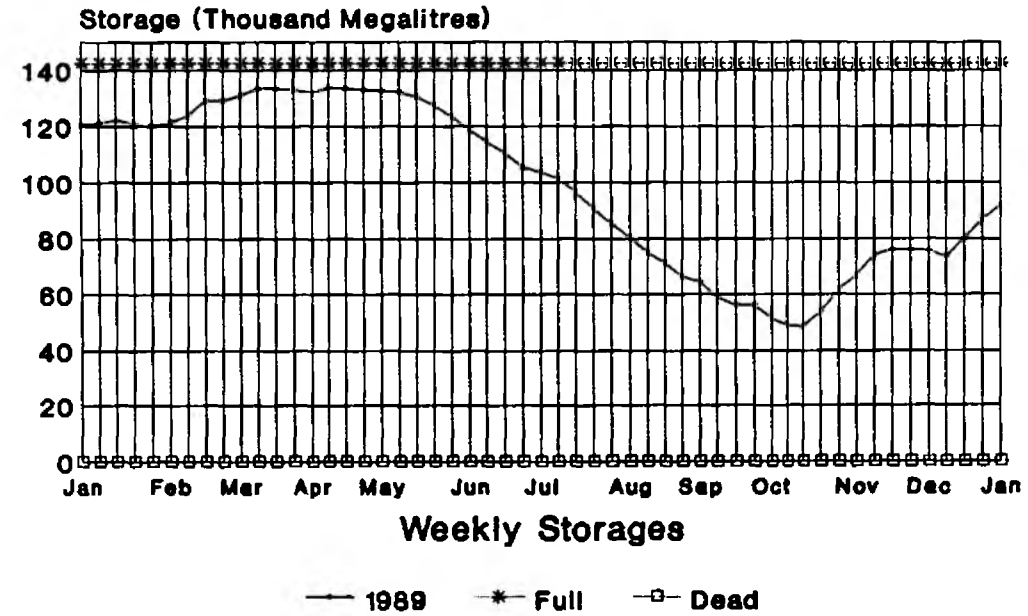

Big 5 Reservoirs
Storage (Thousand Megalitres)
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Weekly Storages
1976
1984
1989
Full
Dead


Llyn Brianne Reservoir
Storage (Thousand Megalitres)
70
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Weekly Storages
1976
1984
1989
Full
Dead

LlysyFran Reservoir



Dee System Storage



The plots show that although the drought started later in 1989 than in 1976 or 1984, storage was used more extensively and resulted in greater depletion. This is especially evident in the cumulative storage plot for the major reservoirs in the south east. It is also clear that the rate of drawoff was greater in 1989 than in the previous droughts as shown by the steep decline in storage. It should also be noted that Taf Fechan (Pontsticill), Talybont and Usk Reservoirs did not refill during the Winter of 1975/76. The operation of these and other south eastern reservoirs is currently under discussion with Welsh Water/Dwr Cymru.

It is interesting to record, from an operational aspect, the interaction between Usk and Llandegfedd Reservoirs. Geographically, Usk Reservoir lies at the headwaters of the River Usk, while Llandegfedd is much nearer the estuary (Figure 1). Whilst Usk Reservoir is an impounding reservoir, and Llandegfedd is an off-river, pumped storage reservoir (with limited natural inflows). Llandegfedd Reservoir is supported by a licenced abstraction from the River Usk at Rhadyr via Prioress Mill Pumping Station. Licence conditions dictate that under certain flow conditions in the Usk, the volume of water that is available for abstraction to Llandegfedd must be balanced by an equivalent volume released from Usk Reservoir. In 1989, this condition was in force during the summer (see Drought Order 1660 and 1863 - Section 4.3). Inspection of the dates of regulation releases in Section 3.2, match the increased steepness of the drawdown curve at Usk Reservoir and the consequent improvement in storage at Llandegfedd Reservoir.

For the south west, as in the south east, the later start of the 1989 drought sequence can be evidenced in the drawdown plots for Llyn Brianne. For the period June to mid September, 1989 falls between the extremes of 1976 and 1984; after that date, the prolonged duration of the 1989 event produced lower minima than either of the other two sequences illustrated. As in previous years, complete recovery was effected by the end of the year. In the case of Llysyfran reservoir, the 1976, 1984 and 1989 rates of drawdown follow a similar pattern, but commencing at different origins; again, 1989 drawdowns provided the relative minima in mid October. Recovery in 1989 was only accomplished by heavy rainfall in mid December (refer to Clarbeston raingauge - Fig 1, where November 1989 rainfall was 71% L.A.A.R and December's 118%). Reference to the storage state at the start of each of these particular years would suggest that the reservoirs could become 2 or 3 season critical in a dry spring year.

Data supplied for the Dee System Storage is the cumulation of the storages at a number of reservoirs, used conjunctively as operated under the Dee Management Plan. It is therefore not possible to comment on the performance on any individual reservoir. Examination of the drawdown curve for the Dee System, shows that the total storage available at the commencement of the drought period was below maximum capacity of the system, and it can be summised that the different refill characteristics of the separate reservoirs within that system must contribute to this shortfall. The cumulative refill curve indicates that the system was only about 60% full by the end of the year.

3.2 Regulation Releases

The only data currently available comes from the South Eastern Division of the Region for the rivers Usk and Wye (Figure 1). Timetables of commencement and termination of regulation releases have been prepared and are included below.

Reservoir	Date	Operation
Usk	14/06/89	Regulation on
	21/06/89	Increased
	16/07/89	Decreased
	21/07/89	Regulation Off
	07/09/89	Regulation On
	12/09/89	Increased
	19/10/89	Decreased
	20/10/89	Regulation Off

Looking back to the storage curves for Usk Reservoir, it will be noticed that the drawdown rate increased markedly in mid June, coincident with the commencement of regulation releases. Similarly, the rate decreased when regulation ended at the end of July.

Reservoir	Date	Operation
Elan Valley (Wye)	31/05/89	Regulation On
	08/07/89	Regulation Off
	17/07/89	Regulation On
	18/09/89	Regulation Off
	25/09/89	Regulation On
	11/10/89	Regulation Off
	17/10/89	Regulation On
	20/10/89	Regulation Off

3.4 Abstraction Licencing

The extent of spray irrigation is an important consideration during drought periods because of its potential impact on low flows. Its usage tends to be an indicator of drought severity and is one category of use that causes concern in low flow periods.

Under a financial agreement (Section 63 - Water Resources Act 1963) between the Authority and the licenced spray irrigator, the abstractor is obliged to make an annual return, stating the amount of water actually abstracted during the previous summer period. During 1989, 110 Section 63 returns were received that were also current during the 1984 drought. Only two of these were current during 1976 and therefore cannot be used to draw any conclusions.

Of those returns received ;

31 abstracted more in 1989 than in 1984
43 abstracted less in 1989 than in 1984
36 abstracted nothing in either period

The very nature of spray irrigation means that demands are crop dependant and the pattern of spray irrigation from year to year will therefore reflect prevailing agricultual practice.

The total water abstracted by those spray irrigators who made returns is shown in the following table;

Year	Quantity (Ml)
1984	571
1989	825

It is interesting to note that for the sample irrigators available, the quantity of water abstracted was greater in 1989 than in 1984, although the pattern of usage may in fact be different during both periods.

4. DROUGHT ORDERS

4.1 Timetable of Events

During the 1989 drought a total of 12 Drought Orders were in force within the Region. These occurred with each Division as shown in the table below;

Division	Orders In Force
South Eastern	9
South Western	2
Northern	1

The chronological sequence in which these Orders came into effect has also be tabulated;

Date	Type	Order Description
29/07/89	Compensation	Cray Reservoir
16/08/89	Compensation	Prescelly Reservoir
23/08/89	Abstraction	Nant Selsig and Rhondda Fawr
23/08/89	Compensation	Talybont Reservoir
24/08/89	Compensation	Aled Isaf Reservoir and River Aled
24/08/89	Compensation	Llwynon and Taf Fechan (Pontsticill)
01/09/89	Compensation	River Usk (No.1)
02/09/89	Abstraction	Bachawy Brook
07/09/89	Non-Essential	Parts of South Eastern Division
30/09/89	Compensation	River Usk (No.2)
04/10/89	Standpipes	South East Wales and Brecknock
24/10/89	Compensation	Taf Fechan & Llwynon Reservoirs (No.2)

In addition to the above, Welsh Water Authority (now Welsh Water/Dŵr Cymru) issued a Regional hosepipe ban which was effective between 23rd July and 25th October 1989, a total of 125 days.

4.2 Summary of Orders Enforced

The orders current during the period to which this report relates are listed in the following tables. Brief details have been included.

4.3 Statutory Orders

Facsimiles of the orders as issued by the Secretary of State for Wales are included in Appendix B.

Schedule of Drought Orders - Welsh Region

Order and Statutory Instrument Ref. Number	Area of Supply	Effect	Dates Effective
Cray Reservoir 1989 : No.1325	South Western Division	Compensation water reduction from 6.82 Ml/day to 2.27 Ml/day	29/07/89 - 28/01/90 or until Cray Res is full whichever is sooner
Prescelly Reservoir 1989 : No.1497	South Western Division	Compensation water reduction from 1.82 Ml/day to 0.59 Ml/day	16/08/89 - 15/02/90
Abstraction at Confluence of Nant Selsig and Rhondda Fawr 1989 : No.1571	South Eastern Division	Emergency Abstraction from Rhondda Fawr at its confluence with Nant Selsig of 2 Ml/day (inc ancillary pumps and pipes)	23/08/89 - 21/02/90
Talybont Reservoir 1989 : No.1574	South Eastern Division	Compensation water reduction from 13.6 Ml/day to 3.0 Ml/day (from 01/08/89 to 31/10/89) and from 25 Ml/day to 12.5 Ml/day (between 01/11/89 and 21/02/90)	23/08/89 - 21/02/90
Aled Isaf Reservoir and River Aled 1989 : No.1572	Northern Division	Reduction in maintained flow from 18.18 Ml/day to 5.68 Ml/day	24/08/89 - 22/02/90
Taf Fechan and Llwyn -on Reservoirs 1989 : N/A	South Eastern Division	Compensation water reduction from 18.2 Ml/d to 9.1 Ml/d at Llwynon and from 19.1 Ml/d to 9.1 Ml/d for Pontsticill	24/08/89 - 22/02/90 Repealed 24/10/89 by Taf Fechan & Llwynon Res Order No.2

Schedule of Drought Orders - Welsh Region

Order and Statutory Instrument Ref. Number	Area of Supply	Effect	Dates Effective
River Usk (No.1) 1989 : No.1660	South Eastern Division	Suspension of maintained flow	01/09/89 - 28/02/90
Abstraction from Bachawy Brook 1989 : No.1659	South Eastern Division	Abstraction from Bachawy Brook of 1.65 Ml/day (inc ancillary pumps and pipes)	02/09/89 - 01/03/90
Parts of South Eastern Division 1989 : No.1651	Parts of South Eastern Division (refer to Schedule in Appendix B)	Powers to Welsh Water to prohibit the use of water for certain purposes	07/09/89 for a period not exceeding six months
River Usk (No.2) 1989 : No.1863	South Eastern Division	Reduction in Hands-Off flow	30/09/89 - 28/02/90
South East Wales and Brecknock (Emergency Provisions) 1989 : No.1832	Parts of South Eastern Division (refer to Schedule in Appendix B)	Powers to Welsh Water to prohibit the use of water as seen fit and supply water by means of standpipes and water tanks as necessary	04/10/89 - 01/01/90
Taf Fechan and Llwyn -on Reservoirs (No.2) 1989 : No.1573	South Eastern Division	Compensation water reduction from 9.1 Ml/d to 2.27 Ml/day revoking earlier (No.1) order	24/10/89 - 20/04/90

5. CONCLUSIONS

The aim of this report was to illustrate, using available data sets, the drought sequence that occurred in 1989. To achieve this it was necessary to establish a point of reference to which to compare. Two datums were chosen, the previous drought years 1976 and 1984, primarily because they were within recent memory and secondly because they feature in reports that have been compiled by the predecessor of the N.R.A in Wales (Welsh Water Authority) {Ref 1 and 2}.

The facts, such as they are, are not conclusive. To draw any inference depends on what statistics you choose. It will be noticed that no attempt has been made to prescribe return periods to any of the event data.

The major conclusions reached from evidence contained in this report can be summarized as;

(a) Rainfall totals in 1989 were generally greater than either 1976 or 1984 for the periods January to September, but similar in both cases for the critical period April to September.

(b) 1984 produced the lowest consecutive period (March to July) of river flows (runoffs) than either 1976 or 1989, with 1976 producing the lowest single monthly runoffs in August. September and October 1989 were lower than both 1976 and 1984.

(c) 1989 produced a more severe depletion in reservoir storages than either 1976 of 1984.

(d) Insufficient information was obtained to arrive at any meaningful conclusions concerning groundwater variations throughout the Region, except to illustrate one small area in the south east. This showed that water levels were lower than normal, but not as low as in 1984.

6. REFERENCES

1. The 1975-76 Drought : Welsh Water Authority (Directorate of Resource Planning) - December 1976

2. Drought Report (A Review of the Effects of the 1984 Drought on the Welsh Water Authority) : Welsh Water Authority - 1984/5 ?

