



**North
West
Water**

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GEN1/B6

21st July, 1982.

To: Members of the West Cumbria Special
Fisheries Advisory Group
(Messrs. T.A.F. Barnes (Chairman);
F. Bunting; E.P. Ecroyd; A. Gleaden;
A. Moffat; Dr. A. Caldicott and S.G. Payne).

Dear Member,

A meeting of THE WEST CUMBRIA SPECIAL FISHERIES ADVISORY GROUP will be held at 2.15 p.m. on WEDNESDAY, 28TH JULY 1982 at the SOUTH CUMBRIA AREA OFFICE of the RIVERS DIVISION, BEATHWAITE, LEVENS, CUMBRIA for consideration of the following business.

Yours faithfully,

W.H. CRACKLE,
Secretary & Solicitor

A G E N D A

1. Apologies for absence.
2. Minutes of the meeting held on Friday, 25th June, 1982.
3. River Derwent Abstractions - Prescribed Flows and Fisheries implications.
4. Any other business.

8/4A18

MINUTES OF A MEETING OF THE
WEST CUMBRIA SPECIAL FISHERIES ADVISORY GROUP

25TH JUNE, 1982

Present: T. A. F. Barnes Esq. (Chairman)
 E. P. Ecroyd Esq. F. Bunting Esq.
 A. Moffat Esq. Dr. Caldicott (Co-opted)

1. APOLOGIES FOR ABSENCE

An apology for absence from the meeting was received from Mr. A. Gleaden.

2. APPLICATION BY BNFL FOR A TEMPORARY LICENCE TO ABSTRACT
 ADDITIONAL QUANTITIES OF WATER FROM WASTWATER

The Group considered a report on the implications of the granting of BNFL's application to increase their present abstraction from Wastwater from 18 Ml/d (4 mgd) to 29 Ml/d (6.4 mgd) until the 31st December 1987 or until a new supply is available, whichever is the earlier.

The Group accepted that the Authority would have to deal with the application in the light of the Secretary of State's acceptance of the fact that "there appears to be no alternative to a temporarily increased abstraction from Wastwater."

The report [which is appended to these Minutes] described the likely effects of the proposed temporary increased abstraction which had been examined with computer simulations for the period 1974-81. In summary the report predicted little effect on migration flows and summer spates although a greater impact on dry weather flows was predicted. In conclusion the report predicted that the temporary increased abstraction applied for was unlikely to have a long term detrimental effect on the stocks of migratory fish.

The Group, whilst appreciative of the officers' work involved in assessing the effects, were, however, very apprehensive that the predictions, although based on the best scientific evidence available, could not demonstrate with certainty that the River Irt fishery and angling would not be affected. They were, therefore, most concerned to ensure that if this increased abstraction were to be permitted then every effort should be made to monitor the effects, and that the best way to achieve this would be to provide a fish counter in the River Irt.

RECOMMENDATION:

That, whilst the temporary increased abstraction should not be opposed, the Water Management Committee be recommended to require BNFL to provide a fish counter on the River Irt at a location to be agreed with the Authority.

3. RIVER DERWENT ABSTRACTIONS - PRESCRIBED FLOWS

Following the Secretary of State's refusal of the previous Ennerdale and Wastwater proposals, the officers have been reviewing alternative ways of meeting the increasing water needs of British Nuclear Fuels Limited and of public water supplies. All these alternatives involved abstractions from the River Derwent in the vicinity of Yearl Weir of quantities up to 70Ml/d (16mgd.)

The officers reported orally on this review and the existing licenced abstractions by the Authority and the British Steel Corporation from the River Derwent immediately upstream of Yearl Weir and the present and proposed augmentation leases to support abstractions. Member expressed concern over the need to control the flow out of the River Derwent into the mill race from which British Steel Corporation presently abstract. This was noted by the Officers who promised a more detailed written report to the next meeting dealing with prescribed flows and fishery implications of any increased abstraction from the River Derwent.

