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<tbody>
<tr>
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<td>AUDIT COMMISSION</td>
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UNTAPPED SAVINGS:

WATER SERVICES IN THE NHS

The Audit Commission
for local authorities and
the National Health Service
in England and Wales

Number 5
May 1993
The NHS spent £52 million on water and effluent charges in 1992/93. Excluding hospital laundries, more than half of the water is used for flushing toilets, and staff and patient washing.

The Audit Commission has investigated the use of water at 300 hospitals and considerable variation was found. Yardsticks of performance have been developed and are shown in Exhibit 51 enabling hospitals to compare their performance with hospitals of similar types.

This paper shows how hospitals can start to reduce water and sewage costs immediately which will lead to cumulative savings of up to 30% or

**Exhibit 51**

**YARDSTICKS OF PERFORMANCE**

Yardsticks of performance have been calculated by the Audit Commission

<table>
<thead>
<tr>
<th>Acute hospitals with more than 100 beds</th>
<th>Litres per patient bed-day</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1138</td>
<td>Very poor</td>
</tr>
<tr>
<td>711-1137</td>
<td>Poor</td>
</tr>
<tr>
<td>531-710</td>
<td>Average</td>
</tr>
<tr>
<td>&lt;530</td>
<td>Good</td>
</tr>
</tbody>
</table>

Source: Audit Commission

15 million per annum. This will release resources for patients and also contribute to the better care of the environment.

If the increasing consumption and cost of water in the NHS is to be contained then greater attention needs to be given to the subject. Managers need to ensure that:

— a policy for water management is adopted;
— a strategy for investment is prepared;
— water bills are critically reviewed;
— accurate information on water consumption is obtained;
— consumption is compared to yardsticks of performance;
— alternative sources of water are explored;
— technology for reducing consumption is installed;
— environmental factors are considered.

Over the next year, the Commission's auditors will be reviewing in NHS hospitals in England and Wales in terms of the issues outlined in this paper. The review will include management arrangements for water, the effectiveness of monitoring and targeting systems, the ways in which technology can be harnessed to reduce water consumption and the extent to which hospitals manage the discharge of substances to drain. The local audit reports will set out for hospital managers where and how savings can be achieved.
1 The NHS spent £52 million on water and effluent charges in 1992/93 (Exhibit 1). These costs have risen rapidly over the last three years due to the K factors and are projected to rise by 50% in real terms by the year 2000 AD. This paper sets out how hospitals can start to reduce water and sewage costs immediately which will lead to cumulative savings of up to 30% or £15 million per annum.

2 The cost of water in England and Wales is not high in comparison with other industrialised countries but costs are rising more rapidly than in these countries except Italy and Australia, (Exhibit 2).

3 The NHS is a major customer of the water companies. There is not a typical District General Hospital in terms of water expenditure, but one hospital with 450 beds spent approaching £100,000 per annum on water and sewerage. It is important to note that water and sewerage costs vary considerably in different parts of the country due to the variation in charges levied by the water companies (paragraph 37). Excluding the laundry, more than half of the water used in a hospital is for flushing toilets, and staff and patient washing (Exhibit 3).

**Exhibit 1**
THE COST OF WATER USED IN THE NHS IN ENGLAND AND WALES

<table>
<thead>
<tr>
<th>Water Costs</th>
<th>Sewage Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>46%</td>
<td>54%</td>
</tr>
</tbody>
</table>

*Source: Audit Commission*

**Exhibit 2**
INTERNATIONAL COMPARISON OF COSTS

Water costs are rising more rapidly in the UK than in most countries

*Source: Audit Commission*
The cost and use of water has been the subject of considerable media interest over recent months. In the last few years Britain has faced the worst drought since records began almost 250 years ago. This has led to pressure to reduce the consumption of water.

Exhibit 3
USES OF WATER IN A HOSPITAL
More than half of the water is used in washing and toilet facilities

Source: Audit Commission
RESPONSIBILITY FOR WATER SERVICES

5 The Department of the Environment and the Welsh Office have responsibility for general policy and legislation for water services in England and Wales. There has been a considerable amount of legislation in the last four years, some of which has led to major changes in the way water is supplied to customers. The Water Act 1989 provided for the privatisation and regulation of the 10 water authorities and 29 statutory water companies. The former became the 10 water and sewerage companies and the latter became water only companies, some of which have now merged. The Water Act also provided for the establishment of several regulatory bodies whose functions are now set out in the Water Industry Act 1991 and the Water Resources Act 1991:

— The Office of Water Services (OFWAT), which regulates the prices set by the water companies, oversees the standards of service provision and protects the interests of water consumers. OFWAT also has 10 regional Customer Services Committees (CSCs) which identify customer concerns, pursue them with the companies and report to the Director General of Water Services.

— The National Rivers Authority (NRA), which regulates the quality and controls pollution of 'controlled' waters, (ie, most inland and coastal waters), and protects the water resources in England and Wales.

— The Drinking Water Inspectorate (DWI), which regulates the quality of supply of drinking water.