3. MORECS (Option 1) : Meteorlogical Office Rainfall and Evaporation Calculation System : Meteorological Office, Bracknell (Weekly)

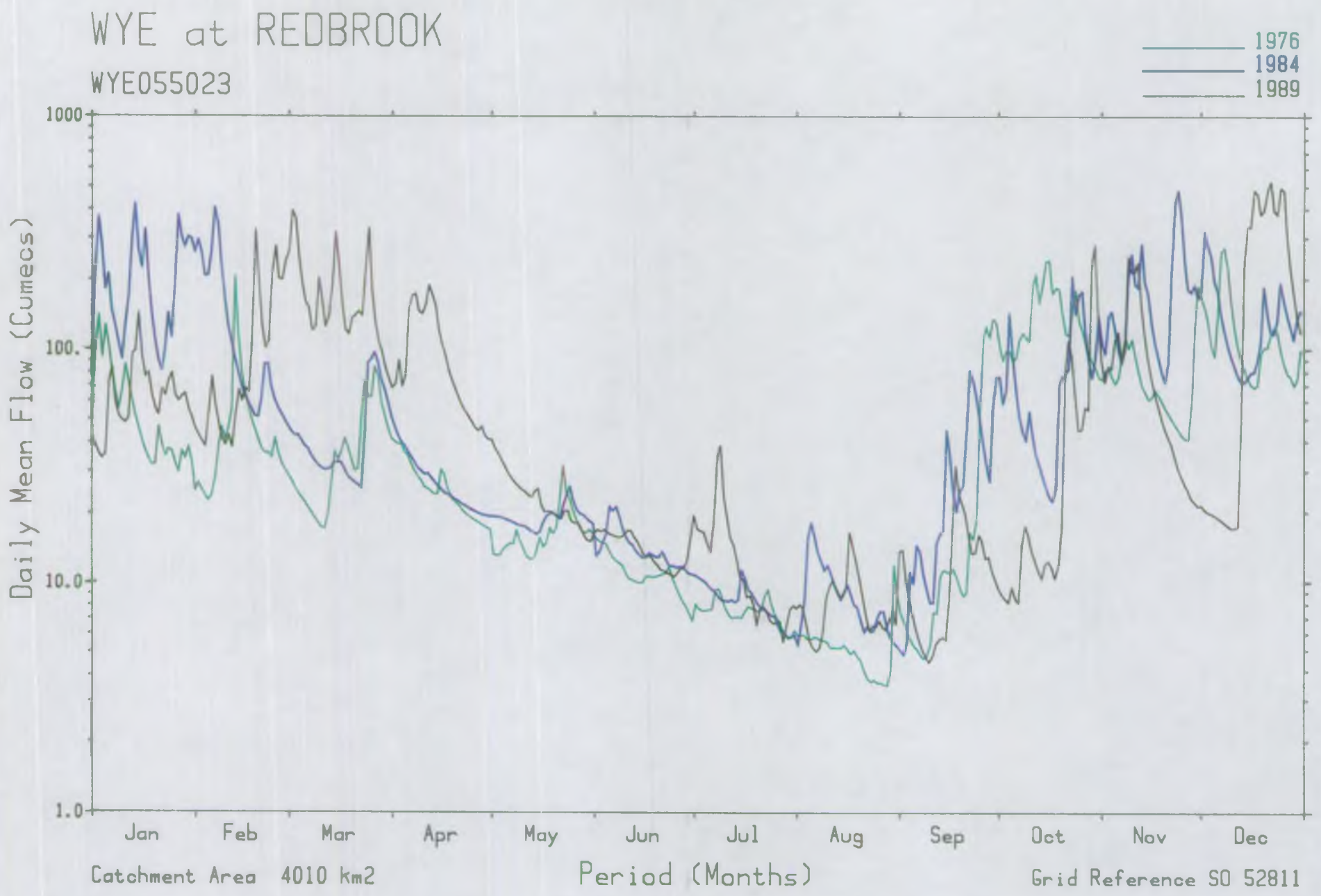
4. Gauging Station Summary : DMFsbuster software (N.R.A)

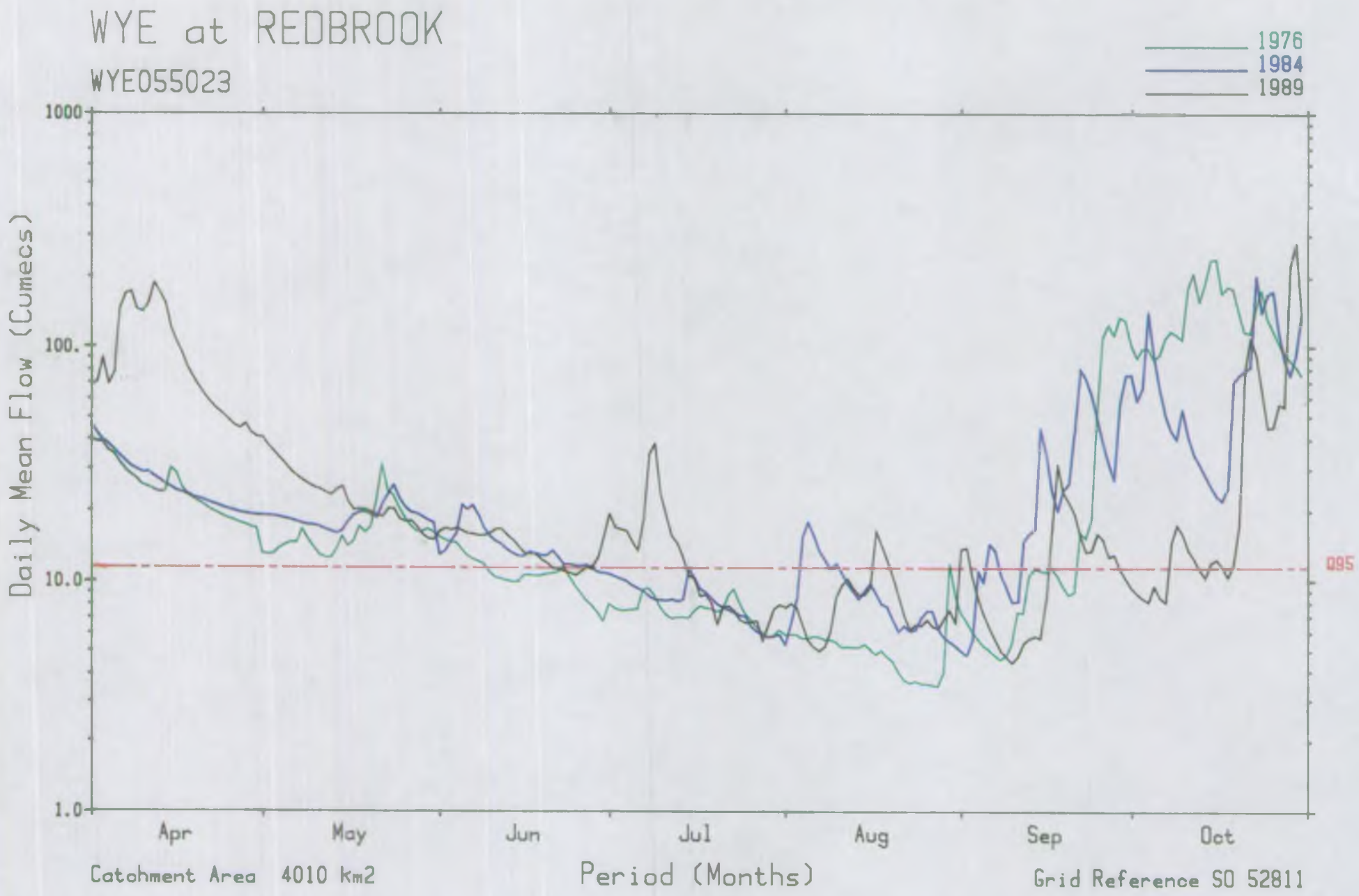
5. Bigsweek : Welsh Water Plc's Supercalc5 Spreadsheet of Big 5 Reservoirs in South East Wales.

6. Abstract of Statistics : Welsh Water Authority 1984

- A P P E N D I X A -

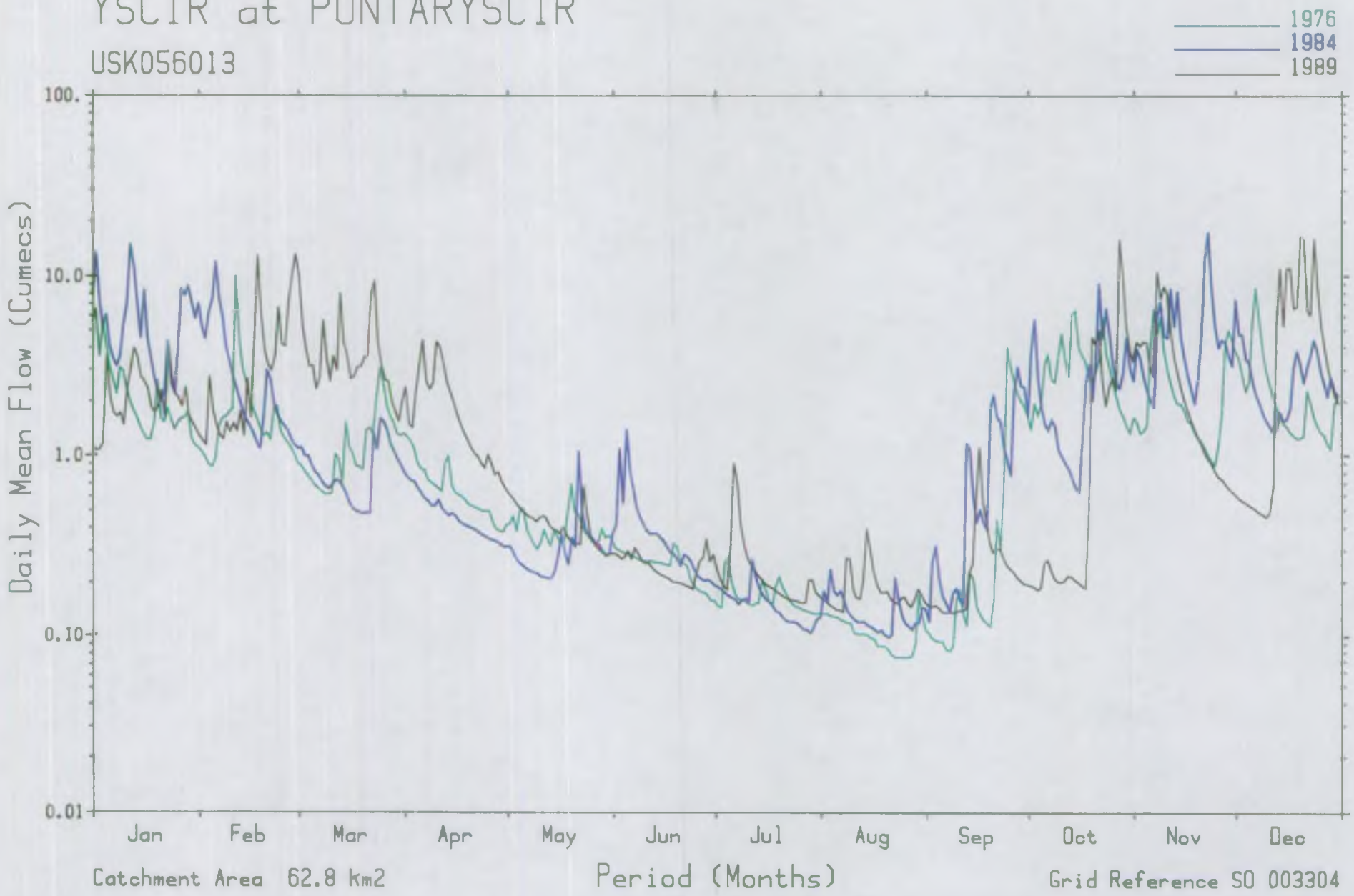
Plots of River Flows at Selected Sites


WYE at REDBROOK
WYE055023
1976
1984
1989
1000
100.
10.0
1.0
Daily Mean Flow (Cumecs)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Catchment Area 4010 km2
Period (Months)
Grid Reference SO 52811


WYE at REDBROOK
WYE055023
1976
1984
1989
1000
100.
10.0
1.0
Daily Mean Flow (Cumecs)
Q95
Apr
May
Jun
Jul
Aug
Sep
Oct
Catchment Area 4010 km2
Period (Months)
Grid Reference SO 52811