4. DATE OF NEXT MEETING

It was agreed that the next meeting of the Group should be held at 2.15pm on Wednesday, 28th July 1982 and again at the Area Office of the Rivers Division at Beathwaite, Levens, Cumbria.

NORTH WEST WATER AUTHORITY

WEST CUMBRIA SPECIAL FISHERIES ADVISORY GROUP

25TH JUNE, 1982

APPLICATION BY BNFL FOR A TEMPORARY LICENCE TO
ABSTRACT ADDITIONAL QUANTITIES FROM WASTWATER.

INTRODUCTION

1. British Nuclear Fuels Ltd (BNFL) are currently authorised to abstract from Wastwater up to 18.2 Ml/d (4 mgd), for supply, and up to 22 Ml/d (4.8 mgd) for compensation water which is to be pumped to the River Irt whenever the flow at Galesyke flow measuring station would otherwise be less than 20.4 Ml/d (4.5 mgd). The annual quantity 'for supply' is 365 times the daily quantity.
2. BNFL have now advertised their intention to apply for a temporary increase of 11 Ml/day (2.4 mgd) in their abstraction from Wastwater, to run until 31st December 1987 or until a new supply is available, whichever is the earlier. This course of action follows the rejection by the Secretary of State of their previous application for a permanent increase of 32 Ml/d (7 mgd) to 50 Ml/d (11 mgd).

The letter setting out the Secretary of State's rejection stated:-

"The Secretary of State notes that at the inquiry BNFL indicated that in the event of their Wastwater proposals not being approved, they would wish to have a temporary consent for increased abstraction of 11 Ml/d (2.4 mgd) from Wastwater Lake pending the provision of a satisfactory supply from another source. He also notes that in the Inspector's view this should be considered reasonable. To the extent that the Company's additional requirements in the short term are for top quality (R1) water, the Secretary of State accepts that there appears to be no alternative to a temporarily increased abstraction from Wastwater; and he considers that any forthcoming application by BNFL for a temporary licence should be viewed accordingly."

3. Notwithstanding the Secretary of State's remarks the officers have examined objectively and in depth the consequences for the fisheries of the River Irt. Evidence presented at the 1980 Public Inquiry stated that an increase in abstraction would result in drawdown below the level of the bar at Wastwater. Re-examination confirms that this could occur during the period of the increased abstraction if authorized by a temporary licence.

IMPLICATIONS FOR RIVER IRT FISHERIES

4. The likely effects of the proposed temporary increase in abstraction from Wastwater on those flows in the River Irt which are important for migratory fish have been examined with computer simulations for the period 1974-81. The flows of particular concern to fisheries are the higher range needed to permit upstream migration of adults and the very low flows where fish survival could be prejudiced.

EFFECT ON FISH MIGRATION

5. Using Dr. Stewart's "formula", the commencing migration flow in the upper reaches of the River Irt has been estimated at 80 Ml/d (17.6 mgd). Over the period 1974-81 an increase in the abstraction from the lake of 11 Ml/d would have resulted, on average, in a reduction in the availability of flows greater than 80 Ml/d (17.6 mgd) of about 6 days during the period May - October in each year. The average availability of these flows during May - October with the present rate of abstraction has been 138 days, so the 6 day reduction represents only a 4.3% loss. The reduction does, of course, vary from year to year, ranging from 3 days in 1978 and 1980 to 14 days in 1975 and this sometimes results in a delay of a few days in achieving a migration flow following rainfall after a prolonged drought, when the lake has been drawn down. This would have happened in 1976 (4-5 days delay) and in 1974 (7-8 days delay).