6 Her Majesty's Inspectorate of Pollution (HMIP) was formed in 1987 as part of the Government's objective to introduce the system of integrated pollution control. HMIP regulates the prescribed processes and substances under the Environmental Protection Act 1990. A body wishing to operate a prescribed process or emit a prescribed substance must be licensed to do so by HMIP. The NHS uses several substances such as low level radioactive material that fall under HMIP control.

7 The Government has issued a Consultation Paper on water conservation entitled Using Water Wisely. This sets out possible elements of a strategy for the future based on demand management rather than new reservoirs or a national pipeline grid to transfer water from heavy rainfall regions of the north to the south.
THE EFFECT ON THE ENVIRONMENT

8 In recent years, directives from the European Community have much influenced environmental legislation in England and Wales. For example, *The Water Supply (Water Quality) Regulations 1989* were issued following the EC directive on water quality.

9 In 1987, the second North Sea Conference agreed that inputs of dangerous substances to the North Sea via rivers and estuaries should be reduced by around 50% between 1985 and 1995. There is a need to reduce inputs of the most dangerous substances which are persistent, toxic and liable to accumulate in living tissues. *The Red List* was produced which includes heavy metals such as mercury and cadmium, certain pesticides, chlorinated industrial chemicals and solvents, (Exhibit 4, overleaf).

10 Addressing pollution is not just the responsibility of Water Companies. There are a number of potential sources of pollution on hospital sites (Exhibit 5, overleaf) and the NHS can make an important contribution to the improvement of the environment by controlling the effluent discharged from hospitals.

11 The need to ensure that the risk of legionella is minimised in hospital water systems does on occasions lead to some controlled waste of water. For example, tanks and calorifiers may need to be drained, cleaned and chlorinated at regular intervals and pipes and water systems need to be inspected. Technical surveys of the sites visited showed that the loss of water due to legionella precautions was not significant.

12 The Audit Commission set up an interdisciplinary team to study the use of water in the NHS under the overall direction of Ken Sneath. The project was managed by Graham Cuthbert who was assisted by Ian Jackson and Erica Ison. The team was advised by a panel of engineers including Ian Herron of NIFES, managers and other specialists associated with the water industry. The team is grateful for their advice and the help given by various other individuals and organisations. The team visited 43 hospitals during the study and obtained data on the use of water from 300 hospitals in England and Wales.

13 The objectives of the study were to:

— evaluate the management arrangements for water services in the NHS;

— determine whether expenditure on water and sewerage could be reduced;

— identify the current and potential use of technology in water conservation;

— examine the extent to which the NHS has responded to the removal of Crown Immunity.

14 In order to investigate these issues it is necessary to define and measure performance and to identify good practices in the management and use of water.

*Exhibit 4*

THE RED LIST CHEMICALS

These chemicals must not be discharged to sewer

<table>
<thead>
<tr>
<th>Mercury and its Compounds</th>
<th>Simazine</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>Trifluralin</td>
</tr>
<tr>
<td>Hexachlorobutadiene</td>
<td>Malathion</td>
</tr>
<tr>
<td>Endrin</td>
<td>Gamma-Hexachlorocyclohexane</td>
</tr>
<tr>
<td>Dichlorvos</td>
<td>Hexachlorobenzene</td>
</tr>
<tr>
<td>Atrazine</td>
<td>Dieldrin</td>
</tr>
<tr>
<td>Triphenyltin Compounds</td>
<td>Polychlorinated Biphenyls</td>
</tr>
<tr>
<td>Azinphos Methyl</td>
<td>Trichlorobenzene</td>
</tr>
<tr>
<td>Cadmium and its compounds</td>
<td>Tributyltin compounds</td>
</tr>
<tr>
<td>Pentachlorophenol</td>
<td>Fenitrothion</td>
</tr>
<tr>
<td>Aldrin</td>
<td>Endosulfan</td>
</tr>
<tr>
<td>1,2-Dichloroethane</td>
<td></td>
</tr>
</tbody>
</table>

Note: In Addition Flammable And Water Immiscible Substances Must Not Be Discharged To Sewer. Source: *Trade Effluent (Prescribed Processes and Substances) Regulations 1989*

*Control of Pollution (Special Waste) Regulations 1980*

*Duty of Care Provisions of Environmental Protection Act 1990*
Exhibit 5
POTENTIAL SOURCES OF SEWAGE POLLUTION
There are many sources of pollution in hospitals