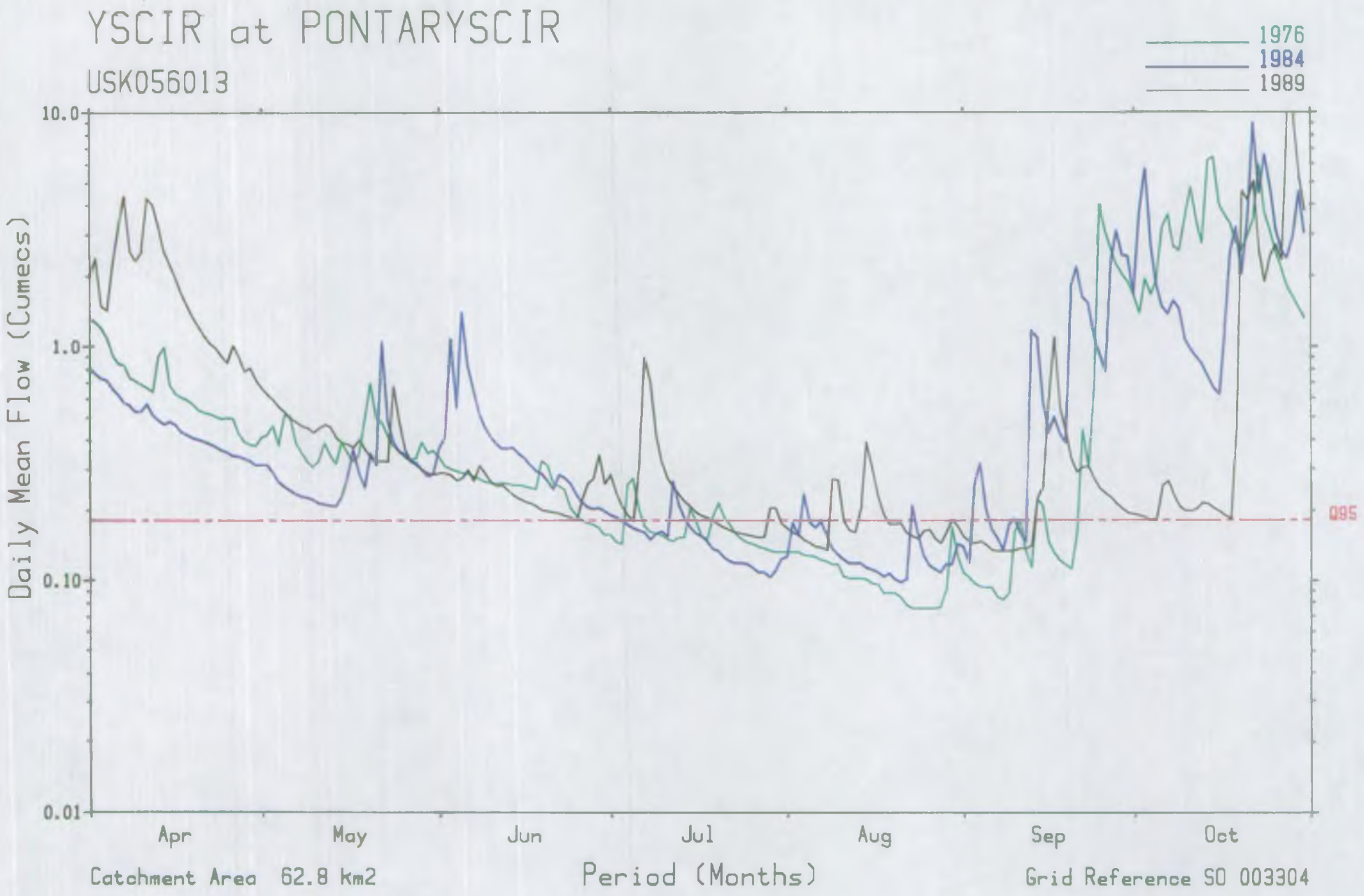
YSCIR at PONTARYSCIR

USK056013



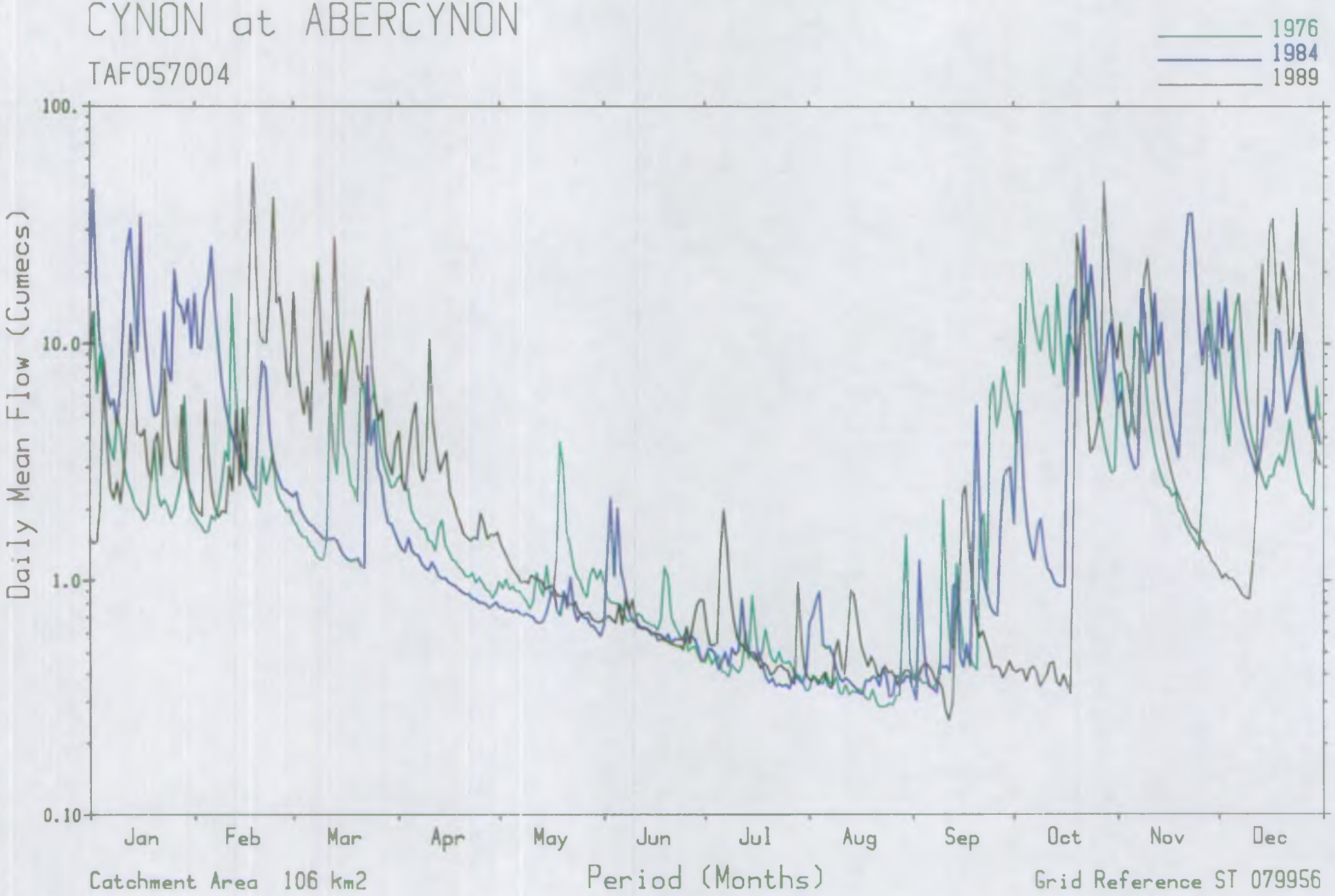
Catchment Area 62.8 km2

Grid Reference SO 003304


YSCIR at PONTARYSCIR
USK056013
1976
1984
1989
10.0
1.0
0.10
0.01
Daily Mean Flow (Cumecs)
Q95
Apr
May
Jun
Jul
Aug
Sep
Oct
Catchment Area 62.8 km2
Period (Months)
Grid Reference SO 003304