EFFECT ON LOW FLOWS AND LAKE LEVELS

6. The increased abstraction would have more significant effects on dry weather flows. Using Dr. Stewart's approach, the so called "survival flow" in the River Irt immediately below Wastwater is estimated to be 26 Ml/d (5.8 mgd), and this value has been used for comparison of changes. With the present abstraction/compensation conditions, the number of days during the period May - October on which the flow would have fallen below 26 Ml/d (5.7 mgd) varies from nil in 1975, 1979 and 1981 up to 24 in 1980, averaging 6.2 days per year. Increasing the abstraction by 11 Ml/d (2.4 mgd) would have increased this by 6.4 days on average to 12.6 days. However there is considerable year-to-year variation, with negligible differences in 1975, 1977, 1979 and 1981, but increases of 17 days in 1974 and 13 days in 1980.
7. An 11 Ml/d increase in abstractions would have resulted in the lake being drawn down below the level of the bar on two occasions, namely in May 1974 (for 15 days) and in May/June 1980 (for 22 days). The drawdown is reflected in the extended periods of flow less than 26 Ml/d as only pumped compensation water would be entering the river at these times. In September 1976 and June 1978 the lake level would have been drawn down to within 10mm above the bar.

EFFECTS ON SPATES

8. The effects of the increased abstraction on the occurrence of small Summer spates has also been examined. Taking a flow in excess of 80 Ml/d (17.6 mgd) at Galesyke as constituting a spate, the effect would have been very slight, with only one summer 'spate' being lost in the last 8 years (June 1975) and one "near miss" when a minor peak of 70 Ml/d (15.4 mgd) would have been reduced to about 45 Ml/d (10.0 mgd) (June 1978).

VARIATION OF COMPENSATION WATER

9. Modifications to the compensation water arrangements have been considered, but these have shown no benefit to the availability

of migration flows or to the occurrence of summer spates. Infact increasing the volume of compensation water would result in longer periods of drawdown below the bar and offset higher flows in the river below the point of discharge.

SUMMARY OF EFFECTS

10. The consequence of increasing BNFL's abstraction from 18 Ml/d (4 mgd) to 29 Ml/d (6.4 mgd) on the availability of migration flows and summer spates is likely to be slight and to be of little significance to migration of fish in the Irt in most years. The increased abstraction would have a more significant effect on the dry weather flow situation, and resulting only compensation water being discharged to the River Irt after extended periods of dry weather and in increases in the duration of flows less than 26 Ml/d (5.7 mgd).

CONCLUSION

11. In view of the fact that these increased durations of low flows would only have occurred in alternate years, it is unlikely that an increase of 11 Ml/d (2.4 mgd) in the abstraction for a temporary period of 5 years would have a long term detrimental effect on the stocks of migratory fish.

GEN1/B1

NORTH WEST WATER AUTHORITY

WEST CUMBRIA SPECIAL FISHERIES ADVISORY GROUP

28TH JULY, 1982

RIVER DERWENT ABSTRACTIONS - PRESCRIBED FLOWS AND
FISHERIES IMPLICATIONS

Introduction

1. Following the rejection of the Authority's Ennerdale proposals the officers have been reviewing alternative ways of meeting the increasing water needs of BNFL and public water supplies in West Cumbria, all of which involve the abstraction of water from the River Derwent in the vicinity of Yearl Weir. It appears that an additional quantity of around 50 - 55 Ml/d (11-12 mgd) will be needed from the River Derwent with additional capacity to meet peaks in demand.

Existing Abstractions in the Derwent Catchment

2. The major abstractions for public water supplies are those from Thirlmere and Crummock Water; average abstractions from which since 1976 have been 187 Ml/d and 25 Ml/d respectively. The Authority also supply under an agreement certain industrial users from the Barepot intake above Yearl Weir. This source is licensed to supply 9.7 mgd (44 Ml/d) on average. The Agreement only requires the Authority to supply 7.8 mgd (35 Ml/d) at present, although the licence provides for up to 12.5 mgd (57 Ml/d) provided any abstraction above 7.5 mgd (34 Ml/d) is limited to one half of the excess of the flow over 42 mgd (191 Ml/d) at Camerton.
3. The British Steel Corporation hold licences of right for 91 Ml/d and their abstractions are not restricted by any controlling level of river flow.