<table>
<thead>
<tr>
<th>Source</th>
<th>Main contaminants</th>
<th>Officer responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray</td>
<td>Photographic fixer</td>
<td>Superintendent/ Senior</td>
</tr>
<tr>
<td>Nuclear Medicine</td>
<td>Aqueous radioactive isotopes</td>
<td>Medical Physicist</td>
</tr>
<tr>
<td></td>
<td>Aqueous radioactive isotopes</td>
<td>Senior Chief MLSO</td>
</tr>
<tr>
<td></td>
<td>Pathology Laboratories</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solvents</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heavy metal compounds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tissues: Human/Animal</td>
<td></td>
</tr>
<tr>
<td>Dental Departments</td>
<td>Mercury</td>
<td>Chief Dental Technician</td>
</tr>
<tr>
<td>Dispensing Pharmacy</td>
<td>Drugs</td>
<td>Chief Pharmacist</td>
</tr>
<tr>
<td>Manufacturing Pharmacy</td>
<td>Batch failures of products</td>
<td>Chief Pharmacist</td>
</tr>
<tr>
<td>Medical Illustration</td>
<td>Photographic fixer</td>
<td>Chief Technician</td>
</tr>
<tr>
<td></td>
<td>Photographic developer</td>
<td></td>
</tr>
<tr>
<td>Laundry</td>
<td>Detergents</td>
<td>Laundry Manager</td>
</tr>
<tr>
<td></td>
<td>Contaminants on laundry</td>
<td></td>
</tr>
<tr>
<td>Catering</td>
<td>Cleaning agents</td>
<td>Catering Manager</td>
</tr>
<tr>
<td></td>
<td>Macerated Food</td>
<td></td>
</tr>
<tr>
<td>Incinerators</td>
<td>Ash</td>
<td>Estates Manager</td>
</tr>
<tr>
<td>Domestic Services</td>
<td>Cleaning agents</td>
<td>Domestic Services Manager</td>
</tr>
<tr>
<td>Vehicle Maintenance</td>
<td>Spent oil</td>
<td>Transport Manager</td>
</tr>
<tr>
<td>Grounds Maintenance</td>
<td>Pesticides</td>
<td>Grounds Manager</td>
</tr>
<tr>
<td>Blood Transfusion Centre</td>
<td>Aqueous radioactive isotopes</td>
<td>BTS Manager</td>
</tr>
<tr>
<td></td>
<td>Crushed glass</td>
<td></td>
</tr>
</tbody>
</table>

Source: Audit Commission
The Commission has developed a performance indicator to measure water consumption in hospitals and this is expressed in litres per patient bed day, (Exhibit 6). An analysis of the data collected from 300 sites revealed that the only significant variable on water consumption in hospitals was the number of in-patients. Other possible factors including outpatients, day attenders, day cases, accident and emergency attendances and visitors were investigated but were not found to have any significant effect and were excluded from the performance indicator.

The performance of 300 hospitals (almost 20% of the total in England and Wales) has been measured using this performance indicator. Whilst it is recognised that the methodology adopted is an indicator and not an absolute measure, a wide range of performance was identified, (Exhibit 7). Higher levels of consumption can be reduced by:

1. Better water management, this is dealt with in Chapter 1; and
2. Improved use of technology, this is considered in Chapter 2.

The report addresses environmental issues in Chapter 3 and finding a way forward is proposed in Chapter 4.

Exhibit 6
MEASURING PERFORMANCE
Water consumption in hospitals can be measured in litres per patient day

Annual Consumption
Patient Bed-Day per annum

Source: Audit Commission
Exhibit 7
PIs HAVE BEEN CALCULATED FOR 300 HOSPITALS
There is a wide variation in performance

Source: Audit Commission
1. **BETTER MANAGEMENT**

17 If the consumption of water in hospitals is to be reduced then it must be better managed. The subject must be given a higher profile, better monitoring and targeting systems must be introduced and alternative management arrangements should be considered. These issues are dealt with in turn in the rest of this chapter.

**RAISING THE PROFILE**

**LOW PROFILE AND A LACK OF STRATEGY**

18 In the past, the supply of water in hospitals has been taken for granted. It was easily obtainable, plentiful and cheap. As a result, the amount of water being consumed and its cost were largely ignored. However, the price of water has increased rapidly, particularly since 1989. Despite the rapid increase in costs, managers still do not give the subject sufficient attention. Only one hospital visited during the study had introduced a policy for water and only one hospital produced an annual report on the management of water.

19 As a result of the low profile given to water, the opportunities for reducing the water bills of hospitals have often been lost. Many of these savings can be achieved as a result of good housekeeping and low-cost investment. Indeed, the majority of the steps that can be taken involve investments with paybacks of less than 12 months and could therefore be financed from revenue expenditure.

**LACK OF STAFF AWARENESS**

20 Not only has management ignored the importance of water resources, staff at all levels in the hospital take the supply of water from a tap for granted. They are generally not aware that the supply of water is metered and that hospitals have to pay for the amount of water used (Box A).

*Box A*

**STAFF AWARENESS SURVEY**

Only 3% of staff in a group of hospitals visited in the Midlands were aware that hospitals were metered for water and therefore that the cost of water was based on the amount consumed. During the interviews staff commented:

— 'I thought hospitals paid rates like everybody else.'

— 'Water does not cost much.'

*Exhibit 8*

**A TURN FOR THE BETTER**

Staff awareness campaigns help get across the message.
A turn for the better

Water is a precious, costly commodity. Why waste it?

Source: South Glamorgan Health Authority
RAISING THE PROFILE

21 Managers need to give a higher profile to water (and associated sewerage costs) which apart from electricity is the fastest growing utility cost in the NHS. It now represents about 25% of the cost of energy. Some hospitals have conducted staff awareness campaigns to get across the message that reducing water consumption saves money that can be used for patient care (Exhibit 8).