CYNON at ABERCYNON

TAF057004

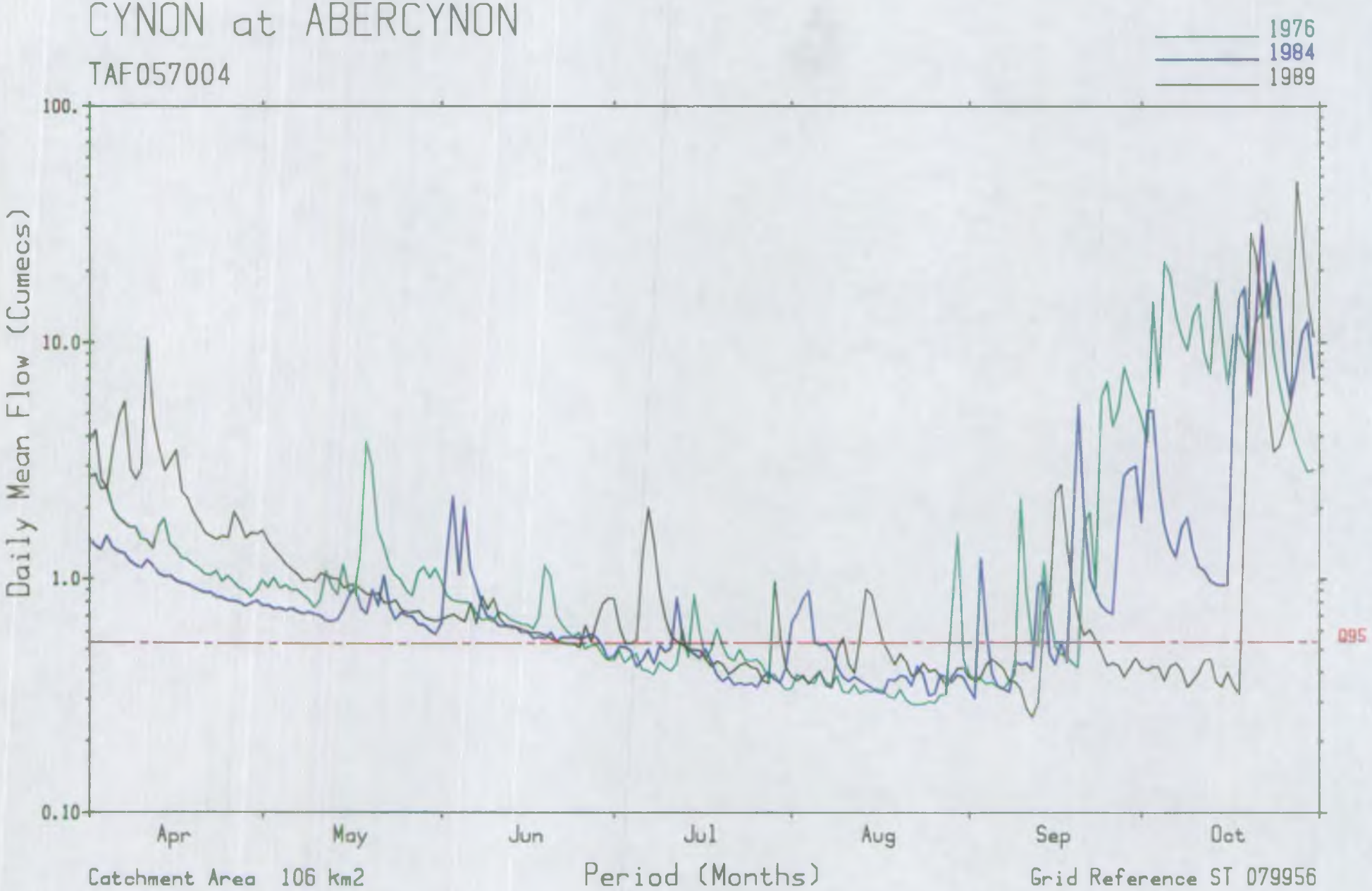


Catchment Area 106 km2

Grid Reference ST 079956

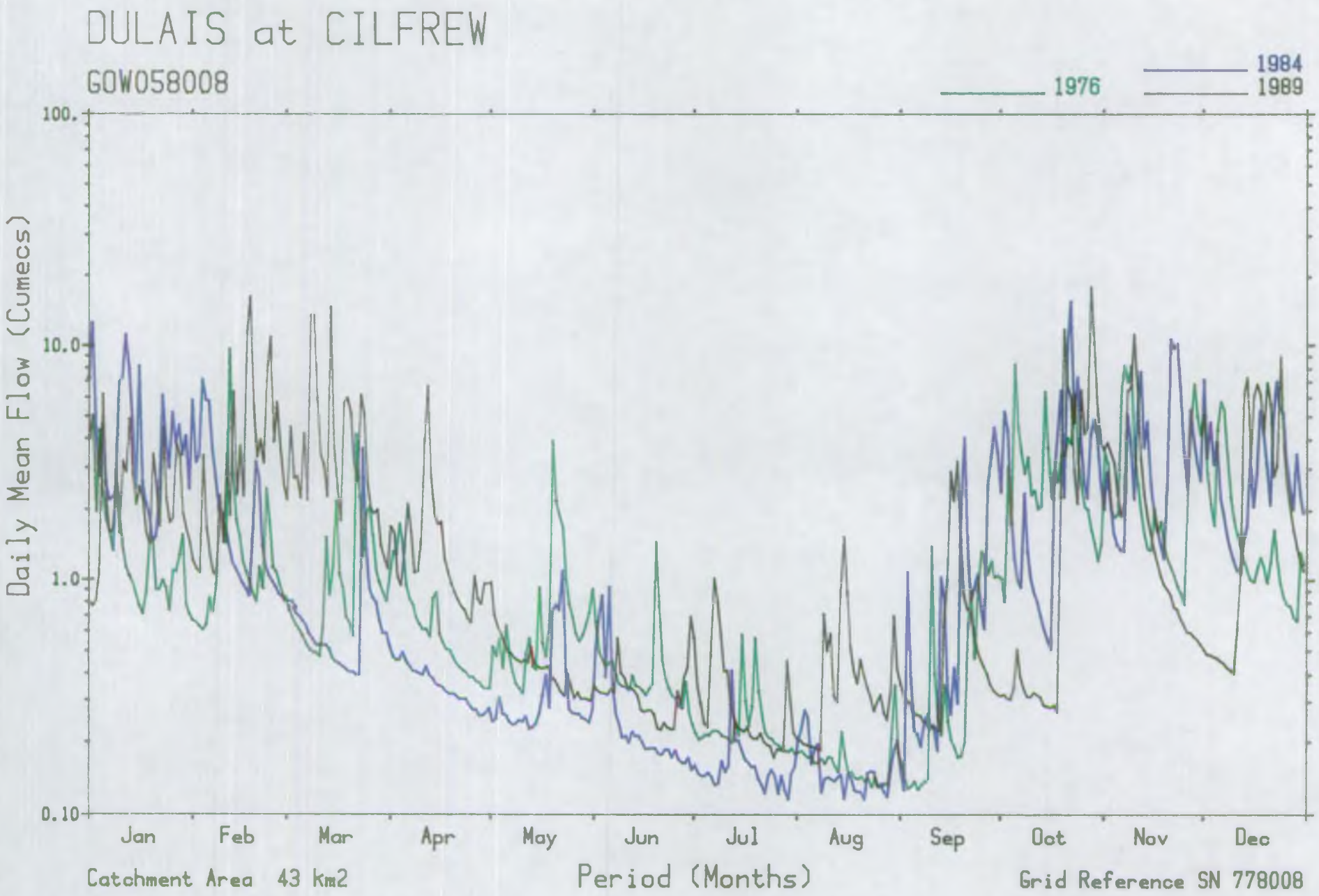
CYNON at ABERCYNON

TAF057004



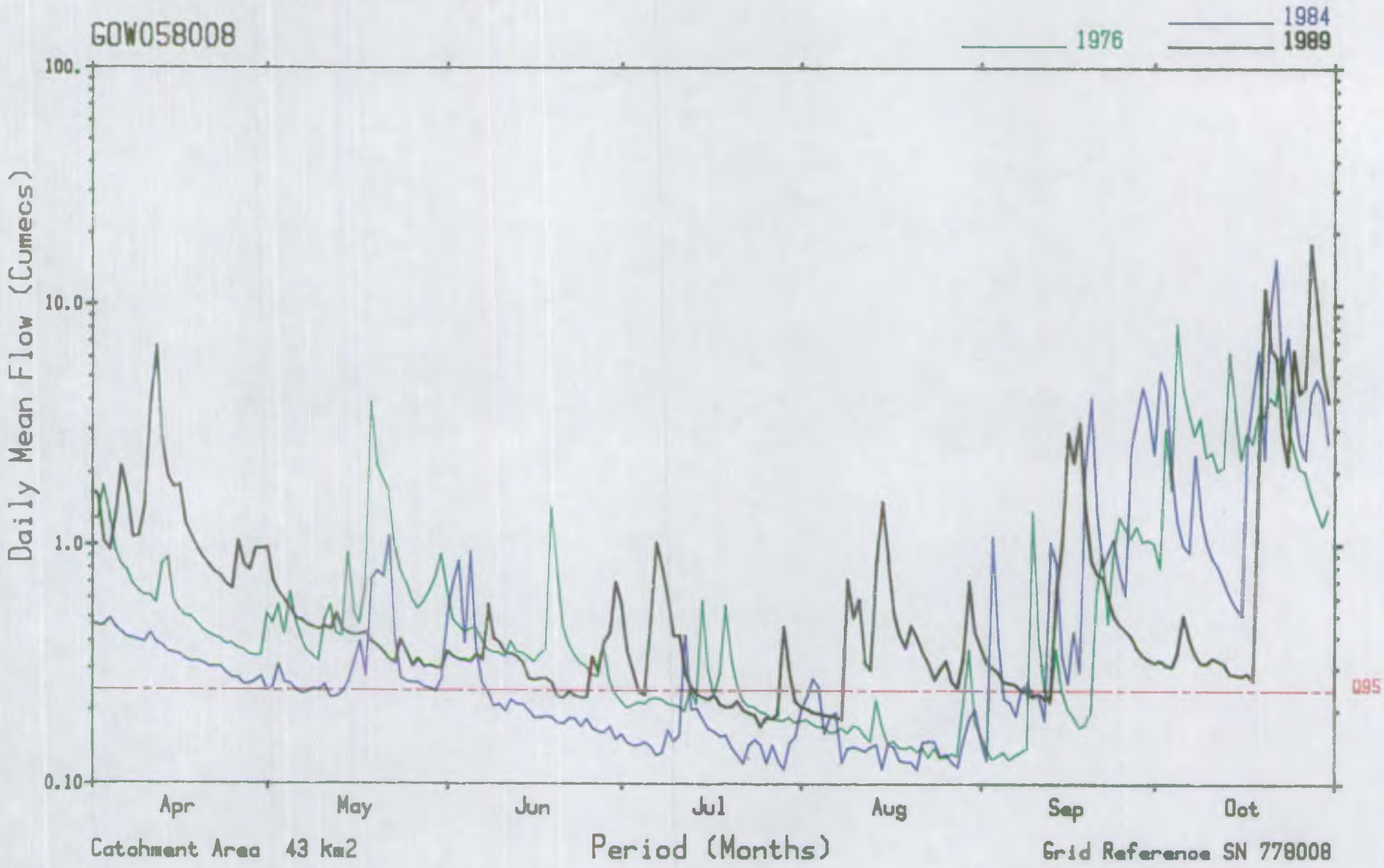
Catchment Area 106 km2

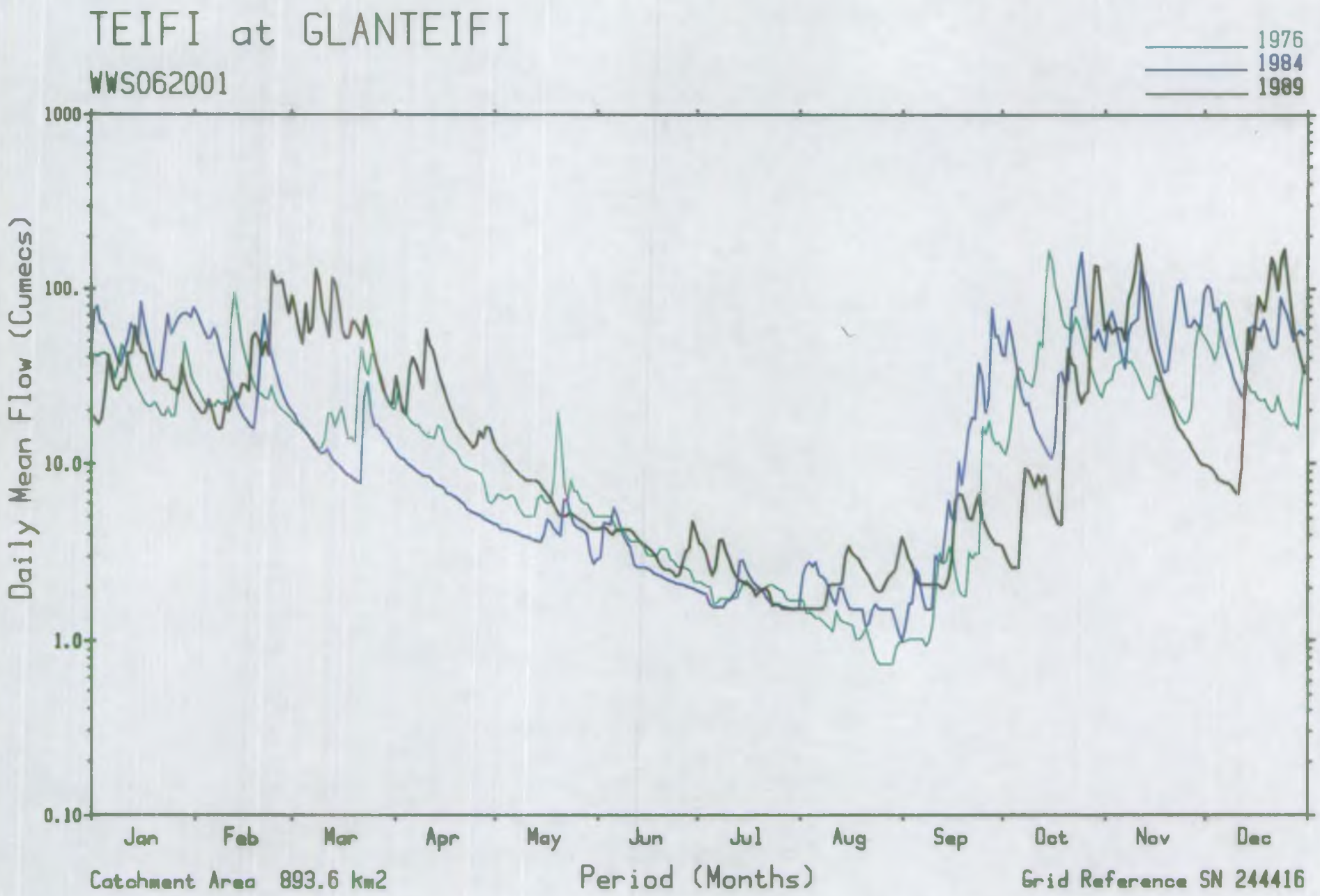
Grid Reference ST 079956


DULAIS at CILFREW
GOW058008
1976
1984
1989
100.
10.0
1.0
0.10
Daily Mean Flow (Cumecs)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Period (Months)
Catchment Area 43 km2
Grid Reference SN 778008

DULAIS at CILFREW

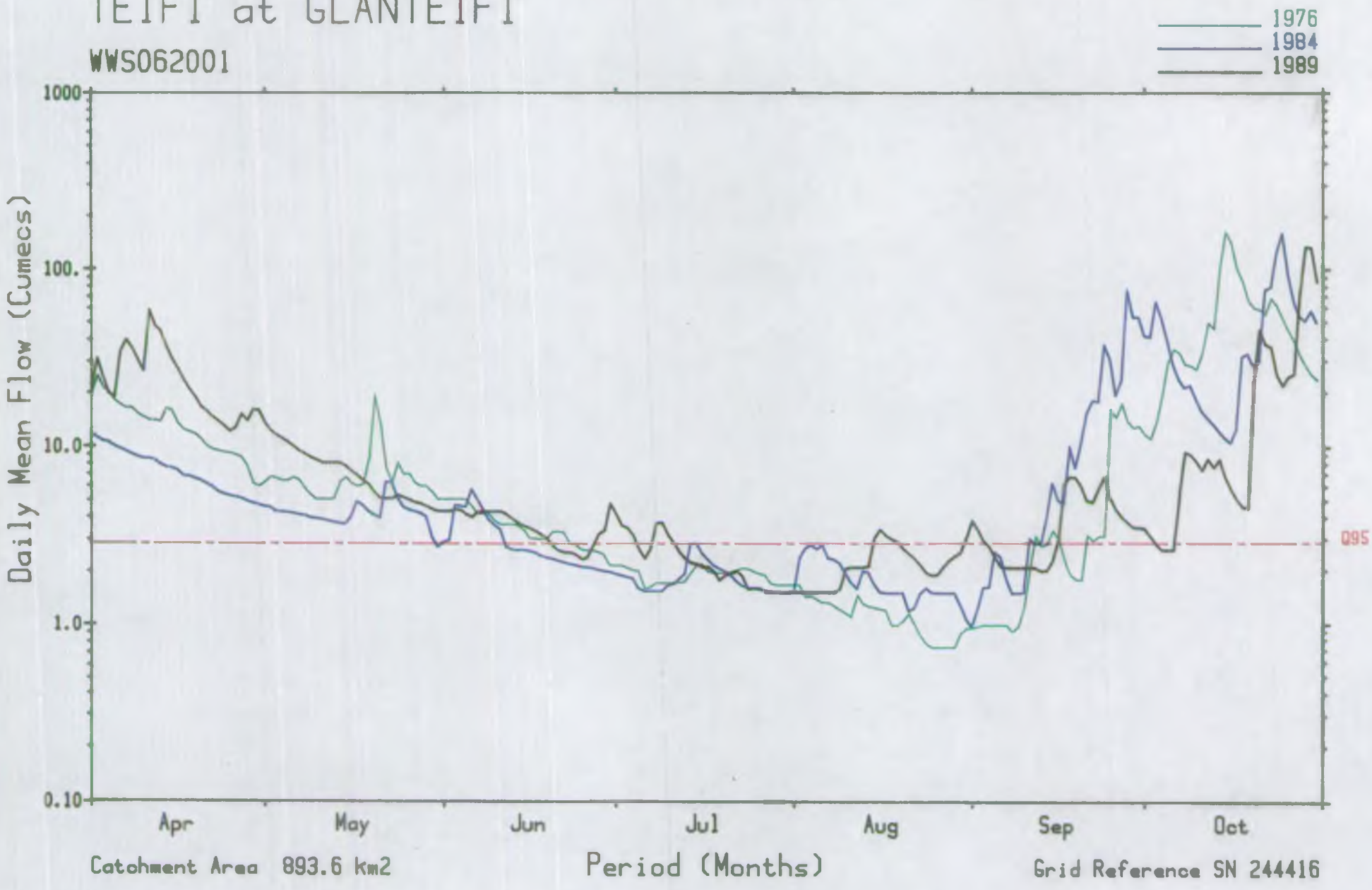
GOW058008




TEIFI at GLANTEIFI
WWS062001
1976
1984
1989
1000
100.
10.0
1.0
0.10
Daily Mean Flow (Cumecs)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Catchment Area 893.6 km2
Period (Months)
Grid Reference SN 244416