Effect of existing development on minimum flows in the Lower Derwent

4. For the maximum authorised daily rate of abstraction of 57 Ml/d by the Authority the flow at Camerton must at present be maintained at $191 + 2 (57 - 34) = 237$ Ml/d. Under the present powers the unrestricted licensed abstractions (91 Ml/d (BSC) plus 34 Ml/d (NWWA)) exceed the lowest recorded river flow at Camerton of 99 Ml/d. However following reconstruction of the Industrial Supply Scheme intake in 1980 the Thirlmere/Derwent scheme has been operated to maintain a flow of 191 Ml/d at Camerton even when NWWA abstractions are less than 34 Ml/d. Thus a minimum flow on any day of 66 Ml/d could pass over Yearl Weir into the estuary:

Maintained flow at Camerton		191 Ml/d
Less: NWWA abstraction	34	
B.S.C. abstraction	<u>91</u>	
	125	<u>125 Ml/d</u>
Residual flow (below Yearl Weir)		<u>66 Ml/d</u>

The residual flow would be increased when abstraction by NWWA exceeded 34 Ml/d and at the maximum authorised daily rate of abstraction a minimum flow of 89 Ml/d would pass to the estuary.

Maintained flow required at Camerton	237 Ml/d
Less: NWWA abstraction (maximum)	57
B.S.C. abstraction	<u>91</u>
	148
	<u>148 Ml/d</u>
Residual flow (below Yearl Weir)	<u>89 Ml/d</u>

5. A significant consequence of the British Steel abstraction is that the river over and below Yearl Weir may be deprived of significant quantities of water even if their nett useage is small. Officers have commenced discussions with BSC about the magnitude of their future requirements for water and have asked BSC to consider reducing their licensed quantities. These discussions are not yet complete but the indications are that their future requirements are likely to be substantially less than the present licensed quantity.
6. Studies of the effect on the River Derwent of increased abstractions by the Authority have been carried out on the basis that not more than 9 mgd (42 Ml/d) would need to be abstracted in future years into the mill race at Yearl Weir.

Effect of Increased Abstractions on River Flows

7. To demonstrate the effect of increased abstractions on river flow and to aid the assessment of the implications for fisheries two computer simulations over the period 1978-81 have been compared:
 - (i) a representation of the present arrangement operating to provide the full amount required at present by the agreement for the Industrial Supply Scheme (35 Ml/d) and with BSC diverting the full 91 Ml/d down the mill race.
 - (ii) the future if the Authority were to abstract an additional 53 Ml/d, making 88 Ml/d in total and BSC were to divert only 42 Ml/d. In this case a prescribed flow of 89 Ml/d (3.4% of Average Daily Flow of 2620 Ml/d) over Yearl Weir has been assumed. This is equivalent to the residual which would be left if the present arrangements were to operate at the maximum authorised daily rate.

When peaks in demand coincide with low river flows then abstractions over and above 88 Ml/d would be supported by further releases from Thirlmere and would not therefore reduce residual flows below the prescribed flow of 89 Ml/d.

