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SOME THOUGHTS ON THE 1985 COMMONS WELSH AFFAIRS COMMITTEE INVESTIGATION INTO BATHING WATER QUALITY AND COASTAL SEWAGE POLLUTION

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ABSTRACT

The report of the Commons Welsh Affairs Committee investigation into coastal sewage pollution in Wales was published in December 1985. Under the terms of the EEC Bathing Water Directive, the competent authorities are required to ensure that water quality at designated bathing waters complies with the EEC standards by December 1985. The investigation initiated by the Commons Welsh Affairs Committee has produced a set of statements by the competent research and management authorities in Britain which provides a timely insight into current British policy on sewage pollution of coastal bathing waters. This paper examines the significance of these proceedings, both within Wales and in the wider United Kingdom context. The latest scientific evidence is evaluated which suggests that, even at beaches which comply with the current EEC standards, statistically significant transmission of minor illnesses could be expected. Recent suggestions of additional designations of coastal bathing waters are noted and the implications of water authority privatization are discussed.

KEY WORDS

water, bathing, water quality, sewage epidemiology, designation, European Community, Parliament, Wales.

INTRODUCTION

The disposal of sewage via marine outfalls is a well established practice in Britain. The waste from approximately six million coastal residents is discharged via outfalls and this contributing population increases to twelve million in the summer months (WRC, 1985). Where the effluent is screened and macerated, before passing from a well designed outfall, rapid dispersion takes place and the aesthetic problems associated with 'objectionable floatables' do not occur. Under such conditions marine disposal presents the 'best practical environmental option' (BPEO) when weighed against the environmental and financial impacts of alternative treatments which themselves produce sewage sludge requiring either marine dumping or land disposal (Pearson, 1975; Roberts and Willis, 1980).

If industrial effluent is ignored, the average dry weather daily flow of foul sewage to coastal waters is some 179 litres per capita of contributing population (DoE, 1973). Following discharge the sewage forms a bouyant slick which slowly disperses into the more dense sea water (Hayashi and Ito, 1975). The main objective in outfall design is to facilitate sufficient dispersion and dilution of the effluent to prevent contact between the bathing population and sewage wastes. This can be achieved by structures fitted to the outfall pipe which create enhanced dispersion and by designing outfalls of sufficient length to ensure physical separation of sewage

and bathers (White and Agg, 1975). Unfortunately these sensible design criteria do not apply to the vast majority of British outfalls which do not even reach the low water mark of the lowest spring tide.

In 1973 the Department of the Environment (DoE) published the results of a major review of British outfalls which revealed that 61% of principal outfalls and 78% of overflow outfalls discharged at or above low water mark (DoE, 1973). These data excluded the many small outfalls, most of which would discharge in this inter-tidal region. It was not the aim of this study to define the number of outfalls directly affecting recreational waters. However, there is no reason to believe that recreational waters were less affected by this sewage input to the 'beach zone' as defined by the DoE. In a later survey, conducted by the Water Research Centre (WRC), working under contract to the DoE, the problem of sewage pollution in recreational waters was addressed more specifically. In total 191 recreational beaches were identified as being in the vicinity of an outfall serving a population in excess of 2000 (Table 1). Aggregates of faecal material, together with other aesthetically revolting materials such as contraceptives and sanitary towels, are frequently found on many British beaches. If screening and maceration take place these aesthetic problems are unlikely but high counts of enteric indicator bacteria are still probable if outfalls discharge in the bathing zone (DoE, 1973).

EPIDEMIOLOGY

The relationship between bathing in sewage polluted sea water

and bather morbidity has been scientifically studied since 1953 (Stevenson, 1953). The extent to which the ingestion of dilute sewage whilst bathing produces a health risk is central to the political and economic debate which determines water authority expenditure priorities and hence the urgency given to pollution abatement programmes. Several early studies provided anecdotal evidence of a link between typhoid fever and sea bathing (Reece, 1909; Winslow and Moxon, 1928). In Britain, the first epidemiological survey was conducted by the Public Health Laboratory Service (PHLS, 1959). This five year investigation was a 'retrospective' study of two 'notifiable' illnesses namely poliomyelitis and enteric fever. The research method employed was to examine all cases of these diseases notified to medical officers of health with the aim of establishing any links between the patient's bathing history and pattern of morbidity. Only four cases were identified for the period 1956-1958 in which a link between bathing in polluted waters and enteric fever could be identified. A further six cases in the period 1946-1952 provided less firm, but additional, evidence of a bathing-disease link. No association could be found between poliomyelitis and coastal bathing histories. Based upon this evidence, the PHLS committee concluded;

> "That bathing in sewage polluted sea water carries only a negligible risk to health, even on beaches that are aesthetically very unsatisfactory."
>
> (PHLS, 1959:468)

On the question of quality standards for bathing waters the committee noted that;

> "on the results of the studies described it could be argued that bathing waters with a median coliform count of greater than 10,000 per 100ml occasionally cause paratyphoid fever, and that a standard of this order can be justified on health grounds,"
>
> (PHLS, 1959:467)

The committee later concluded;

> "That, since a serious risk of contracting disease through bathing in sewage polluted sea water is probably not incurred unless the water is so fouled as to be aesthetically revolting, public health requirements would seem to be reasonably met by a general policy of improving grossly insanitary bathing waters and of preventing as far as possible the pollution of bathing beaches with undisintegrated faecal matter during the bathing season."
>
> (PHLS, 1959: 469)

In its much quoted Memorandum 37, the Medical Research Council (MRC) stated;

> "With the possible exception of a few aesthetically revolting beaches around the coast of England and Wales, the risk to health of bathing in sewage contaminated sea water can, for all practical purposes, be ignored.
>
> (MRC, 1959:23)

This interpretation of the PHLS research has remained the official position of the competent British authorities to the present day and in 1985 the Welsh Water Authority stated;

> "A committee of the MRC conducted epidemiological studies relating to polio and enteric fever between 1955 and 1959 and it was their conclusion that there was no significant risk to health 'unless waters were so fouled as to be aesthetically revolting' (MRC, 1959). This conclusion was accepted by the United Kingdom government and has been the

basis of national policy since its publication."