TEIFI at GLANTEIFI

WWS062001

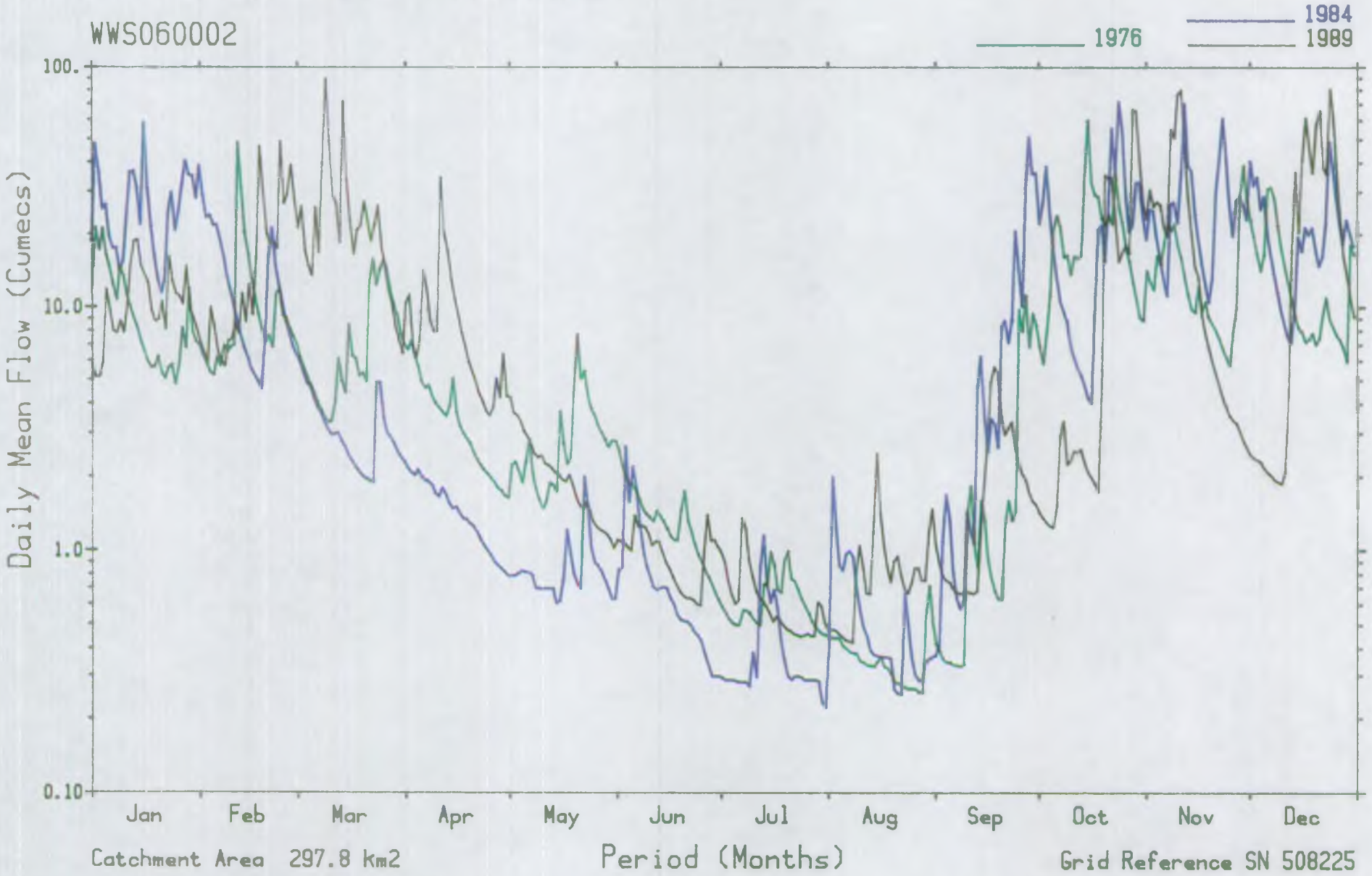


Catchment Area 893.6 km2

Grid Reference SN 244416

COTHI at FELINMYNACHDY

WWS060002

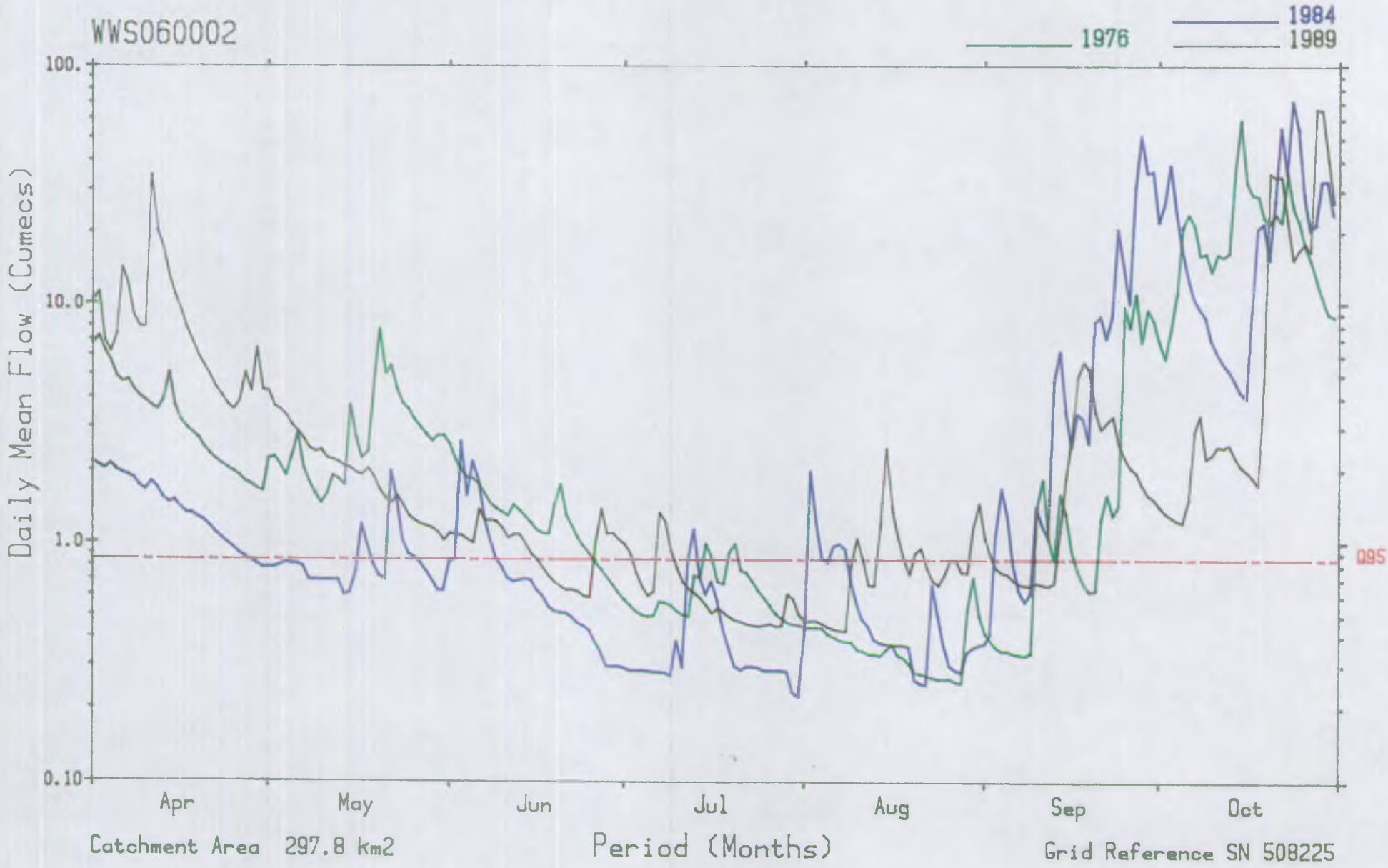


Catchment Area 297.8 km2

Grid Reference SN 508225

COTHI at FELINMYNACHDY

WWS060002

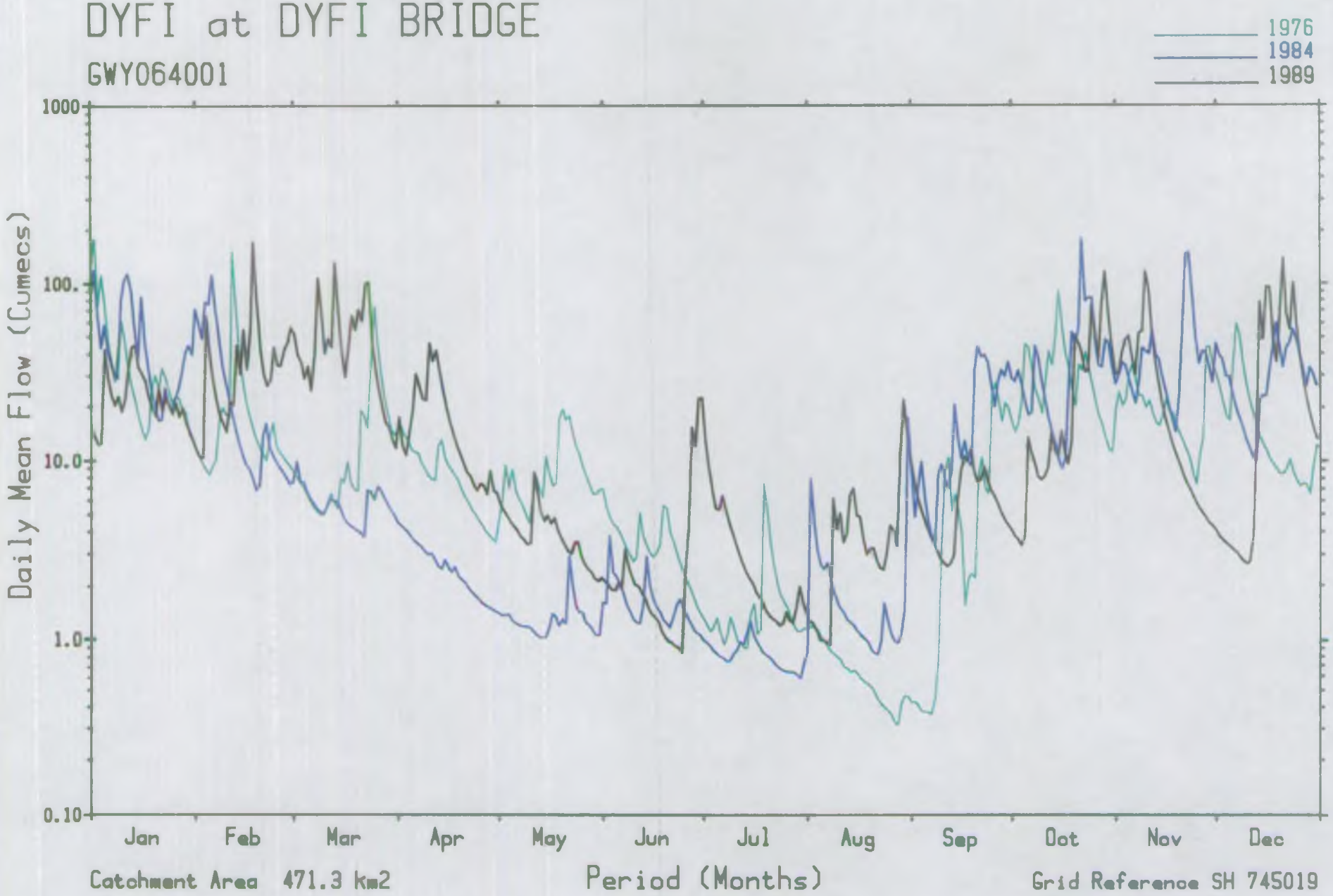


Catchment Area 297.8 km2

Grid Reference SN 508225

DYFI at DYFI BRIDGE

GWY064001

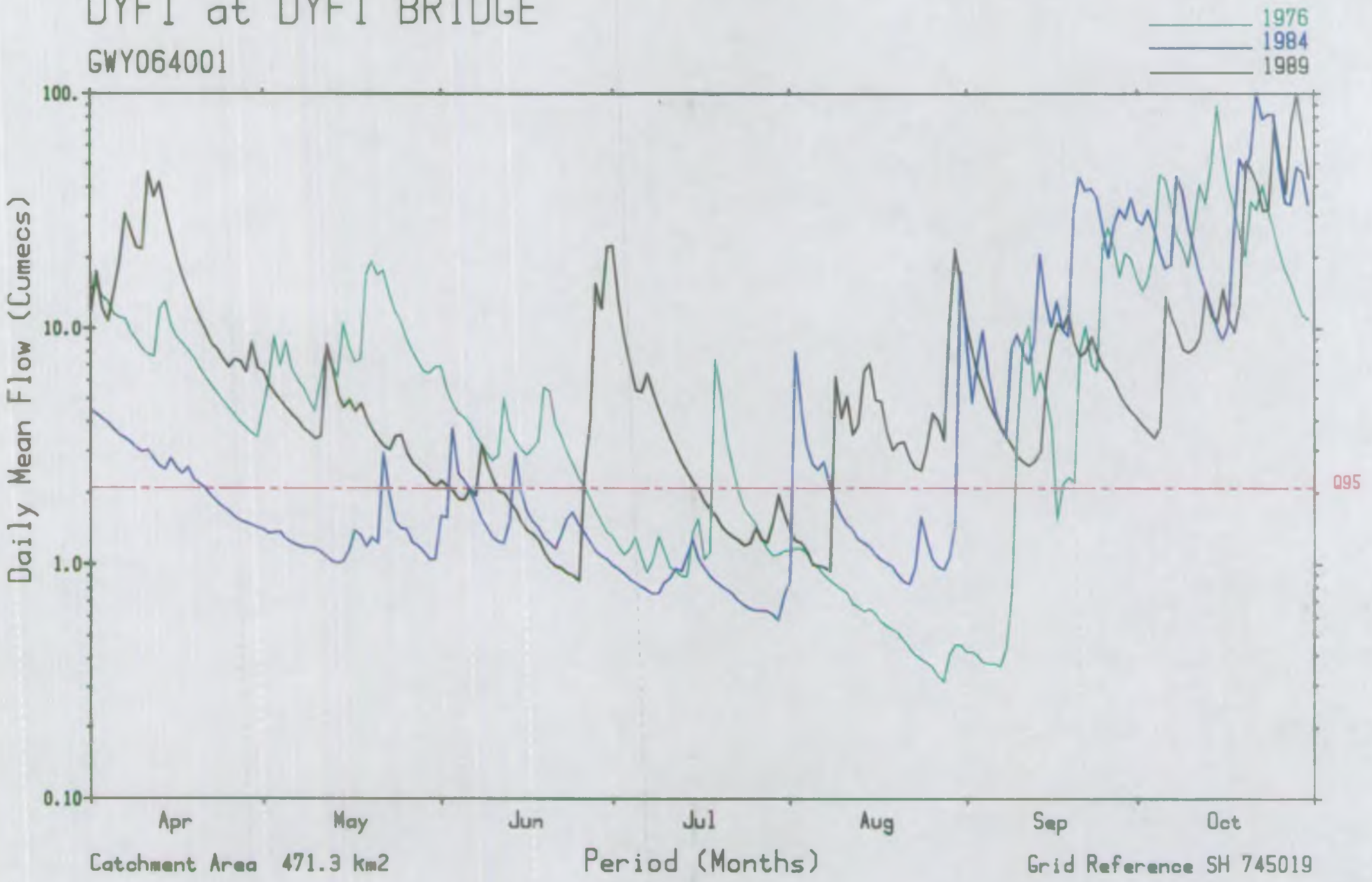


Catchment Area 471.3 km2