22 South Glamorgan Health Authority which uses 2.4 million litres of potable water each day at a cost of £700,000 per annum has produced publicity material which identifies simple measures that staff can take to avoid wasting water, such as reminding staff to report dripping taps. Portsmouth and South East Hampshire Health Authority has produced a video Together We Can Save It on how to save water and energy costs which can be shown to staff on induction and other courses.

A STRATEGY FOR WATER

23 An essential first step towards good practice is to adopt a policy for water management. Hospitals should also prepare an annual report on the management of water which identifies objectives and achievements. South Devon Healthcare Trust has adopted a water utilisation policy which aims to reduce the wastage of water to a minimum. One of the principles applied to all new building works and upgradings is that services and equipment which minimise the use of water shall be used. It also requires consumption of water to be monitored every month and variations in consumption to be investigated promptly. An independent company is used to carry out logging of larger sites for one week once a year to provide flow profiles to aid future planning, meter sizing and assessing distribution losses.

BETTER MONITORING AND TARGETING

24 The Commission found that there were three main problems which were inhibiting hospitals from monitoring the consumption of water:

(a) Failure to check water bills;

(b) lack of information about water consumption;

(c) No yardsticks against which performance could be measured.

(a) CHECKING THE BILL

25 Many hospitals suffer from what has been described as 'the act of God' syndrome. The water bill arrives and it is paid. There is nothing that can be done about it. However, the Energy Efficiency Yearbook 1992 reported that energy consultants ‘still find more mistakes in bills from water companies than any other utility’. This was confirmed by the Audit Commission study which found that some water companies are more accurate than others in charging for water. At one health authority, errors totalling £155,000 were identified over a four year period. These errors included incorrect meter readings, duplicate accounts and charges for properties not owned by the authority.

26 Hospitals need to be much more proactive in reducing their water bills. They should begin by checking their bills more carefully. There are opportunities to reduce standing charges; to adjust the tariff on sewerage charges; to apply for a different tariff structure on some effluent discharges; storm water charges may also be avoided. Where management is not satisfied, complaints should be taken to the relevant CSC of OFWAT. Hospitals should also explore opportunities for obtaining alternative supplies of water.
Standing Charges

27 Standing charges for water and sewerage are often higher than necessary because the sizes of meters are larger than they need be. NHS Supplies Authority has collected data on water consumption and related costs from ten health authorities in one Region. Data were obtained from a diverse collection of health premises ranging from small residences to hospital sites. This was a very time consuming task as data were not readily available. NHS Supplies Authority concluded that savings in excess of £100,000 per annum could be made by reducing standing charges in the Region. The Audit Commission study team also found that standing charges were not being reviewed and that data were not being routinely collected to enable charges to be monitored.

28 Broken meters can also lead to overcharging. Several examples of overcharging by water companies were found where the water meter was broken; estimates of use were made which were not always accurate and were often found to be an over estimate when previous consumption patterns were examined.

29 Hospitals should ensure that data on the number, location and size of water meters in health premises are maintained. These data should be reviewed to ensure that costs are appropriate and that standing charges are kept to a minimum.

30 Standing charges can often be decreased by the size of meters which are often larger than they need to be. 33% of the meters in Norwich Health Authority have or are being changed thereby reducing the standing charges by 34% or over £7,000 per annum. However, assessing appropriate meter sizes is not a simple mathematical calculation. The size of meters must accommodate not only the average flow rate of water but the peak demand which often occurs in midmorning and is frequently very much higher than the average flow rate. The needs of fire fighting should also be recognised but should not preclude the opportunities for obtaining savings from the tariff structures. The Audit Commission has developed a methodology whereby the appropriate size of meter can be calculated in accordance with peak demand. Details are included in an Audit Guide on water management which will be published by the Audit Commission.

The Appropriate Tariff

31 Water and sewerage companies categorise discharge to drain as either domestic, non-domestic or trade effluent. Although hospitals have always been classified as domestic customers, parts of the hospital site such as the laundry could be reclassified as trade effluent. There was no consistency of approach by the water companies. Private laundries are readily granted trade effluent status and private laundries located on NHS premises have also been classified as trade. Some water companies would not negotiate with health authorities and the largest NHS laundry is classified as domestic. At least three NHS laundries have achieved trade effluent status and savings of £177,000 per annum have been achieved. However, these laundries were the exception rather than the rule. Several hospitals were advised by the study team of this possible economy, and savings have already been achieved as a result. Much depends on management being aware of the opportunities for obtaining a reduction in the tariff and the vigour with which negotiations are pursued.

32 Charges for sewage on the trade effluent tariff depend on the composition of the effluent put down the drain. Hospitals should therefore take the opportunities for reducing the trade effluent charge by modifying the composition of the discharge for example by changing the amount and/or type of detergent used.