(WWA, 1985:25)

In reality, the PHLS investigation is a very weak foundation for United Kingdom policy for three reasons.

(i) Only two notifiable illnesses were examined, one of which is not transmitted by the water route (WRC, 1985).

(ii) A wider range of more minor ailments had already been linked to bathing in polluted waters by Stevenson (1953). These were ignored by the PHLS and hence any conclusions regarding general health risks are not supported by the PHLS research findings.

(iii) The criteria used by the committee in assessing whether a particular case of enteric fever was contracted from bathing waters was so stringent as to exclude the vast majority of cases from consideration (Moore, 1959:35). For example, individuals were excluded unless they were infected with an organism of the same phage type as had already been isolated from the relevant bathing water. This presupposes almost constant pathogen monitoring of all bathing waters if the identified population of patients is to accurately reflect environmental risk.

Dufour has succinctly pointed to the pitfalls in the current UK position on this issue when he stated;

"negative findings in retrospective studies should not be interpreted to mean that a relationship does not exist."

(Dufour, 1982:2)

Subsequent workers have attempted to quantify the

relationship between water quality and bather morbidity using a more rigorous experimental design based on a prospective cohort study. Bathers and non-bathers are carefully defined at the time of exposure and studied over a 10 day period to determine any differential morbidity patterns. These studies have been conducted mainly in North America where workers such as Cabelli et al. (1982, 1983), Cabelli (1980) and Dufour (1982, 1983, 1984) have established significant relationships between bathing water quality and illness rates in the bathing population. In general enterococci are better indicators of health risk than Escherichia coli and Dufour has reported measurable health effects at freshwater beaches with bacterial indicator densities as low as 11 enterococci $100ml^{-1}$ and 23 faecal coliforms $100ml^{-1}$. He suggests that higher illness rates would be expected in marine bathers encountering similar indicator concentrations because of the enhanced die-off experienced by enteric bacterial indicators in the marine environment. Cabelli et al. (1983) report the following regression equations which predict highly credible gastrointestinal symptoms (HCGI ie. vomiting, diarrhea or stomach ache accompanied by fever)

Enterococci

$$Y = 0.20 + 12.17 \log10 X$$

E. coli

$$Y = 5.88 + 6.30 \log10 X$$

where: X = bacterial density per 100ml
Y = symptom rate per 1000 people

This type of functional relationship can form the basis for objective water quality standards based upon a risk assessment of some defined

'acceptable' excess disease incidence in the recreator population. It should be noted that this level of risk will change if the indicator/pathogen relationships alter due to, for example, epidemic conditions in the population. Furthermore, because the prevalence of disease varies between populations, the functional relationships calculated by Cabelli et al. (1983) may not be transferable beyond the North American context.

The work of the Environmental Protection Agency (EPA) epidemiologists does not contradict the findings of earlier PHLS investigations because these studies examined very different sets of diseases (Agg, 1981) Undoubtedly the prospective studies have provided a better assessment of overall disease risk because the range of diseases covered was not artificially restricted by the experimental design. The prospective studies have demonstrated the errors of those who have suggested that the PHLS study proved the lack of a health risk. For example, the MRC's statement that there was 'no significant risk to health' is clearly incorrect if gastrointestinal ailments are to be considered as a health risk. The standard of 10,000 E.coli $100ml^{-1}$, suggested by the PHLS, might result in approximately 30 cases of HCGI symptoms per 1000 bathers, assuming that Cabelli's functional relationships apply.

STANDARDS

Concentrations of faecal indicator species demonstrate very wide variations over short time periods (Gameson, 1978,1980,1982;

Gameson and Munro, 1980). Together with the absence of British epidemiological data, this has led many British workers to suggest that bacterial standards are not a suitable means of defining recreational water quality (Moore, 1975,1977). It was not surprising therefore that the 1976 EEC Bathing Waters Directive (EEC, 1976), which specified acceptable bathing water quality standards, received widespread resistance and antipathy from the competent authorities in Britain. Dr Brendan Moore, the PHLS committee chairman, described the British position as follows;

> "broadly speaking the philosophy of this country differed from that of the EEC which was essentially an importation from the USA. The tendancy of the UK had been to take the view that priorities on the public health side should be where there was demonstrated risk to public health. The other philosophy, which was basically American, was that the mystical thing called environmental quality must be conserved by prescribing a number of indices of contamination which had to be kept in mind."
>
> (Moore, 1979 see Gameson 1979:210)

In addition to the concept of 'environmental quality', EEC directives are designed to produce harmonization of pollution control leading to fairer economic competition between member states. Critics of the Bathing Waters Directive have suggested that harmonization in this area is not possible because the environments of the Mediterranean and the British coastal waters are so different that similar standards should not be applied (Moore, 1979; Waddington, 1981). There is some scientific justification for this position and recent studies have demonstrated very different rates of bacterial die-off in the two environments (Evison and Tosti, 1980; Evison, 1985).

The EEC Bathing Waters Directive (EEC, 1976) specified the standards outlined in table 2. These apply to 'designated' bathing waters in member states. Article 1 defines bathing water as follows;

> "bathing water means all running or still waters or parts thereof and sea water, in which:
>
> --bathing is explicitly authorised by the competent authorities of each member state, or
>
> --bathing is not prohibited and is traditionally practiced by large numbers of bathers."
>
> (EEC, 1976:L31/2)

Under Article 4 of the directive, member states were responsible to ensure that all bathing waters so defined conformed to the limits set out in table 2 within ten years ie. by December 1985. In exceptional circumstances member states could grant derogations of the ten year time limit, although justification for such derogations should be reported to the Commission by December 1981.