Grid Reference SH 745019

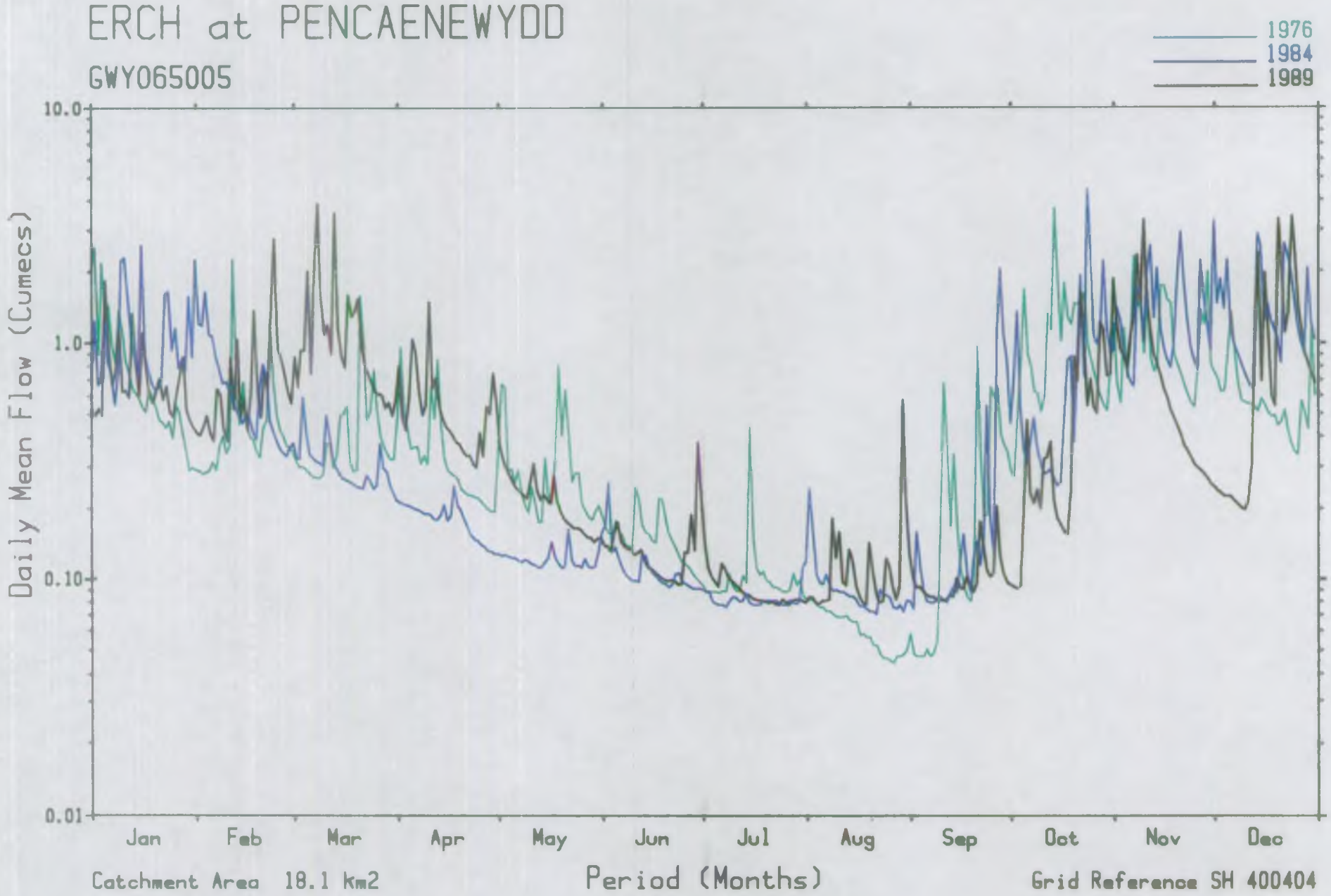
DYFI at DYFI BRIDGE

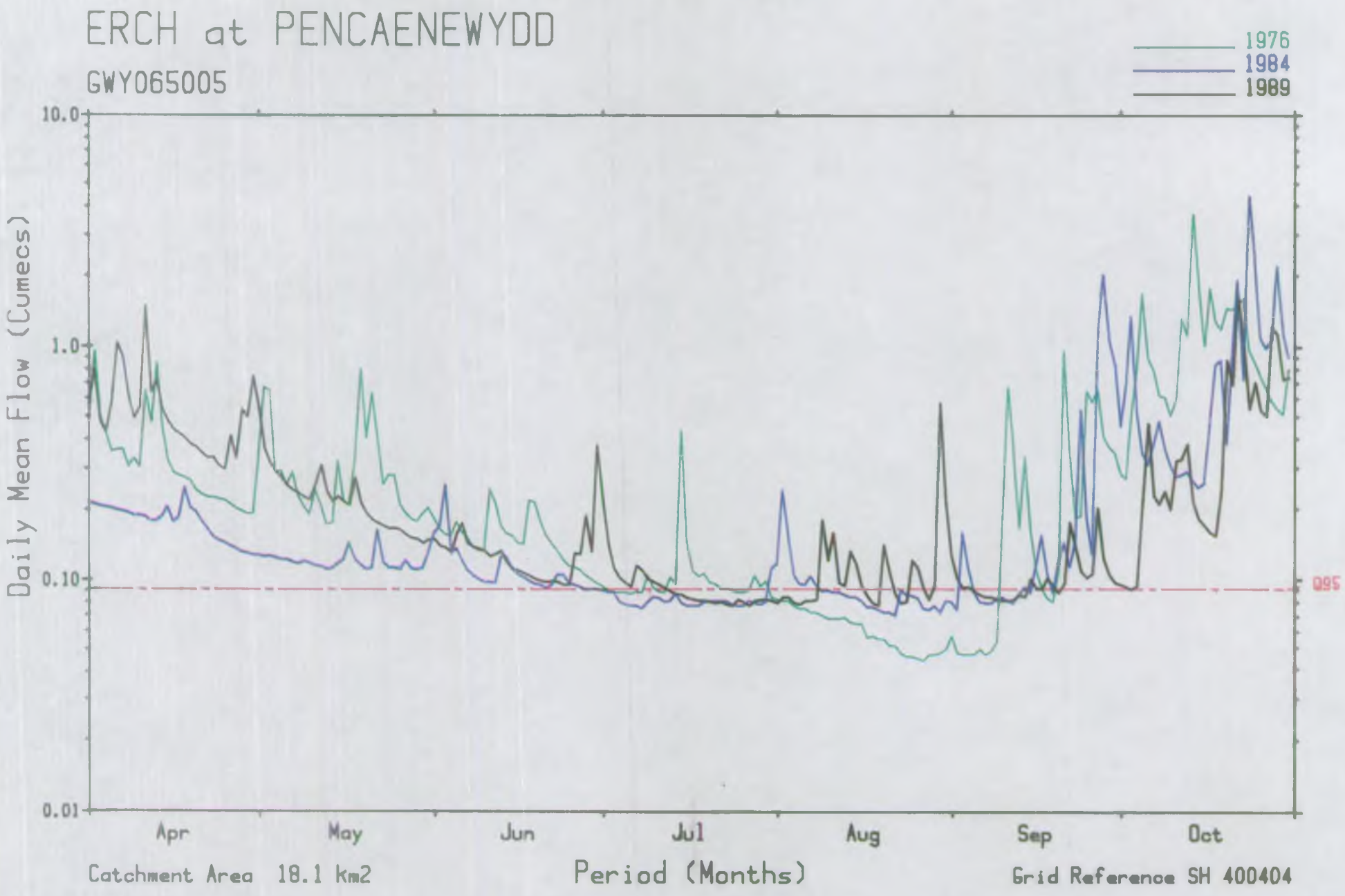
GWY064001

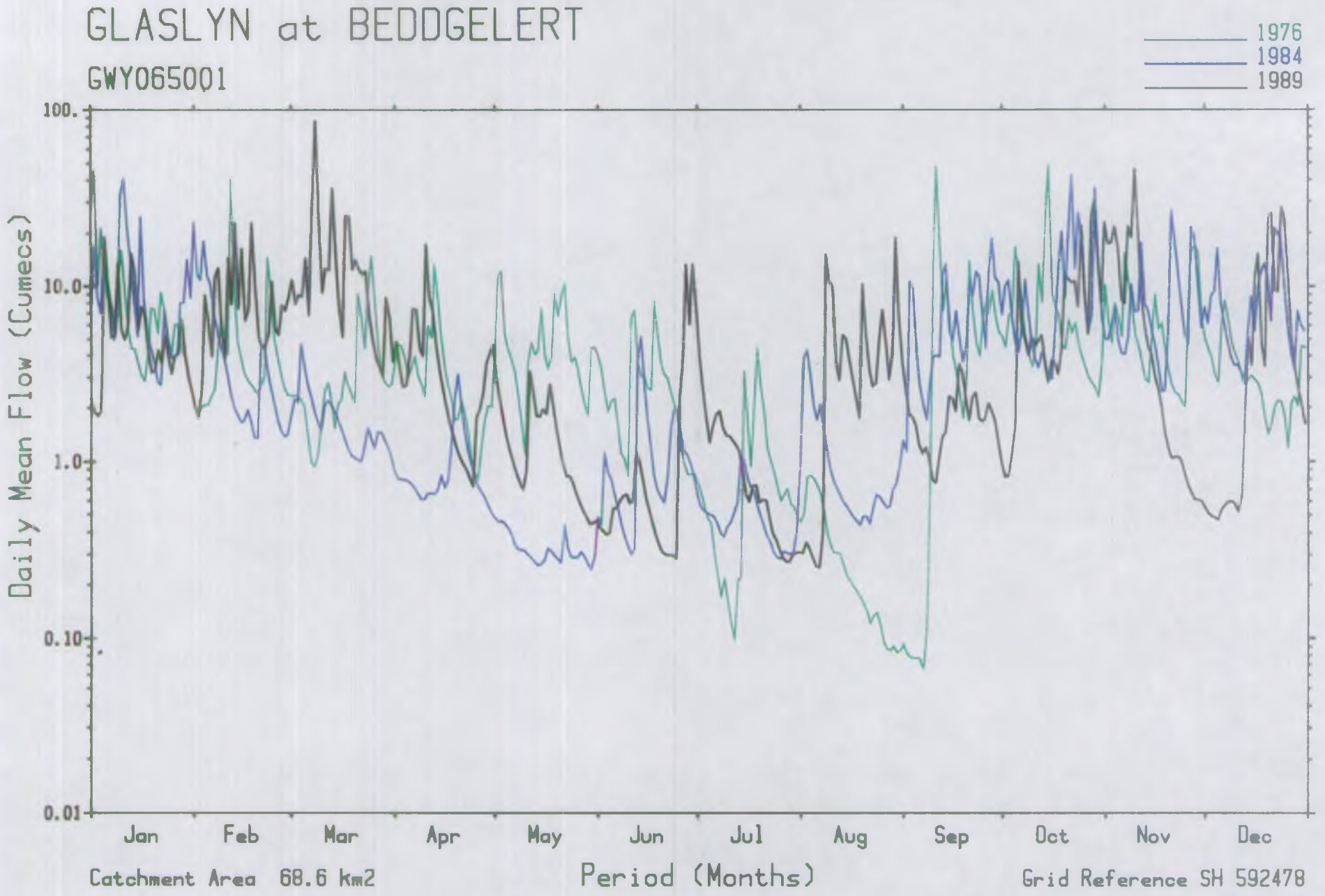


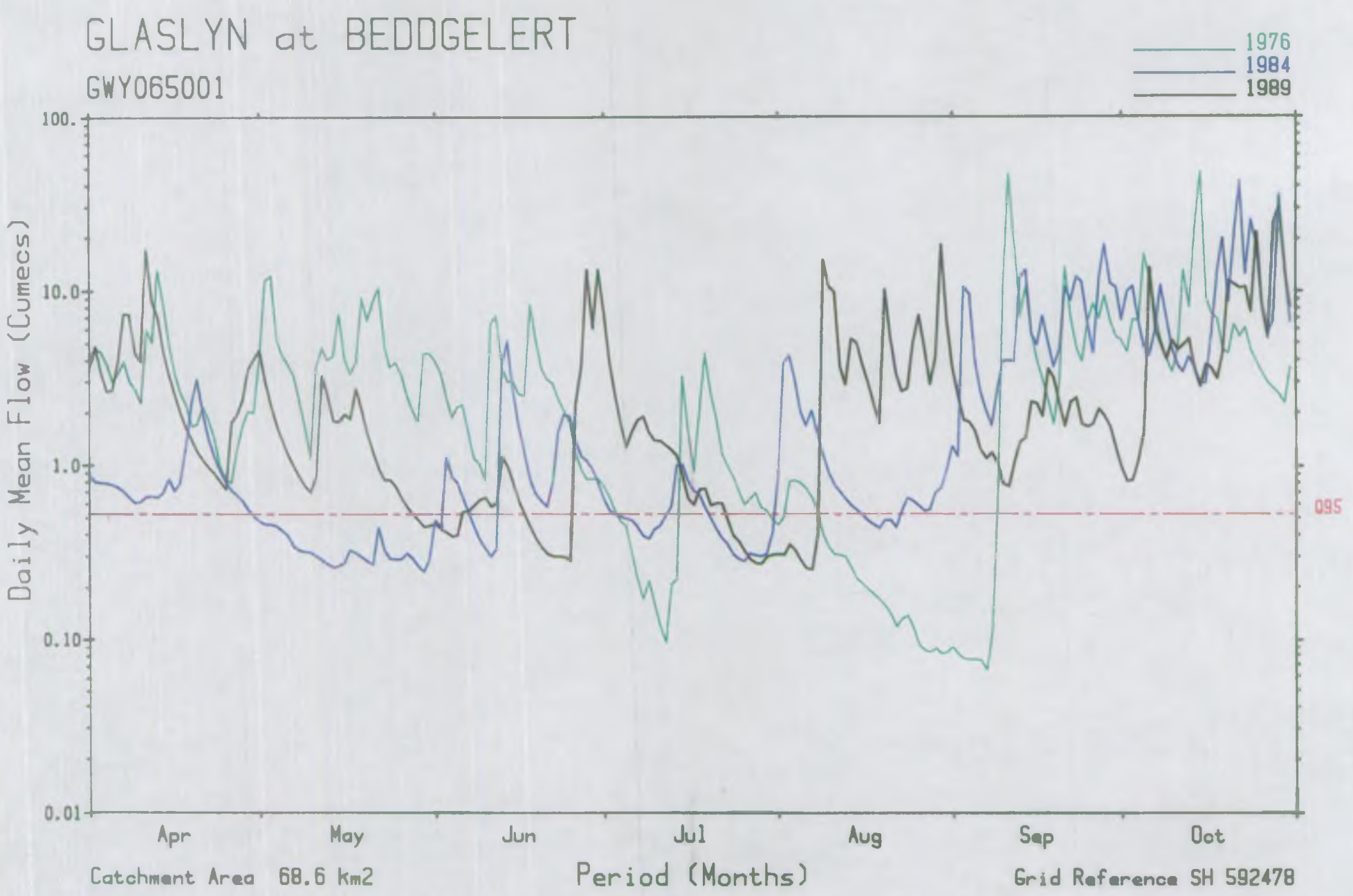
Catchment Area 471.3 km2

Grid Reference SH 745019


ERCH at PENCAENEWYDD
GWY065005
1976
1984
1989
10.0
1.0
0.10
0.01
Daily Mean Flow (Cumecs)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Period (Months)
Catchment Area 18.1 km2
Grid Reference SH 400404