Metered Supplies

33 There are still some healthcare premises that do not have a metered supply of water. For some sites, a change to payment of water by volume would reduce the cost of water and this should be done in these cases.
Rebates not Obtained

Although water is metered into a hospital site, sewage is not usually metered out. Hospitals are classified as 'Domestic' users and charges for sewerage are levied by the water companies. These are based on a standing charge, depending on the size of the incoming water meter and the volume of water consumed, less in many cases a negotiated allowance for water that is not returned to sewer. This allowance made by the water companies varies from 0% to 30% and at some hospitals bears little relation to the actual level of evaporation. The Government's Consultation Paper Using Water Wisely suggests that of the water used in households, commerce and service industries, about 95% is returned to sewers. Typically hospitals have a higher than average rate of evaporation due to processes in laundries and kitchens, the operation of steam boilers, surface loss from swimming and hydrotherapy pools and humidification. They should therefore assess the evaporation loss and then where appropriate negotiate a rebate with the relevant water company. Many hospitals have failed to do this and some receive no rebate at all for evaporation. In certain cases this is due to a failure to negotiate and in others a refusal of certain water companies to allow such a rebate.

USE OF STORM WATER

One water company (Severn Trent) has identified the surface drainage charge separately; hospitals have to pay sewerage charges on all storm water that goes to drain. Other companies include the cost of processing storm water in the overall charge. This may be avoided by using storm water for watering gardens or by putting it into controlled waters (after appropriate licensing). In the future some hospitals may be able to recycle this water. Most hospitals visited during the study were not aware that they were paying a storm water charge and therefore were not considering alternative ways of disposing of the storm water.

INFRASTRUCTURE CHARGES

Hospitals should be aware that infrastructure charges will be levied on any new developments or major extensions and should budget accordingly. Examples were found where this change was not fairly applied and hospitals should therefore examine these changes critically and refer any matters of dispute to the relevant CSC.

OPPORTUNITIES FOR SUPPLY FROM NEIGHBOURING WATER AUTHORITIES

There is a considerable variation in the charges levied by the major water companies in England and Wales. In 1992, these varied from 58 pence per cubic metre in Wessex to 41 pence in the Thames region. When the smaller companies are included the variation is even greater. There is a range of more than 3:1 in sewage charges by the major water companies is even greater. There is also a range of more than 3:1 in sewerage charges applied by the companies (Exhibit 9).

Exhibit 9
COMPARISON OF WATER AND SEWAGE CHARGES 1992

Source: Water Companies
38 The majority of hospitals do not have a choice of supplier for water. The Director General of OFWAT has a duty to use his powers to increase the scope for competition in the water industry. Large users of water (currently defined as using, or expecting to use, more than 250 megalitres a year) can now 'shop around' to obtain a cheaper supply of water other than their existing supplier. These arrangements to replace the existing supplier by another are known as 'inset appointments'. They can only be made by the Director in response to an application and after public consultation. Only the largest hospitals are likely to benefit from these arrangements but the Audit Commission study found no evidence that any of the hospitals visited had taken steps to obtain water from another water company.

39 OFWAT has received few complaints from hospitals who are generally unaware of their procedures for settling disputes. OFWAT cannot respond unless complaints are made. Hospitals have many concerns about aspects of tariffs such as trade effluent status, return to sewer allowance and standing charges for meters. Health authorities should pursue matters of dispute with the relevant customer service committee. The Director General of OFWAT has legal powers to arbitrate in many types of disputes between customers and water companies.

(b) OBTAINING INFORMATION ABOUT WATER CONSUMPTION

40 Managers need good information if they are to make the best use of the resources that are available to them. Accurate information on water consumption in hospitals needs to be collected if this increasingly expensive resource is to be better managed. This can be collected in two ways:-

— Using a Building Management System (BMS); and,

— Manually.

Building Management Systems

41 Although some hospitals visited had some form of monitoring and targeting systems, only one hospital visited in England and Wales monitored water consumption using a building management system. The overall picture was patchy and most hospitals were unaware of the base load demand for water.

42 For monitoring to be effective, there needs to be much more extensive sub-metering in order to determine the amount of water used by major departments. Whereas it is common for a hospital laundry to be separately metered, few hospitals were aware of the amount of water used in major departments such as Sterile Services, Catering Departments and Manufacturing Pharmacies.

43 A major acute hospital in Germany with 1300 beds used a building management system to monitor and control the use of water. There was extensive use of sub-metering with more than 25 groups of wards and departments linked to a real time BMS in the central control room. Individual departments were charged for the use of water and direct incentives for reducing the consumption of water were thus created.

44 The Audit Commission's Occasional Paper Saving Energy in the NHS recommended the effective use of building management systems as one of the solutions to the problems of energy management. Building management systems are used to supervise and control the technical installations in hospitals such as heating, ventilation, air conditioning plant and (in some instances) lighting and process steam to laundries. They can be linked to meters in order to monitor the consumption of a utility including water. This has been implemented at Queen Alexandra Hospital in Portsmouth which is now producing regular reports of water consumption in graphical format.
As well as monitoring the consumption of water, there are additional benefits of using a building management system. At one hospital, the BMS was used to perform two other important functions related to water management:

—Monitoring of the temperature of the cold water in the storage tanks, and;

—Monitoring the level of the cold water in the storage tanks.