In view of Britain's less than enthusiastic acceptance of the need for standards, it may seem strange that British negotiators agreed to the directive at all. Some indication of the views of the UK negotiators is given by Mr. Garnett, a DoE representative who explained;

> "The answer to why there was a bathing water directive was that they had not really thought it was worth arguing against. At the time major issues were being discussed in Brussels, and they had not wanted to appear too obstructive."
>
> (Garnett, 1981 see Barrow, 1981:229)

In view of this ambivalent attitude, it was not surprising that the

DoE criteria, which defined the designated beaches, were drafted so as to allow only 27 designated bathing waters in Britain (Table 3). These included no Welsh beaches and excluded such popular bathing resorts as Blackpool and Brighton (RCEP, 1984).

The DoE designation criteria, published in July 1979, specified that a beach should have at least 500 bathers actually in the water and/or 1500 bathers in the water per linear mile of beach to comply with the DoE interpretation of Article 1 of the EEC Directive (Welsh Office, 1985; CAPL, 1985). Pearce (1982) has commented on the designation process as follows;

> "In the South-West the Authority gave the counting job to local councils which were keen to get their beaches designated as a result 11 beaches qualified. But only 16 other beaches were designated for the whole of the rest of Britain. ..... Blackpool - doyen of British resorts with eight miles of beaches, three piers and 500,000 tourists at the height of the bathing season - miraculously failed to be labelled a traditional bathing beach.
> It emerged that, had Blackpool been designated, the North West Water Authority would have to spend £25m on sewage treatment plant and outfalls to cut sewage pollution."
>
> (Pearce, 1982:122)

More 'official' disquiet at the manner in which the DoE effectively circumvented the EEC directive has been expressed by the report of the Royal Commission on Environmental Pollution (RCEP) which recommended the designation of additional beaches and described the 1979 DoE designation criteria as 'unrealistic' (RCEP, 1984:94). The fact that Britain is out of step with its European partners can be seen from the totals of designated bathing waters for all community countries in December 1984.

In many respects the EEC standards, and their associated monitoring programmes, are not designed to provide effective management information. In the case of the coliform standards, fortnightly sampling is suggested; 95% of samples should be less than the 'I', or imperative, level; 80% of samples should be less than the 'G', or guide value (Table 2.). Using this sampling framework, a full bathing season would be required to obtain say 10 samples from which a realistic assessment could be made of the percentage compliance achieved at a given sampling location. The information required by any management authority considering the closure of a designated beach, which consistently failed the standards, would therefore come available after the summer bathing season when presumably any health damage had been done. Clearly, no competent authority would open itself to the ridicule of closing a beach in winter.

The North American standards offer a more useful management tool for making beach closure decisions (McDonald and Kay, 1984). The Canadian faecal coliform standard specifies that the geometric mean of 5 samples taken over a 30 day period should be less than 200 $100ml^{-1}$ and resampling should be undertaken if any sample exceeds 400 faecal coliforms $100ml^{-1}$ (Canadian Government, 1983). The implementation of these standards throughout Canada has resulted in beach closure decisions in many areas. In metropolitan Toronto daily samples from some 35 locations are analysed. Where the 10 day geometric mean value of these determinations exceeds 100 faecal

coliforms $100ml^{-1}$ the beach is closed. This occurred in 1983, 1984, and 1985 causing considerable political pressure generated by the economically disadvantaged local traders as well as potential bathers (Kay and McDonald, 1985; Hollobon, 1983; Baker, 1985a,1985b). The Canadian standards are much more restrictive than those of the EEC directive 'I' values. However, they are based on local epidemiological research and designed to limit adverse health effects from bathing (Seyfried, 1980; Dufour, 1982, 1983).

Although better than the European counterparts, the Canadian standards still present problems of implementation. The main problem is that instantaneous bacterial measurement is not possible. The minimum time for a faecal coliform determination is 18 hours. Where a ten day geometric mean value is calculated, a manager could be closing a beach on a sunny day, when water quality was good, simply because of the statistical effects of previous poor water quality. Furthermore, the beach could remain closed for several subsequent days of good water quality while the statistical effects work through the series of data. This problem is fully appreciated by local pressure groups who can generate searching questions regarding closure policies. Attempts to overcome this problem have utilised some form of predictive modelling based either on a multiple regression approach (Kay and McDonald, 1985) or, where resources allow a simulation model (Palmer and Dewey, 1984; Palmer,1985). Such models offer the potential for predictive risk assessment although the main UK modelling efforts have to date been directed to questions of outfall design (Munro, 1975, Herbertson, 1985).

THE WELSH CONTEXT

The Welsh Water Authority (WWA) discharges 56% of its daily sewage effluent into the sea through 260 outfalls. Of these, 112 discharge to coastal areas and the remaining 148 discharge to estuaries. Only 30% of the coastal outfalls comply with current DoE/Welsh Office performance criteria which require that solids are not deposited on the foreshore and that foaming or discolouration is not visible from the beach (WWA, 1985:30). Only 6% of all outfalls are less than 10 years old. The majority are short outfalls discharging untreated sewage above low water mark (HMSO 1985c; HMSO, 1985a:15). In addition, hundreds of small private outfalls discharge into the beach zone. There is some evidence to suggest that overall water quality at Welsh beaches is inferior to that experienced at English locations. The WRC presented the data outlined in table 4 which describes water quality at 191 sites in England and Wales. Only 18% of the Welsh sites, as against 43% of the English sites, were classified as having 'good' water quality. This grading is based on a 97% compliance with the EEC 'imperative' level of 2000 E. coli $100ml^{-1}$. The functional relationships of Cabelli et al. (1983) would indicate that HCGI symptom rates of 26/1000 might be expected at an indicator concentration of 2000 E. coli $100ml^{-1}$.