ERCH at PENCAENEWYDD
GWY065005
1976
1984
1989
10.0
1.0
0.10
0.01
Q95
Daily Mean Flow (Cumecs)
Apr
May
Jun
Jul
Aug
Sep
Oct
Period (Months)
Catchment Area 18.1 km2
Grid Reference SH 400404


GLASLYN at BEDDGELERT
GWY065001
1976
1984
1989
100.
10.0
1.0
0.10
0.01
Daily Mean Flow (Cumecs)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Catchment Area 68.6 km2
Period (Months)
Grid Reference SH 592478


GLASLYN at BEDDGELERT
GWY065001
1976
1984
1989
100.
10.0
1.0
0.10
0.01
Daily Mean Flow (Cumecs)
Q95
Apr
May
Jun
Jul
Aug
Sep
Oct
Catchment Area 68.6 km2
Period (Months)
Grid Reference SH 592478

- A P P E N D I X B -

Statutory Instruments

STATUTORY INSTRUMENTS

1989 No 1571
WATER, ENGLAND AND WALES

The Welsh Water Authority (Abstraction at Confluence of Nant Selsig and Rhondda Fawr) (Drought) Order 1989

Made	22nd August 1989
Coming into force	23rd August 1989

The Secretary of State for Wales, in exercise of powers conferred by sections 1 and 3(4) of the Drought Act 1976 (a), and of all other powers enabling him in that behalf, hereby makes the following Order:

1. This Order may be cited as the Welsh Water Authority (Abstraction at Confluence of Nant Selsig and Rhondda Fawr) (Drought) Order 1989 and shall come into force on 23rd August 1989.

2. In this Order -

"The Authority" means the Welsh Water Authority;

"the deposited plan" means the plan prepared in duplicate signed on behalf of the Secretary of State and marked "Plan Referred to in The Welsh Water Authority (Abstraction at Confluence of Nant Selsig and Rhondda Fawr) (Drought) Order 1989" of which one copy is deposited and available for inspection at the offices of the Welsh Water Authority at Plas-y-Ffynnon, Cambrian Way, Brecon, and the other at the Welsh Office, Cathays Park, Cardiff.

3. During the period that this Order has effect the Authority may abstract from the Rhondda Fawr river at a point at its confluence with the Nant Selsig, at National Grid Reference SS 9289 9905, in the Community of Treherbert, in the Borough of Rhondda in the County of Mid Glamorgan, as shown on the deposited plan, a quantity of water not exceeding 2 megalitres in any period of 24 hours, and for that purpose may -

(a) on land adjacent to the said abstraction point install and maintain pumps and any necessary associated works required for the purpose of taking that water;

(b) lay a 150 millimetre pipeline along the route shown in green on the deposited plan being a route from the said abstraction point along the bed of the Rhondda Fawr river for a distance of approximately 314 metres to the Authority's raw water main at National Grid Reference SS 9284 9935;

(c) enter upon, occupy and use the land specified above to such extent and in such manner as may be necessary for the installation, execution and maintenance of the said pumps, works and pipeline.

(a) 1976 c.44

4. The Authority shall, before exercising the power of entry contained in article 3 of this Order, give to the occupier of the land not less than 7 days notice of the intended entry by the Authority on the land.

5. This Order shall have effect until and including 21st February 1990 and any pumps, pipeline and other works installed in pursuance of this Order shall thereupon be removed.

Signed by authority of
the Secretary of State

An Assistant Secretary
Welsh Office

22 August 1989

STATUTORY INSTRUMENTS

1989 No 1574.
WATER, ENGLAND AND WALES

The Welsh Water Authority (Talybont Reservoir) (Drought) Order 1989

Made 22nd August 1989

Coming into force 23rd August 1989

The Secretary of State for Wales, in exercise of powers conferred by section 1 of the Drought Act 1976 (a), and of all other powers enabling him in that behalf, hereby makes the following Order:

1. This Order may be cited as the Welsh Water Authority (Talybont Reservoir) (Drought) Order 1989 and shall come into force on 23rd August 1989.

2. In this Order, "the licence" means the multiple licence serial number 20/56/41/07 (in respect of the abstraction of water from the Talybont Reservoir, Talybont, in the Borough of Brecknock in the County of Powys and from the River Clydach at Llanfigan in the said Borough of Brecknock) originally issued by the Usk River Authority on 20th November 1967 to the Newport and South Monmouthshire Water Board, transferred by the provisions of article 35 of the Gwent Water Board Order 1969 (b) on 1st April 1970 to the Gwent Water Board, and revised with effect from 19th January 1973 and now held by the Welsh Water Authority.

3. During the period that this Order has effect the obligations contained in sub paragraphs (iii) and (iv) of paragraph (f) in Part III (Schedule) to the licence whereby minimum daily quantities of water are to be discharged from the Talybont Reservoir in a regular and continuous flow are hereby modified as follows:-

   (a) in sub paragraph (iii), for "3,000,000 gallons" substitute "3 megalitres";

   (b) in sub paragraph (iv), for "5,500,000 gallons" substitute "12.5 megalitres".

4. This order shall have effect until and including 21st February 1990.

Signed by authority of
the Secretary of State

Alyn Hoffman

An Assistant Secretary
Welsh Office

22 August 1989

(a) 1976 c.44

(b) SI 1969/1475

STATUTORY INSTRUMENTS

1989 No 1572

WATER, ENGLAND AND WALES

The Welsh Water Authority (Aled Isaf Reservoir and River Aled) (Drought) Order 1989

Made 23rd August 1989

Coming into force 24th August 1989

Whereas the Secretary of State for Wales is satisfied that, by reason of an exceptional shortage of rain, a serious deficiency of supplies of water exists in parts of the area of the Northern Division of the Welsh Water Authority:

Now, therefore, the Secretary of State for Wales, in exercise of powers conferred by section 1 of the Drought Act 1976(a), and of all other powers enabling him in that behalf, hereby makes the following Order:

1. This Order may be cited as the Welsh Water Authority (Aled Isaf Reservoir and River Aled) (Drought) Order 1989 and shall come into force on 24th August 1989.

2. In this Order -

"the Act" means the Rhyl Urban District Council Act 1932(b);

"the Authority" means the Welsh Water Authority;

"the licence" means licence serial number 24/66/5/7/S of 12th May 1983 granted by the Secretary of State for Wales to the Authority;

"the point of abstraction" means the point at which water is abstracted by the Authority from the river Aled at the existing pumping station near Bryn-Aled referred to in subsection (6) of section 13 of the Act and referred to in paragraph (a) of Part III (Schedule) to the licence; and

"the weir" means the weir referred to in subsection (6) of section 13 of the Act.

3. (1) When the combined storage in the Llyn Aled and Aled Isaf reservoirs is less than thirty per cent of their total capacity, the Authority, in addition to the requirement contained in subsection (3) of section 13 of the Act for the discharge of 500,000 gallons of water per day from the Aled Isaf reservoir into the river Aled may, during the period that this Order has effect, discharge from the Aled Isaf reservoir into the river Aled at the point referred to in the said subsection (3) an additional quantity of water per day being -

(a) 1976 c.44

(b) 1932 c.xxxi.

(a) a quantity of water per day which is equal to the daily abstraction required by the Authority at the point of abstraction; and

(b) such quantity per day as is required to maintain the flow of water in the river Aled downstream of the weir in excess of 1.25 million gallons per day.

(2) For the purposes of this article, "the daily abstraction required" means such quantity of water as may be abstracted by the Authority at the point of abstraction not exceeding the amount of 6,000,000 gallons per day authorised by paragraph (d) of Part III (Schedule) to the licence.

4. During the period that this Order has effect:

(a) The obligation contained in paragraph (i)1 and Part III (Schedule) to the licence whereby the Authority shall make no abstraction which will have the effect of reducing the residual flow in the river Aled immediately downstream of the point of abstraction to less than 4 million gallons per day is hereby modified by substituting for the words "4 million gallons", the words "1.25 million gallons".

(b) Paragraph (i)2 of Part III (Schedule) to the licence shall be suspended.

5. This Order shall have effect until and including 20th February 1990.

Signed by authority
of the Secretary of State

An Assistant Secretary
Welsh Office

23rd August 1989

WELSH WATER AUTHORITY

DROUGHT ACT 1976

THE WELSH WATER AUTHORITY (TAF FECHAN AND LLWYN-ON RESERVOIRS) (DROUGHT) ORDER 1989

NOTICE IS HEREBY GIVEN that in exercise of the powers conferred upon him be Section 1 of the Drought Act 1976, the Secretary of State for Wales on the 23rd day of August 1989 made the above-named Order. The effect of the Order is as follows:

For a period terminating on the 22nd day of February 1990 (or until the Taf Fechan and Llwyn-On Reservoirs are full, whichever is the sooner):

1. (1) The obligation contained in Section 20 of the Merthyr Tydfil Corporation Act 1911 as amended by Section 3 of the Taf Fechan Water Supply Act 1955 whereby the Authority is required to discharge or deliver in a regular uniform and continuous flow into the River Taf Fechan from the Taf Fechan Reservoir not less than four million two hundred thousand gallons of water during every day of twenty-four hours is modified by substituting for the words "four million two hundred thousand" where they occur in the said Section 20, the words "9.10 megalitres".

2. (1) The obligations to which the Authority is subject by provisions contained in Section 40 (Compensation Water) and Section 41 (for the protection of local authorities) of the Cardiff Corporation Act 1934 (as altered and amended) whereby the Authority is required -

(a) to discharge as compensation water from the Llwyn-On Reservoir or the works immediately connected therewith into the River Taff Fawr in a regular equal constant and continuous supply during the whole twenty-four hours of a day a quantity of four million gallons; and

(b) to cause there to be a flow of water in the said river at the Ffrwd Gauge (as defined in Section 41 (1) of the said Act of 1934) at a regular and uniform rate of not less than five and three-quarter million gallons per day of twenty-four hours;

are modified by substituting for the words "four million" and "five and three-quarter million", where they occur in the said Sections 40 and 41, the words "9.10 megalitres".

A copy of the Order is deposited at the offices of the Authority at Plas-y-Ffynnon, Cambrian Way, Brecon, Powys, and at Pentwyn Road, Nelson, Treharris, Mid-Glamorgan, where it may be inspected at any time during normal office hours.

Dated 24th August 1989

J Rowland Price
Chief Solicitor to the Authority

Welsh Water Authority
Plas-y-Ffynnon
Cambrian Way
Brecon
Powys
LD3 7HP

STATUTORY INSTRUMENTS

1989 No 1665

WATER, ENGLAND AND WALES

The Welsh Water Authority (River Usk)

(Drought) Order 1989

Made 31st August 1989

Coming into force 1st September 1989

Whereas the Secretary of State for Wales is satisfied that, by reason of an exceptional shortage of rain, a serious deficiency of supplies of water exists in the area of the South Eastern Division of the Welsh Water Authority:

Now, therefore, the Secretary of State for Wales, in exercise of powers conferred by section 1 of the Drought Act 1976(a), and of all other powers enabling him in that behalf, hereby makes the following Order:

1. This Order may be cited as the Welsh Water Authority (River Usk) (Drought) Order 1989 and shall come into force on 1st September 1989.

2. In this Order -

"the licence" means the Water abstraction licence numbered 20/56/22/27 issued by the Usk River Authority on 21st November 1967 (as amended by an endorsement thereon of 31st May 1973 and as varied by a variation granted by the Secretary of State for Wales on 31st December 1981 in respect of the conditions governing the abstraction from the River Usk).

"condition 1(i)" means the condition in sub-paragraph 1(i) of paragraph (h) of section B of Part III of the licence whereby the authorised abstraction from the River Usk at the Rhadyr Intake may not at any time cause the rate of flow of the river immediately downstream thereof to fall below the sum of:

(1) 228 thousand cubic metres per day,

(2) the rate of abstraction at that time at the Llantrissant Intake.

3. During the period that this Order has effect the restriction contained in condition 1(i) of the licence is hereby suspended.

4. This Order shall have effect until and including 28th February 1990.

Alyn Hughes

Signed by authority of
the Secretary of State

An Assistant Secretary
Welsh Office

31 August 1989

(a) 1976 c.44.