The Department of Health Code of Practice on legionella preventative measures recommends that stored water is kept below 20 degrees C to minimise the risk of legionella propagation. The BMS was used at this hospital to monitor compliance with the legionella regulations and to exercise corrective action when necessary.

**Manual Systems**

Where a building management system is not being used to monitor water consumption, meters should be read regularly. At the James Paget Hospital in Great Yarmouth (a hospital in the upper quartile of performance), manual meter readings of water consumption have been taken each week since the hospital was commissioned in 1980. The readings are verified, compared with similar periods and any abnormal consumption investigated. This has resulted in minimal loss of water due to leaks and a saving of unnecessary expenditure on water and sewerage charges.

It is important in monitoring the use of water in hospitals not only to identify sudden increases in consumption but also to establish that the underlying base consumption is correct. One way that this can be done is to monitor the consumption of water in a hospital in the early hours of the morning when demand for water is minimal. A high level of consumption of water at night indicates either a leak or wastage. This can be identified by preparing a water demand profile, (see paragraphs 73ff). At one hospital, monitoring the use of water consumption at night led to the discovery that staff were doing personal washing in the ward washing machine which had been provided by the League of Friends. This practice was stopped immediately.

**(c) USING YARDSTICKS**

Hospitals had no means of comparing their consumption of water with what it ought to be. Fortuitously, two hospitals in one city were of a similar size and bed occupancy. When the management arrangements for the two hospitals were changed, the consumption of water of the two sites was compared for the first time which revealed that one hospital used twice as much water as the other. The reason was soon identified as leakage of water which over a period of five years had cost the health authority £500,000 in water and sewage charges.

The Audit Commission has developed yardsticks of performance of water consumption based on data collected at 300 hospitals during the study (Exhibit 10). They provide a monitoring tool whereby hospitals can compare their performance with other similar hospitals. The three hospital categories (see Glossary) use most of the water consumed in the NHS. There was a strong correlation between hospitals that were in the upper quartile of performance and good management practices at those hospitals.

Laundries are significant users of water but the supply of water to a hospital laundry is usually separately metered. Performance indicators for hospital laundries have also been developed and are included in the Audit Guide.

**ALTERNATIVE MANAGEMENT ARRANGEMENTS**

The study has shown that the expertise of hospital engineers with regard to the management of water was very variable. Where the subject was regarded with some importance the problems were more likely to be identified. But in many hospitals, there was a lack of expertise and a failure to invest in the necessary equipment.
The management of water supplies in hospitals has traditionally been a function of the District Health Authority estates department. The Audit Commission's Occasional Paper Saving Energy in the NHS recognised that alternative management models would be needed as more hospitals and units became NHS Trusts and DHAs relinquish their provider responsibilities. Whilst in many hospitals in-house staff will continue to manage water and energy, other hospitals will use a variety of means including:

— buying in expertise from the private sector;
— consortium arrangements with neighbouring units;
— partnership and profit sharing arrangements for the entire estate management function;
— management buyouts.

Whatever model is employed it is important that responsibility for the management of water is clearly identified.

**Exhibit 10**

**YARDSTICKS OF PERFORMANCE**

Yardsticks of performance have been calculated by the Audit Commission

| Acute hospitals with more than 100 beds |
| Litres per patient bed- | = |
| per 711-1137 | Very poor |
| <520 | Poor |
| >1138 | Good |

| Long stay hospitals with more than 25,000 patient days per annum |
| Litres per patient bed-day | = |
| per 412-689 | Very poor |
| 331-411 | Poor |
| <330 | Average |
| >690 | Good |

| Long stay hospitals with less than 25,000 patient days per annum |
| Litres per patient bed-day | = |
| per 218-397 | Very poor |
| 218-297 | Poor |
| <217 | Average |
| >380 | Good |

**Source:** Audit Commission

**USE OF CONSULTANTS**

An audit of water by consultants can often produce significant savings. During the study a joint project was carried out by the Audit Commission and North East Thames Regional Health Authority to examine the opportunities for reducing the use and cost of water and sewerage at 4 hospitals in North East Thames Region. A firm of water consultants was employed and they identified a number of the opportunities for savings at the four hospitals which are similar to those included in this report. The use of consultants is particularly relevant in areas where specialist expertise is required.
2. IMPROVED USE OF TECHNOLOGY

FINDING ALTERNATIVE SUPPLIES

54 There are a number of opportunities for hospitals to obtain water from alternative sources of supply. These include greater use of boreholes, springs and water falling on to hospital roofs. The reason for obtaining water from these sources is a substantial reduction in cost.

BOREHOLES

55 Boreholes can be drilled in the ground to underground rock strata that contain water and are known as aquifers. Water is extracted at various depths, usually in the range from 20 to 200 metres. An electrically driven submersible pump is used to raise the water to the surface where it is usually transferred into a holding tank and then onwards to the point of use. Although boreholes are in use in the NHS particularly for functions that do not require potable water much more water could be obtained from this source.