In 1982 the costs of rectifying the ten worst discharges was estimated at £200m (Pearce, 1982). Currently, Welsh Water capital expenditure on sewage outfall improvements is some 6% of the national expenditure. This proportion is due to rise and will finally form

some 20% of total Water Authority investment (WRC, 1985). In the national context the WWA are seen to have a record of expenditure comparable to other UK water authorities (Table 5). However, in its evidence to the Parliamentary Committee, WWA expressed concern that;

> "the continuing decline in the economy has forced investment well below that which is considered necessary."

and

> "shortage of funds for investment has severely restricted the commencement of new works in tidal waters and other areas."
>
> (Welsh Water, 1985:21)

It seems reasonable to conclude that the legacy of old outfalls and the length of the Welsh coast, relative to the population of the Principality, combine to produce a requirement for investment levels much higher than the national average if the present unsatisfactory pollution level is to be reduced.

EVIDENCE TO THE PARLIAMENTARY ENQUIRY

By its very nature, the enquiry focused attention on Wales. However, the statements by the principal actors set out the current views of all research and management organisations with an interest in this area. To that extent the 1985 report is of much wider UK significance because it is these views and perceptions that will influence government policy on beach pollution.

(i) Evidence relating to health risks.

This issue was addressed by all major organisations giving evidence to the Committee. It was a central question in considering the relevance of the 1976 Bathing Water Directive. Welsh Water tackled this issue by citing the PHLS/MRC studies discussed above and they concluded;

> "the Authority sees no reason to depart from the views generally held in the United Kingdom that a serious risk to health does not exist unless waters are grossly contaminated by sewage solids.
>
> (Welsh Water, 1985:25)

In arriving at this statement the Authority considered the prospective epidemiological studies of Cabelli et al. (1975,1976). However, WWA dismissed the conclusions of these workers and cited 'an authoritative review' of the subject by Stanfield (1982) of the WRC to support their conclusion. Stanfield's views are reported as follows;

> "there is no reason to depart from the view held by the medical research council."
>
> (Welsh Water, 1985:25)

It is difficult to justify this interpretation of Stanfield's work. In fact, Stanfield called for an epidemiological survey of UK bathers and stated;

> "Certainly the results of the PHLS survey no longer appear to provide the assurance demanded by the general public and by organisations with direct responsibility for coastal waters."
>
> (Stanfield, 1982:57)

Surprisingly, the WWA submission fails to take account of the EPA prospective epidemiological studies published after 1976. Much of Cabelli's field work was completed in 1977 at Lake Pontchartrain (LA) and in 1978 at Boston (MA). This work was published in 1982 in the American Journal of Epidemiology and hence should have been readily available to the Authority. The lack of consideration given to the most recent epidemiological evidence together with the erroneous interpretation of Stanfield's work casts some doubt on the rejection by WWA of any serious health risk associated with bathing in sewage polluted sea waters. There is also evidence of some confusion in the WWA submission which seems to reject the EPA studies whilst at the same time stating.

> "It is possible that many cases, and even outbreaks, of infectious disease, especially viral gastroenteritis which can go unnoticed are associated with bathing waters which are deemed acceptable by current standards."
>
> (Welsh Water, 1985:32)

The Welsh Office (WO) states the current government position on the health aspects of bathing in sewage polluted waters which is that;

> "There is, however, no evidence that sewage pollution ..... in the waters off Welsh beaches results in the spread of serious illness. No direct association with sea bathing has been found for poliomyelitis or the enteric fevers in Wales
>
> (Welsh Office, 1985:121)

Less 'serious' illnesses such as gastroenteritis are not discussed specifically but, in subsequent examination by the Committee, WO officials noted the difficulty in conducting a thorough

epidemiological survey to quantify the risks of these less serious ailments.

Evidence submitted by the Association of Welsh District Councils (ADC) was based on a questionnaire survey of the 22 maritime councils which was designed to investigate both evidence of pollution and evidence of illness. A summary of the survey results are presented in Table 6. The Association of district councils concluded that;

1. A well designed epidemiological survey should be conducted to define the health risks of bathing in sewage polluted waters.
2. The current levels of pollution were environmentally unacceptable in view of the importance of the tourist industry to the Welsh economy
3. Central funds should be made available to Welsh Water for capital programmes aimed at reducing pollution.

It is clear from the WWA evidence that the EEC standards, set out in the 1976 Bathing Waters Directive, have become the accepted design criteria for new capital projects. This is to some extent surprising in view of the widespread rejection of any epidemiological rationale for the EEC standards and the restricted application of these standards to only 27 designated beaches. In practice the EEC standards are being applied by the competent authorities because they offer the only set of politically acceptable water quality criteria.

(ii) Evidence relating to non-health issues

Several secondary issues were raised during the course of the enquiry. Of particular concern was the effects of government policy on WWA capital investment programmes and the extent to which tight financial targets imposed on WWA prevented a rapid improvement in water quality. WWA evidence indicated expenditures of £6m at 1984 prices (just under 10% of total investment at outturn prices). Current capital programmes for 1985-1989 will account for £65m at 1984 prices. To complete the required improvements by 2001, WWA estimate that an additional expenditure of £125m would be required (again at 1984 prices). Current government policy restricts the External Finance Limit (EFL) of the Authority and WWA would not be permitted to borrow the funds required for outfall improvement. If WWA were to fund improvements by increasing revenue, WWA customers would have to bear a 5% increase in costs for the period to 2001. Since the policy of WWA is to restrict any increase in charges to the rate of inflation, there are clearly no resources available to fund the required capital works. Government policy on restricting the EFL can be seen as part of an overall financial strategy to control public sector borrowing. However, the application of this tight financial control seems, at times, to discourage WWA from actions which are of net benefit to the nation as a whole. For example, if the Authority obtains grants from external sources such as the EEC, the EFL is reduced accordingly. This has occurred in the case of the Tenby outfall improvement scheme for which WWA received a 30% EEC grant. The extent to which the EFL is reduced was not specified by the Welsh

Office (HMSO, 1985a:103; HMSO 1985b:135). It is clear, however, that senior WWA officers perceive only a marginal benefit from grants to their customers and current DoE policy does not encourage a vigorous persuit of such monies which are of net benefit to Britain and could speed pollution abatement.