Impact of increased abstraction on Fisheries

8. The flows of particular concern to fisheries are the very low flows, when fish survival could be prejudiced (and when fish can be very vulnerable to poaching) and the higher range of flows needed to permit upstream migration of adults. The part of the river which would be most affected by the proposals is the stretch from Yearl Weir to the sea. Mortalities amongst salmon and sea trout due to outbreaks of the disease furunculosis have occurred in the past in the tidal Derwent when large numbers of fish have accumulated there during drought periods.
9. The "survival flow" downstream of Yearl Weir, based on the criteria developed by Lancashire River Authority of 0.3 cusecs per foot width, is estimated to be 83 Ml/d. The present abstraction arrangements now permit the minimum flow below Yearl Weir to fall to between 66 and 89 Ml/d, depending upon the actual level of abstraction. Thus whenever the actual NWWA abstraction is less than 51 Ml/d the residual flow could fall significantly below the "survival flow"; when the BSC take is less than 91 Ml/d these minimum flows increase. (Actual abstractions for the industrial scheme averaged 17 Ml/day in 1981.
10. The simulation of the present conditions shows the flow falling to 67 Ml/d in 1976, 1978 and 1980, and the numbers of days during the period May - October in these years when the flow was below the "survival flow" were 15, 19 and 15 respectively. Under the operating rules assumed in the simulation of the new proposals, a minimum residual flow of 89 Ml/d, maintained by releases from Thirlmere, has been adopted. Thus in the drought years the minimum flow would be increased to 89 Ml/d, slightly above the "survival flow", which would undoubtedly be an improvement.
11. The simulations show that in the "non-drought" years, the increased abstraction would result in a slight decrease in the minimum flow value. To quantify this effect in terms of duration of low flows, the numbers of days with a flow less than 260 Ml/d (10% of ADF) were compared for the present and proposed situations. The differences are insignificant and never amount to more than one day in the May - October period.
12. The effect of the proposals on the availability of migration flows downstream of Yearl Weir were ascertained by comparing the duration of flows within the band 245 Ml/d - 2,400 Ml/d. This flow band was selected after examining data from Yearl fish counter (which is immediately downstream of Yearl Weir) for the periods May-October in 1979, 1980 and 1981. The lower limit of this band agrees with the figure which is arrived at if the "Lancashire" criterion for "commencing migration flow" of 0.9 cusecs per foot width is applied

to the Derwent in the vicinity of the counter. The effect of the increased NWWA abstraction on flows in this band is negligible, with one day lost during the May-October period in 1976, 1977 and 1979, and no difference in other years. (Average availability of migration flows in this period is estimated at 110 days). The effects on migration flow durations during the period June-August were also examined, but again the effects were found to be negligible.

13. The flow corresponding to the "mean angling flow" is 860 Ml/d. Availability of flows above this value would be unaffected by the abstraction proposals.
14. Releases of water from Thirlmere to maintain the residual flow downstream of Yearl Weir would obviously augment natural flows upstream of the abstractions and this could cause complaints if these enhanced flows encouraged migratory fish to move upstream to the disadvantage of fishery interests in the Derwent above Yearl. The likelihood of this happening was investigated by examining the duration at Camerton of flows in excess of the commencing migration flow of 245 Ml/d under the present conditions, and with the increased NWWA abstraction. (River widths below Yearl Weir and at Camerton are very similar, so that migration flows are likely to be closely related). There would be a slight increase, of the order of 2-3 days, in the duration of migration flows at Camerton with the increased abstraction (an average figure of 167 days during the period May-October increased to 169 days); it is unlikely that this would influence fish migration patterns.
15. In another computer simulation, the increased NWWA abstraction was super-imposed on a B.S.C. abstraction of 91 Ml/d. Although there was an improvement in drought years, in "non-drought" years the minimum flow into the estuary was reduced substantially, and there was a tendency to even out the differences between wet and dry summers. Duration of low flows, i.e. of flows less than 10% ADF (260 Ml/d), was increased by, on average, 3-4 days during the period May-October. There was also an increased effect, albeit a modest one, on availability of migration flows, with, on average, a reduction of 5 days in the May-October period.

Yearl Weir

16. Consideration is being given to ways of improving the monitoring of abstractions into the mill race and also to works which reduce the blocking of the fish pass.

Conclusions

17. The proposals for increased abstraction by NWWA appear to have very little effect on those flows of particular significance to

migratory fish, and on balance should be beneficial in drought years when the residual flow into the estuary would be maintained at a level above the "survival flow". These results demonstrate that advantages can be gained from both a reduction in abstraction by BSC offsetting the increase by NWWA and by changing the present abstraction arrangements to a simple prescribed flow.

18. Members are invited to express at the meeting their views on the proposals examined in this paper.