56 Water companies obtain a significant amount of water from boreholes and some 80% of drinking water in the South East comes from underground supplies. Industry, brewers and farmers also use underground supplies of water and there is therefore a concentration of boreholes in industrial and farming areas of the country as well as the South East. A number of examples of hospitals using alternative supplies of water has already been identified but there is considerable scope for extending these opportunities throughout the NHS.

57 The National Rivers Authority has a responsibility to manage water resources and protect their long-term future by controlling abstraction rates. Since 1 April 1991, any NHS site at which abstraction from an inland or ground water source is undertaken must be licensed to do so (section 60 of the National Health Service and Community Care Act 1990). Water abstraction licences are granted by the NRA who have a duty to ensure that new licences do not adversely affect the water environment.

58 Hospitals do not receive priority of treatment and where there are potential opportunities for obtaining water from boreholes, hospitals should as a first step register their interest with the NRA. They should always consult the NRA to determine the potential viability of any scheme before engaging consultants.

59 A borehole was sunk on the West Norwich Hospital site. The nitrate level recorded at the borehole was marginally higher than that found in the mains supply and the water has been used only for non potable purposes including the hospital laundry. At the nearby Norfolk and Norwich Hospital where there was a similar nitrate level, most of the site had a separate drinking water distribution system. A borehole was sunk and now supplies 80% of the total water whilst the drinking water supply remains connected to the mains. The combined savings from these recent boreholes is running at over £170,000 per annum.

60 The use of water from boreholes is sometimes constrained by the need to ensure that the extraction rate of water from the aquifer does not exceed that which can be met by the replenishment rate. At Nottingham City Hospital laundry, which is one of the largest in Europe, this problem has been overcome by blending mains water with water obtained from a borehole. This scheme thus maximises the use of the limited supply of the cheaper water from the borehole.

SPRINGS

61 The potential for obtaining water from springs is dependent on geological factors such as the underlying rock formations. Most hospitals have not explored the possibility of using water from this source, and during the study only one example was found where this had been done.
A scheme to pipe water 7 miles from a spring to a hospital cost £6,000 in 1897. The only other cost has been the abstraction charges which have been levied for the last two years by the NRA. After the payback of the original investment, the hospital has received 'free water' which would have cost £3 million at current prices.

WATER FROM ROOFS

Rainwater that falls on hospital roofs together with most of the water put into the supply system, other than that which is lost through leakage, is returned to the sewage system. Hospitals have not taken advantage of the opportunities for re-using water from roofs for use in laundries, toilet and urinal flushing and watering grounds and gardens. However, this requires investment which is appropriate at the design stage of new buildings or major upgradings.

ELIMINATING LEAKS

The Government's Consultation Paper Using Water Wisely draws attention to the fact that almost a quarter of the water put into supply by water companies never reaches the customer. The average loss in distribution in England and Wales is estimated to be around 25% and from 15 to 38% in respect of individual companies. These losses occur through leakages from mains and service reservoirs and in the distribution systems. A substantial amount of the loss occurs in customers' pipes, and hospitals are no exception.

The water distribution system serving a typical district general hospital involves an extensive network of pipes leading from the incoming main of perhaps 150mm or 200mm diameter and ending with 15-mm branches serving wash-hand basins, toilets and showers. The water main becomes the responsibility of the hospital it serves at the main supply meter or meters and all leaks that occur after that point incur costs to the hospital for both water and sewerage charges.

TOO MANY LEAKS

The majority of hospital sites are served by water mains that are buried underground rather than being laid in ducts. This makes the detection of leaks far more difficult than if the mains could be visually inspected within the duct.

Leaks will manifest themselves more quickly in clay soils or other impervious layers but may go undetected in porous ground conditions. Leaks can cause severe damage to the fabric and foundations of hospital buildings. In one case, the front end of a delivery vehicle disappeared into a hole in the road caused by the erosion of the soil due to a major leak. Such occurrences not only give the public a poor impression of the hospital but cause disruption to service delivery. Leaks also occur due to poor standards of maintenance of plant and equipment such as pumps, valves and flanged fit-rings. It is important not to neglect carrying out the planned preventative maintenance and inspection programmes of plant and services related to water systems.

The Audit Commission estimated that leaks in many of the hospitals visited were typically in the range of 15-30%. Some hospitals had no significant leaks (under 10%), whereas others had leaks of up to 50% of consumption. Whilst it is recognised that leaks will never be entirely eliminated they can be considerably reduced with potential savings in many district general hospitals of the order of £15,000 per annum recurring.