The effects of beach pollution on the tourist industry were of particular concern to the Welsh Members of Parliament. There are no designated bathing waters, or 'eurobeaches', in Wales and it was suggested that this could place Welsh resorts at a disadvantage in competing with towns who were currently using their eurobeach designation in publicity material (HMSO 1985a; ADC, 1985). Furthermore, the lack of Welsh designated beaches could have financial implications if the EEC were to make funding available for water quality improvements at the eurobeaches (RCEP, 1984). The Parliamentary Committee expressed some concern at the way in which beaches had been chosen for designation and it is significant that they chose to repeat the words of the Coastal Anti Pollution League which expressed;

> "disgust at the way the Department of the Environment have circumvented the requirements of the EEC Directive by nominating so few beaches."
>
> (HMSO, 1985c:X)

RECOMMENDATIONS OF THE COMMONS WELSH AFFAIRS COMMITTEE

As representatives of Welsh constituencies, the Commons Welsh Affairs Committee had a difficult task. They were responsible for providing an objective report on coastal sewage pollution whilst at the same time being mindful of the potential impacts of their deliberations on the Welsh tourist industry which, in 1981, catered for 21 million overnight stay visitors, generated £150m and employed 35,000 Welsh constituents.

The recommendations of the Committee represent both a statement of 'acceptable' standards and a set of suggestions which outline how the standards could be implemented. The recommendation on acceptable standards is based on the highly praised 'pragmatic' approach of Welsh Water which defines the areas presenting a health risk to have;

> "The presence of significant amounts of faecal matter and/or sewage debris."
>
> (Welsh Water, 1985:92)

The Committee recommended that;

> "There should be a total exclusion of faecal solids from bathing waters, and compliance with the E. coli standard of the EEC Directive."
>
> (HMSO, 1985c:XXI)

A series of measures are suggested to implement this standard. Engineering works are encouraged to replace and repair old outfalls and the WWA is urged to make funds available for the

necessary work although significantly the committee voted to insert the following statement into its report.

> "The ultimate increase in cost that is the result of increased borrowing to finance sea outfalls and associated plants must always be fully borne in mind by the WWA and the Welsh Office."
>
> (HMSO, 1985c:XX)

This replaced the original drafting which stated;

> "we therefore recommend that the WWA be allowed to increase its borrowing to fund the accelerated programme of outfall replacement."
>
> (HMSO, 1985c:XXIV)

Since the expenditure required to implement a full programme of remedial measures is £125m in excess of allocated capital expenditure, it is clear that the Parliamentary committee is suggesting a course of action for which it is not prepared to recommend the consequent expenditure. The only constructive financial suggestion made was that the government should be prepared to relax control on the Authorities EFL to exempt any grant monies obtained from consideration. The Authority is also urged to catalogue and eliminate, where possible, private sewage discharges. The engineering and financial implications of this step are not discussed in the Committee's report.

The final set of recommendations come under the general heading of monitoring and publicity. Important statements on both the scope of monitoring and the nature of the monitoring organisations are made by the committee. Perhaps the most significant recommendation, in the UK context, is that the DoE should reconsider the whole designation exercise. In Wales it is suggested that WWA, together

with the relevant District Councils, should agree a 'realistic number' of Welsh beaches which could come under the terms of the EEC directive. The Welsh Office are urged to instigate regular monitoring of coastal water quality which should be independent of WWA. The maritime District Councils are urged to cooperate with WWA when, and if, specific problems arise. The data generated by the monitoring programmes should be collated by the Welsh Office and made available to the public in a form similar to the French Directorate-General for Health publication; "Sanitary Conditions of Sea and Freshwater Bathing Zones." This data base should be used to monitor any future changes in water quality.

EVALUATION

In general terms the Commons Welsh Affairs Committee report reflects the wider political debate between environmental issues and public expenditure. Outfall disposal represents a cost of only 20% that of alternative options (WRC, 1985). Given the required remedial measures, Wales could have the 'best practical environmental option' implemented by 2001. The present situation is not satisfactory from either a health or aesthetic viewpoint and, in effect, WWA are externalising a cost for which they are administratively responsible. The reasons rest with a historical pattern of neglect. The present WWA officers have won high praise from environmental pressure groups such as CAPL for their extensive monitoring programmes and the access they have allowed to WWA data. Central government policy, in particular the controls on Water Authority EFL, slows the pace of

change and perpetuates present pollution problems.

Perhaps the most significant aspect of the enquiry was the widespread condemnation of the 1979 DoE designation criteria which ensured so few eurobeaches in the UK. It is not yet clear (February 1986) if the Committee's recommendations for a re-examination of the designation exercise will be implemented. However, in December 1985, shortly after the publication of the Committee's report, the DoE issued two press releases (DoE, 1985a, 1985b) announcing a major monitoring exercise to determine water quality at 350 sites around the coasts of England and Wales. Monitoring will be based on EEC criteria but it is pointed out that;

> "inclusion of a bathing water does not necessarily imply that the water will be identified in terms of the Bathing Water Directive."
>
> (DoE, 1985b)

This suggests that the DoE is considering a national redesignation programme but it raises the question of why the DoE is monitoring 'water quality' when 'recreator numbers' is the specified designation criterion (EEC, 1976; HMSO, 1984). The past designation exercise was seen as cynical circumvention by many observers and, in any future designation exercise, the DoE should seek to avoid the charge that locations with unacceptable water quality were omitted from designation.