STATUTORY INSTRUMENTS

1989 No 1659

WATER, ENGLAND AND WALES

The Dwr Cymru Cyfngedig (Abstraction from Bachawy Brook) (Drought) Order 1989

Made	1 September 1989
Coming into force	2 September 1989

Whereas the Secretary of State for Wales is satisfied that, by reason of an exceptional shortage of rain, a serious deficiency of supplies of water exists in the area of the South Eastern Division of Dwr Cymru Cyfngedig:

Now, therefore, the Secretary of State for Wales, in exercise of powers conferred by sections 1 and 3(4) of the Drought Act 1976(a) as continued in force by paragraph 34 of Schedule 26 to the Water Act 1989 (b), and in exercise of all other powers enabling him in that behalf, hereby makes the following Order:

1. This Order may be cited as the Dwr Cymru Cyfngedig (Abstraction from Bachawy Brook) (Drought) Order 1989 and shall come into force on 2 September 1989.

2. In this Order -

"The Company" means Dwr Cymru Cyfngedig;

"the deposited plan" means the plan prepared in duplicate signed on behalf of the Secretary of State and marked "Plan Referred to in The Dwr Cymru Cyfngedig (Abstraction from Bachawy Brook) (Drought) Order 1989" of which one copy is deposited and available for inspection at the offices of the Company at Plas-y-Ffynnon, Cambrian Way, Brecon, and the other at Welsh Office, Cathays Park, Cardiff.

3. During the period that this Order has effect the Company may abstract from the Bachawy Brook at a point at National Grid Reference SO 1275 4515 at Llanddewi in the Borough of Brecknock in the County of Powys as shown on the deposited plan, a quantity of water not exceeding 1.65 megalitres in any period of 24 hours, and for that purpose may -

(a) on land immediately adjacent to the said abstraction point install and maintain pumps and any necessary associated works required for the purpose of taking that water;

(b) lay a 150 millimetre diameter pipeline along the route shown in green on the deposited plan being a route from the said abstraction point through Ordnance Survey Parcel Numbers 6412, 4614, 2712 and 2200 (as on the 1974 Revision of Sheet SO) for a distance of approximately 745 metres to the Company's Llandeilo Graban Water Treatment Works at National Grid Reference SO 1208 4508;

(a) 1976 c. 44 (b) 1989 c. 15

(c) enter upon, occupy and use the land specified above to such an extent and in such manner as may be necessary for the installation, execution and maintenance of the said pumps, works and pipeline.

4. The Company shall, before exercising the powers of entry contained in article 3 of this Order, give to every owner, lessee and occupier of the land not less than 7 days notice of the intended entry by the Company on the land.

5. This Order shall have effect until and including 1 March 1990 and any pumps, pipeline and other work installed in pursuance of this Order shall thereupon be removed.

Signed by authority of
the Secretary of State

/ September 1989

An Assistant Secretary
Welsh Office

STATUTORY INSTRUMENTS

1989 No. 1651

WATER, ENGLAND AND WALES

The Dwr Cymru Cyfyngedig (Part of South Eastern Division) (Drought) Order 1989

Made	6 September 1989
Coming into force	7 September 1989

Whereas the Secretary of State for Wales is satisfied that, by reason of an exceptional shortage of rain, a serious deficiency of supplies of water exists in the area of the South Eastern Division of Dwr Cymru Cyfyngedig;

Now therefore the Secretary of State, in exercise of his powers under section 1 of the Drought Act 1976(a), as continued in force by paragraph 34 of Schedule 26 to the Water Act 1989 (b), and in exercise of all other powers enabling him in that behalf, hereby makes the following Order:

Citation, commencement and interpretation

1. - (1) This Order may be cited as the Dwr Cymru Cyfyngedig (Part of South Eastern Division) (Drought) Order 1989 and shall come into force on 7 September 1989.

(2) In this Order "the Company" means Dwr Cymru Cyfyngedig.

Power to prohibit use of water for certain purposes

2. The Company may, for such period as they think necessary not exceeding six months beginning with 7 September 1989, prohibit or limit as respects the whole or any part of the area described in the Schedule to this Order the use of water supplied by them, for any of the following purposes:-

(a) the watering, by hose-pipe, sprinkler or other apparatus, of parks, ornamental gardens, lawns, allotments, recreation grounds, sports grounds, playing fields, golf courses or racecourses, whether publicly or privately owned;

(b) the filling, whether wholly or partially, of privately owned swimming pools and ornamental ponds, other than fish ponds;

(c) the operation of mechanical vehicle washers, whether automatic or not;

(d) the washing of road vehicles, boats and railway rolling stock for any reason other than safety or hygiene;

(a) 1976 c.44.
(b) 1989 c.15.

(e) the cleaning of the exterior of buildings;

(f) the cleaning of industrial premises and plant for any reason other than safety or hygiene;

(g) the operation of ornamental fountains or cascades, including any where water is recycled;

(h) the operation in relation to any building or other premises of any cistern which flushes automatically, during any period when the premises are wholly or substantially unoccupied.

Alyn Hughes

Signed by authority of
the Secretary of State
6 September 1989

An Assistant Secretary
Welsh Office

SCHEDULE

AREA TO WHICH THIS ORDER APPLIES

In the County of Gwent the following local authority areas:

Borough of Blaenau Gwent

Borough of Islwyn with the exception of the areas of the

Communities of Crumlin,
Newbridge, Abercarn,
Penmaen, Ynysddu, Risca
and Cross Keys

Borough of Torfaen with the exception of the areas of the

Communities of Cwmbran,
Henllys and
Llanfrechfa Lower

In the County of Mid-Glamorgan the following local authority areas:

Borough of Cynon Valley
Borough of Merthyr Tydfil
District of Rhymney Valley
Borough of Rhondda
Borough of Taff Ely

STATUTORY INSTRUMENTS

1989 No 1863

WATER, ENGLAND AND WALES

The Dwr Cymru Cyfyngedig (River Usk) (Drought)(No 2) Order 1989

Made	29th September 1989
Coming into force	30th September 1989

Whereas the Secretary of State for Wales is satisfied that, by reason of an exceptional shortage of rain, a serious deficiency of supplies of water exists in the area of the South Eastern Division of Dwr Cymru Cyfyngedig:

Now, therefore, the Secretary of State for Wales, in exercise of powers conferred by section 131 of the Water Act 1989(a), and of all other powers enabling him in that behalf, hereby makes the following Order:

1. This Order may be cited as the Dwr Cymru Cyfyngedig (River Usk) (Drought)(No 2) Order 1989 and shall come into force on 30th September 1989.

2. In this Order -

"the Licences" means the water abstraction licence numbered 20/56/22/27 issued by the Usk River Authority on 21st November 1967 and the water abstraction licence numbered 20/56/21/34 issued by the Usk River Authority on 15th December 1965 (as amended in both cases by endorsements thereon on 31st May 1973 and variations granted by the Secretary of State for Wales on 31st December 1981 in respect of the conditions governing the abstraction from the River Usk);

"the Rhadyr and Llantrissant Intakes" means the intakes defined in paragraph (h) of Section B of Part III of the Licence number 20/56/22/27 referred to above, and therein named as "The Rhadyr Intake" and "The Llantrissant Intake";

"the Regulation Release" means that quantity of water released from the Usk Reservoir which is defined in paragraph (h) of Section B of Part III of the Licence number 20/56/22/27 referred to above under the reference "The Regulation Release".

3. During the period that this Order has effect the Licences are hereby modified such that notwithstanding the abstraction limits specified therein Dwr Cymru Cyfyngedig may abstract at the Rhadyr and Llantrissant Intakes a quantity of water which, in relation to any period of 24 hours commencing at 11.00 hours and in respect of both intakes does not exceed an amount equal to:

(a) the Regulation Release, and

(b) when the difference between the flow per day of the River Usk at Trostrey Weir as measured at the commencement of any period of twenty-four hours as referred to above and the Regulation Release is:

(a) 1989 c. 15

(i) in excess of 30,000,000 gallons per day and not exceeding 50,000,000 gallons per day, the amount by which the said difference exceeds 30,000,000 gallons per day; or

(ii) in excess of 50,000,000 gallons per day and not exceeding 80,000,000 gallons per day, the amount by which the said difference exceeds 30,000,000 gallons per day provided that this provision shall not apply for more than five days in any period of seven days, or

(iii) in excess of 80,000,000 gallons per day and not exceeding 190,000,000 gallons per day, the amount by which the said difference exceeds 40,000,000 gallons per day provided that this provision shall not apply for more than five days in any period of seven days, or

(iv) in excess of 190,000,000 gallons per day, the amount by which the said difference exceeds 40,000,000 gallons per day, provided that the sum of the quantities of water abstracted in any one day from the Rhadyr and Llantrissant Intakes shall not exceed 90,000,000 gallons.

4. This Order shall have effect until and including 28th February 1990.

Alyn HH Jones

Signed by authority of
the Secretary of State

An Assistant Secretary
Welsh Office

29th September 1989

STATUTORY INSTRUMENTS

1989 No. 1832

WATER, ENGLAND AND WALES

The Dŵr Cymru Cyfyngedig (South East Wales and Brecknock) (Emergency Provisions) (Drought) Order 1989

Made	3rd October 1989
Coming into force	4th October 1989

Whereas the Secretary of State for Wales is satisfied that, by reason of an exceptional shortage of rain, a serious deficiency of supplies of water exists in the areas described in the Schedule to this Order:

And whereas the Secretary of State for Wales is further satisfied that the deficiency is such as to be likely to impair the economic or social well-being of persons in the said areas:

Now, therefore, the Secretary of State for Wales, in exercise of powers conferred on him by section 132 of the Water Act 1989 (a), and of all other powers enabling him in that behalf, hereby makes the following Order:

1. This Order may be cited as the Dŵr Cymru Cyfyngedig (South East Wales and Brecknock) (Emergency Provisions) (Drought) Order 1989 and shall come into force on 4th October 1989.

2. In this Order "the Company" means Dŵr Cymru Cyfyngedig.

3. During the period that this Order has effect the Company may, in relation to all or any part of the areas described in the Schedule to this Order:

(a) prohibit or limit the use of water for such purposes as they think fit;

(b) supply water by means of stand-pipes or water tanks, and erect or set up and maintain stand-pipes or water tanks in any streets.

4. This Order shall have effect until and including 1st January 1990.

Signed by authority of
the Secretary of State

An Assistant Secretary
Welsh Office

3rd October 1989

(a) 1989 c.15.

THE SCHEDULE

AREA TO WHICH THIS ORDER APPLIES

The County of Gwent;

In the County of Powys:

The Borough of Brecknock

In the County of Mid Glamorgan:

The Boroughs of Cynon Valley, Merthyr Tydfil, Rhondda, Taff Ely, and the District of Rhymney Valley.

The County of South Glamorgan.

STATUTORY INSTRUMENTS

1989 NO 1573
WATER, ENGLAND AND WALES

The Dwr Cymru Cyfyngedig (Taf Fechan and Llwyn-on Reservoirs) (Drought) (No 2) Order 1989

Made 23rd October 1989

Coming into force 24th October 1989

Whereas the Secretary of State for Wales is satisfied that, by reason of an exceptional shortage of rain, a serious deficiency of supplies of water exists in the area of the South Eastern Division of Dwr Cymru Cyfyngedig:

Now, therefore, the Secretary of State for Wales, in exercise of powers conferred by section 131 of the Water Act 1989(a), and section 5(5) of the Drought Act 1976(b) as continued in force by paragraph 34 of Schedule 26 to the Water Act 1989, and of all other powers enabling him in that behalf, hereby makes the following Order:

1. This Order may be cited as the Dwr Cymru Cyfyngedig (Taf Fechan and Llwyn-on Reservoirs) (Drought) (No 2) Order 1989 and shall come into force on 24th October 1989.

2. In this Order, "the Company" means Dwr Cymru Cyfyngedig.

3. The obligation contained in section 20 of the Merthyr Tydfil Corporation Act 1911(c) as amended by section 3 of the Taf Fechan Water Supply Act 1955(d) whereby the Company is required to discharge or deliver in a regular uniform and continuous flow into the river Taf Fechan from the Taf Fechan Reservoir not less than four million two hundred thousand gallons of water during every day of twenty-four hours is hereby modified such that until this Order ceases to have effect or until the Taf Fechan Reservoir is full, whichever is the sooner, for the words "four million two hundred thousand gallons" where they occur in the said section 20, there shall be substituted "2.27 megalitres".

4. The obligations to which the Company is subject by provisions contained in section 40 (Compensation water) and section 41 (For the protection of local authorities) of the Cardiff Corporation Act 1934(e) (as altered and amended) whereby the Company is required -

   (a) to discharge as compensation water from the Llwyn-on Reservoir or the works immediately connected therewith into the river Taff Fawr in a regular equal constant and continuous supply during the whole twenty-four hours of a day a quantity of four million gallons; and

   (b) to cause there to be a flow of water in the said river at the Ffrwd gauge (as defined in section 41(1) of the said Act of 1934) at a regular and uniform rate of not less than five and three-quarter million gallons per day of twenty-four hours.

(a) 1989 c.15 (b) 1976 c.44 (c) 1911 c.xcvii.
(d) 1955 c.viii. (e) 1934 c.xcv; sections 40 and 41 were altered by section 6 of the Cardiff Corporation Act 1943 (c.xvi) and amended by section 3 of the Cardiff Corporation Act 1955 (c.ix); section 6 of the Cardiff Corporation Act 1943 was amended by section 4 of the Cardiff Corporation Act 1955.

are hereby modified such that until this Order ceases to have effect or until the Llwyn-on Reservoir is full, whichever is the sooner, for the words "four million gallons" and "five and three-quarter million gallons", where they occur in the said sections 40 and 41 there shall be substituted "2.27 megalitres".

5. This Order shall have effect until and including 20th April 1990.

6. The Welsh Water Authority (Taf Fechan and Llwyn-on Reservoirs) (Drought) Order 1989(a) is hereby revoked.

Signed by authority of
the Secretary of State

An Assistant Secretary,
Welsh Office

23 October 1989

(a) SI 1989/1573