On February 5th 1986 the UK Environment Secretary, Kenneth Baker, and the Secretary of State for Wales, Nicholas Edwards,

announced plans for the privatization of the water industry by 1987. One benefit of this move, noted by government, was that the industry would no longer be bound by borrowing limits set in the wider national interest but of little relevance to the plans of a particular Authority. There is a clear suggestion here that the Welsh Water Authority would be able to borrow funds, beyond its current EFL, which might be used for outfall improvements. In addition, the WWA would be able to pursue EEC grant monies for relevant environmental improvements without fear of adverse adjustments in its EFL. However, on the negative side, the historical legacy of old outfalls and expensive remedial works is likely to reduce the attractiveness of WWA to investors. It is not clear if potential investors will discount the costs of all required outfall improvements in their assessments of the WWA share price. They will undoubtedly perceive uncertainty in central (UK) government and EEC policy towards bathing waters because these organisations could impose water quality standards at some future date requiring expensive remedial measures. The current monitoring exercise (HMSO, 1985a, 1985b) will define the extent of the problem on a national basis as measured by the EEC standards. A central question for investors, consumers and bathers is the extent to which environmental quality maintenance will be an obligation of the new private water companies. Many will argue that a private water company, with responsibility to dividend minded shareholders, could not be expected to take on the role of environmental gamekeeper and poacher which is currently fulfilled by the ten Regional Water Authorities. It may be, therefore, that the monitoring functions suggested by the Commons Welsh Affairs Committee

for bodies such as the Welsh Office and the District Councils could become essential elements in bathing water quality maintenance. One clear implication of the political climate created by the privatization announcement is that the type of epidemiological survey suggested by the ADC (1985), Kay (1985) and Stanfield (1982) will be very unlikely because of the risk that its findings could confirm the conclusions of Cabelli et al. (1983) and Dufour (1984) which suggest that current EEC standards are not sufficiently stringent to prevent all disease transmission.

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REFERENCES

ADC Committee of Welsh District Councils (1985) Minutes of Evidence to the House of Commons Committee on Welsh Affairs 16.1.85. Coastal Sewage Pollution in Wales. H.M.S.O. London pp. 142-147.

Agg, A.R. (1981) Cleaning up the coastline. Water 39, 26-28

Baker, A. (1985a) Water tests at beaches under fire. Toronto Globe and Mail 25.7.85

Baker, A. (1985b) Pollution warnings posted on beaches. Toronto Globe and Mail 19.7.85

Barrow, G.I. (1981) Microbial pollution of coasts and estuaries: The public health implications. Wat. Pollut. Control 80(2), 221-231

Cabelli, V.J., Levin, M.A., Dufour, A.P. and McCabe, L.J. (1975) The development of criteria for recreational waters. In Gameson, A.L.H. (Ed.) Discharge of sewage from sea outfalls Pergamon. 63-74

Cabelli, V.J., Dufour, A.P., Levin, M.A., McCabe, L.J and Haberman, P.W. (1976) The impact of marine pollution on marine bathing beaches: an epidemiological study. Limn. Oceanog. 2, 606-616.

Cabelli, V.J. (1980) Health effects criteria for marine recreational waters. Report EPA-600/1-80-031. Environmental Protection Agency, Cincinnati, Ohio.

Cabelli, V.J., Dufour, A.P., McCabe, L.J. and Levin, M.A. (1982) Swimming associated gastroenteritis and water quality. Amer. J. Epidem. 115(4), 606-616.

Cabelli, V.J., Dufour, A.P., McCabe, L.J. and Levin, M.A. (1983) A marine recreational water quality criterion consistent with indicator concepts and risk analysis. J. Wat. Pollut. Control Fed. 55, 1306-1314.

Canadian Government (1983) Guidlines for Canadian recreational water quality. Federal-Provincial working group on recreational water quality. Canadian Government Publishing Service. 75p.

CAPL Coastal Anti-Pollution League (1985) Minutes of Evidence to the House of Commons Committee on Welsh Affairs 16.1.85. Coastal Sewage Pollution in Wales. H.M.S.O. London pp. 157-162.

DoE Department of the Environment (1973) Report of a survey of the Discharges of Foul Sewage to the Coastal Waters of England and Wales. HMSO London. 20p.

Doe Department of the Environment (1985a) Survey of Coastal Bathing Waters. News Release 625 18.12.85. 13p.

DoE Department of the Environment (1985b) Survey of South West Coastal Bathing Waters. News Release SW 143 . 23.12.85. 4p.

Dufour, A.P. (1982) Fresh recreational water quality and swimming associated illness. Second National Symposium on Municipal Wastewater Disinfection, Orlando Florida. January 26-28, 21p.

Dufour, A.P. (1983) Microbiological recreational water quality objectives. Paper presented at the First National Conference on Recreational Water Quality and Human Health. Canadian Public Health Association. Oct. 27-28, Toronto, Ontario.

Dufour, A.P. (1984) Bacterial indicators of recreational water quality. Canadian J. Publ. Hlth. 75, 49-56.

E.E.C. (1976) EUROPEAN ECONOMIC COMMUNITY. Commission of the European communities. Council directive of 8 December 1975 concerning the quality of bathing waters. Official J. Eur. Communities, 31/1-31/7 (February).

Evison, L.M. and Tosti, E.(1980) Bathing water quality in the North Sea, and the Mediterranean. Marine Pollut. Bull. 11, 72-75.

Evison, L.M. (1985) Bacterial pollution of coastal waters in the UK and Mediterranean. J. App. Bact. 59 Suppl. No. 14, 81-94.

Gameson, A.L.H. (1978) Investigations of sewage discharges to some British coastal waters, Chapter 1 Introduction. WRC Technical Report TR67, 9p.

Gameson, A.L.H. (1979) EEC directive on quality of bathing water. Wat. Pollut. Control 78(2), 206-214

Gameson, A.L.H. (1980) Variability of bacterial counts in coastal waters. Prog. Wat. Tech. 12,481-489

Gameson, A.L.H. (1982) Investigations of sewage discharges to some British coastal waters, Chapter 4 Interpretation of Bacteriological data. WRC Technical Report TR180, 43p.

Gameson, A.L.H. and Munro, D. (1980) Investigations of sewage discharges to some British coastal waters, Chapter 5 Bacterial distributions. WRC Technical Report TR147, 115p.

Garnett, P.H. (1981) see Barrow (1981) p229.

Hayashi, T. and Ito, M. (1975) Initial Dilution of Effluent Discharging into Stagnant Sea Water. In Gameson, A.L.H. (Ed.) Discharge of sewage from sea outfalls Pergamon. 253-264p

Herbertson, P. (1985) Long sea outfalls and the computer model. Wat. Bull. 174, 8-9.

HMSO (1984) Controlling pollution: priciples and prospects. Pollution Paper No. 22. The government's response to the Tenth Report of the Royal Commission on Environmental Pollution. HMSO, London.
HMSO (1985a) House of Commons Committee on Welsh Affairs Coastal sewage pollution in Wales Minutes of Evidence 5.12.84.. HMSO London. 117p.

HMSO (1985b) House of Commons Committee on Welsh Affairs Coastal sewage pollution in Wales Minutes of Evidence 16.1.85.. HMSO London. 118-167p.

HMSO (1985c) House of Commons Committee on Welsh Affairs Coastal sewage pollution in Wales. Report and Proceedings Vol I 12.12.85.. HMSO London. 27p.

Hollobon, J. (1983) Sunnyside bathers are being warned water is polluted. Ontario Globe and Mail July 22nd. p.5.

Kay, D. (1985) Bathing water quality: the relevance of epidemiological research in the British context. Appendix I. In HMSO (1985d) House of Commons Committee on Welsh Affairs Coastal sewage pollution in Wales. Appendices to the Minutes of Evidence. 30.10.85.. HMSO London.

Kay, D. and McDonald, A.T. (1985) Risk Recreation and Regression: a study of the Toronto beaches. Working Paper No. 430 Leeds University School of Geography. 18p.

McDonald, A. T. and Kay, D. (1984) Beach closures and recreational water quality. Environments 16(1), 43-46.

Moore, B. (1959) The risk of infection through bathing in sewage-polluted water. Proceedings of the First International Conference on Waste Disposal in the Marine Environment Berkley California. 29-38.

Moore, B. (1975) The case against microbial standards for bathing beaches. In Gameson, A.L.H. (Ed.) Discharge of sewage from sea outfalls Pergamon. 110-114.

Moore, B. (1977) The E.E.C. Bathing water directive. Mar. Pollut. Bull. 8(12), 269-272.

Moore, B. (1979) see Gameson (1979) discussion p210.

M.R.C. (1959) MEDICAL RESEARCH COUNCIL Sewage contamination of bathing beaches in England and Wales. Medical Research Council Memorandum No. 37, 32p.

Munro, D. (1975) Observed and predicted coliform distributions near a sea outfall. In Gameson, A.L.H. (Ed.) Discharge of sewage from sea outfalls Pergamon. 353-362.

Palmer, M.D. and Dewey, R.J. (1984) Beach faecal coliforms. Canadian J. Civ. Eng. 11(2), 217-2244.

Palmer, M.D. (1985) Eastern Beaches Study 1984 Gore and Storrie Ltd. Consulting Engineers Toronto

Pearce, F. (1982) Watershed: the water crisis in Britain. Junction Books, 208p.

Pearson, E.A. (1975) Conceptual design of marine waste disposal systems. In Gameson, A.L.H. (Ed.) Discharge of sewage from sea outfalls Pergamon. 403-413.

P.H.L.S. (1959) PUBLIC HEALTH LABORATORY SERVICE. Sewage contamination of coastal bathing waters in England and Wales: a bacteriological and epidemiological study. Jour. Hygiene, Cambs. 57(4), 435-472.

RCEP Royal Commission on Environmental Pollution (1984) Tenth Report. HMSO London 233p.

Reece, R.J. (1909) 38th Annual Report to the local govenment board 1908-1909. Appendix A. No.6 90.

Roberts. D.G.M. and Willis R.R. (1980) Environmental aspects of marine and inland sewage treatment options for coastal towns. Prog. Wat. Tech. 13, 15-25.

Seyfried, P. (1980) A study of disease incidence and recreational water quality in the Great Lakes PHASE I. Report No. 81-EHD-67. Health and Welfare Canada, 161p.

Stanfield, G. (1982) Disposal of sewage from coastal towns. J. Roy. Soc. Hlth 2, 53-58.

Stevenson, A.H. (1953) Studies of bathing water quality and health. Amer. J. Publ. Hlth 43, 529-538.

Waddington, J.I. (1981) see Barrow (1981) discussion p229.

White, W.R. and Agg, A.R. (1975) Outlet Design. In Gameson, A.L.H. (Ed.) Discharge of sewage from sea outfalls Pergamon. 265-276.

Winslow, C.E. and Moxon, D. (1928) Bacterial pollution of bathing beach waters in New Haven harbour. Amer. J. Hygiene 8, 299-306.

WO Welsh Office (1985) Minutes of Evidence to the House of Commons Committee on Welsh Affairs 16.1.85. Coastal Sewage Pollution in Wales. H.M.S.O. London pp. 118-130.

WRC Water Research Centre (1985) Minutes of Evidence to the House of Commons Committee on Welsh Affairs 5.12.84. Coastal Sewage Pollution in Wales. H.M.S.O. London pp. 1-9.

WWA Welsh Water Authority (1985) Minutes of Evidence to the House of Commons Committee on Welsh Affairs 5.12.84. Coastal Sewage Pollution in Wales. H.M.S.O. London pp. 18-98.

TABLE LEGENDS

TABLE 1.

BATHING BEACHES IN THE VICINITY OF SEWAGE OUTFALLS

TABLE 2.

MICROBIOLOGICAL WATER QUALITY REQUIREMENTS FOR BATHING WATER SET BY THE EEC BATHING WATER DIRECTIVE.

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NUMBERS OF BATHING WATERS DESIGNATED BY EACH MEMBER STATE UNDER THE TERMS OF THE BATHING WATERS DIRECTIVE IN 1980.

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CAPITAL EXPENDITURE ALLOCATED BY EACH WATER AUTHORITY FOR THE IMPROVEMENT OF CONDITIONS AT RECREATIONAL BEACHES

TABLE 6.

SELECTED SUMMARY OF QUESTIONNAIRE RETURNS PRESENTED BY THE COMMITTEE OF WELSH DISTRICT COUNCILS TO THE COMMONS WELSH AFFAIRS COMMITTEE

TABLE 1.

BATHING BEACHES IN THE VICINITY OF SEWAGE OUTFALLS

WATER AUTHORITY	NUMBER OF BEACHES	POPULATION CONTRIBUTING SEWAGE $x10^3$
Anglian	24	45
Northumbrian	19	22
North West	32	30
Southern	32	52
South West	19	16
Welsh	48	15
Wessex	8	34
Yorkshire	9	23

(Source WRC, 1985)

TABLE 2.

MICROBIOLOGICAL WATER QUALITY REQUIREMENTS FOR BATHING WATER SET BY THE EEC BATHING WATER DIRECTIVE.

PARAMETER	GUIDE	IMPERATIVE
Total coliforms .$100ml^{-1}$	500	10000
Faecal coliforms .$100ml^{-1}$	100	2000
Fecal streptococci .$100ml^{-1}$	100	-
Salmonella .1^{-1}	-	0
Entro viruses PFU .10 .1^{-1}	-	0

In addition to the 5 microbiological parameters, 14 physio-chemical quality criteria are specified in the Directive Annex. Article 5 of the Directive specifies that 95% of samples should correspond to the standards set in the 'IMPERATIVE' column and 90% should correspond to the 'GUIDE' column except in the case or total and faecal coliforms where the acceptable % compliance falls to 80%.

(Source EEC, 1976)

TABLE 3.

NUMBERS OF BATHING WATERS DESIGNATED BY EACH MEMBER STATE UNDER THE TERMS OF THE BATHING WATERS DIRECTIVE IN 1980.

MEMBER STATE	INLAND BATHING WATERS	COASTAL BATHING WATERS
Luxembourg	39	0
Belgium	41	15
Netherlands	323	60
F.R. Germany	85	9
Ireland	0	6
Denmark	139	1117
France	1362	1498
Italy	57	3308
United Kingdom	0	27

In the cases of Denmark, France and Italy, the numbers refer to sampling locations rather than beaches. They are not therefore directly comparable with the UK data.

(Source WRC, 1985)

TABLE 4.

SUMMARY OF FAECAL COLIFORM BEACH WATER QUALITY DATA FOR 191 SITES IN THE VICINITY OF A SEWAGE OUTFALL (1979-1983).

WATER AUTHORITY	POOR	FAIR	GOOD	NO DATA
Anglian	3	2	3	16
Northumbrian	2	3	2	12
North West	3	0	2	27
Southern	4	5	7	16
South West	2	1	8	8
Welsh	9	9	4	26
Wessex	4	4	0	0
Yorkshire	1	3	4	1
TOTAL	28	27	30	106

Sites were classed as 'GOOD' if they had 97% compliance with the 'IMPERATIVE' level. Beaches classed as 'FAIR' had 90% compliance and 'POOR' beaches had less than 90% compliance.

(Source WRC, 1985)

TABLE 5.

CAPITAL EXPENDITURE ALLOCATED BY EACH WATER AUTHORITY FOR THE IMPROVEMENT OF CONDITIONS AT RECREATIONAL BEACHES

WATER AUTHORITY	COST OF SCHEMES IN PROGRESS £M	ALLOCATION FOR PROPOSED SCHEMES
Anglian	48	31
Northumbrian	13	12
North West	6	<1
Southern	32	53
South West	7	33
Welsh	11	40
Wessex	46	19
Yorkshire	12	<1
TOTAL	175	188

(Source WRC, 1985)

TABLE 6.

SELECTED SUMMARY OF QUESTIONNAIRE RETURNS PRESENTED BY THE COMMITTEE OF WELSH DISTRICT COUNCILS TO THE COMMONS WELSH AFFAIRS COMMITTEE

QUESTION	NO. OF POSITIVE REPORTS BY MARITIME DISTRICT COUNCILS MAX. 22
1. Evidence of sewage pollution on or in the coastal area.	21
2. If yes to question 1 is there	
(a) contamination of sea water	19
REASONS	
(i) dumping of sewage sludge	2
(ii) pollution from other D.C's	7
(iii) short sea outfalls	17
(iv) other	3
(b) foreshore contamination	16
REASONS	
(i) short sea outfalls	3
(ii) other	2
3. Concern expressed by local general practitioner	5
4. Evidence of gross undisintegrated faecal material on the beaches or within the coastal waters of the authority	
(i) regular evidence	7
(ii) occasional evidence	6
(iii) no evidence	6
5. Visible beach pollution from other sources, eg. streams.	2
6. Extent to which outfalls comply with DoE criteria	
(i) extensive compliance	2
(ii) some meet criteria	8
(iii) none meet criteria	5
(iv) no opinion	4

(Source ADC, 1985)