REDUCING LEAKS

Under both the Water Bylaws and the Water Industry Act 1991, it is the customer's responsibility to ensure that water is not being wasted. It is not only environmentally responsible to reduce the amount of water wasted through leaks, it is also cost effective. But before leaks can be stopped they must first be identified. Whilst hospitals should aim to reduce leaks to a minimum a balance needs to be struck between the cost of identifying leaks and the reduction in water and sewerage charges arising from their elimination.
Hospitals have leaks in the pipe infrastructure that have been present for many years but also leaks that are of more recent origin. Long term leaks can be more readily identified by the use of performance indicators and comparison of consumption with other similar hospitals. Monitoring consumption on a regular basis will help to identify new leaks as they occur. It is important to remember that leaks cost the hospital money from the minute they occur. This involves both water and sewerage charges so that the unnecessary expenditure is about twice the cost of the lost water. Some leaks can be detected by visual inspection but the full range of detection methods needs to be employed (Exhibit 11).

**Exhibit 11**
**FINDING LEAKS**
The full range of detection methods should be employed

<table>
<thead>
<tr>
<th>Cartoon drawing Here</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Monitoring consumption</td>
</tr>
<tr>
<td>- Use of performance indicators</td>
</tr>
<tr>
<td>- Visual inspection</td>
</tr>
</tbody>
</table>

*Source: Audit Commission*

Meter readings should be compared with corresponding periods in the previous year, (Exhibit 12). Increases in consumption that are not related to a change in patient activity should be investigated because they may indicate a leak.

**USE OF PERFORMANCE INDICATORS**

The performance indicators developed by the Audit Commission (see paragraph 49) are one of the means that can be used to identify significant, unexplained consumption patterns that may be caused by long term leaks.
Exhibit 12
MAJOR LEAKS IN HOSPITALS
Leaks can be identified by monitoring consumption

Source: Audit Commission
WATER DEMAND PROFILES

73 A water demand profile traces the consumption of water over a period of time. Where the profile indicates a higher than expected consumption of water at night the most common cause is a leak. The techniques required to prepare water demand profiles using a data logger are not commonly available in the NHS and specialist consultants would normally be used.

74 The water supplied to one hospital in Wales passed through two main meters. Consumption was monitored and water demand profiles prepared. This showed the constant baseload of water measured by one meter was 74% whereas on the other meter it was only 19% (Exhibit 13). The water demand profile relating to the second meter (meter B) shows the high constant flow of water throughout the night and further investigation revealed that the cause was a major leak.

REDUCING CONSUMPTION

75 The major impact upon water costs will be achieved by water consumption, so this section is of great importance, but it is also important that reducing consumption does not cause other problems or reduce hygiene standards.

76 With the exception of laundries, budgets for water are not devolved to individual wards and departments in hospitals. There is therefore little incentive for them to reduce their consumption of water. During brief visits to various hospitals, many examples where water was being wasted were identified (Exhibit 14). These examples give an indication of the sums that can be saved if more attention was given to saving water.

TOILETS

77 29% of the water used in hospitals is for flushing WCs and urinals. In the hospitals visited in the study, it was common to find urinal flush controls wrongly set, and as a result they were flushing far more frequently than necessary. To give an indication of the cost, a urinal in an accident and emergency department toilet had been inappropriately fitted with a lever operated ball valve which had been left fully open. The flow rate was measured at 9 litres per minute which was costing the hospital £110 per week in unnecessary water and sewage charges just for this one urinal. This was not untypical and the average district general hospital has between 15 and 30 urinals.

Exhibit 13
WATER DEMAND PROFILES
High water consumption of Meter B at night indicated a major leak

Source: Audit Commission
WATER WASTAGE

Water is wasted in many ways

- Taps left running
- Dripping Taps
- Urinals flushing too frequently
- The use of cooling water when equipment was not in use
- Humidifiers on air conditioning plant running to drain in an uncontrolled manner
- Excessive boiler blowdown
- Excessive regeneration of water softening plant
- Hydrotherapy pools being drained more frequently than necessary
- Cistern and storage tank overflows to running drain
- Defrosting frozen food by means of running water
- Excessive water used to flush chemicals to drain in labs

*Source: Audit Commission*

78 Normally, urinals are set to flush every fifteen to twenty minutes. But urinals can be controlled in a more cost effective way by installing an automatic flush control system. The University Hospital of Wales in Cardiff introduced automatically controlled flushing cisterns in the gentlemen's' washrooms with a saving of over £20,000 per annum. The pay-back for this scheme was just six months.

79 Toilet cisterns in hospitals in England and Wales deliver a flush of nine to fourteen litres. Where such cisterns are replaced without replacing the WC pan at the same time, a cistern of similar capacity may be installed. However, the new water bye-laws introduced in 1993 require a new single-flush toilet system installed at the same time as a WC pan to deliver no more than 7.5 litres per flush. Research suggests that there is scope for further reducing the amount of water used for flushing toilets. Old toilets can be replaced with modern low-flush (six litre) models. Adjustment of the ball valve can save at least a litre of water at each flush. The introduction of a WC dam into a cistern can save up to 40% of the volume of each flush.

80 Cistern dams were installed at Torbay District Hospital with a payback of 8 months. A 40% reduction in the volume of water in each flush was achieved. It must be recognised that the amount of water required to clear a WC pan is closely related to the design of the pan and certain problems can occur with measures to reduce the volume of water used in flushing toilets. Potential savings can be eliminated if the first flush volume is inadequate to clear the pan and repeat flushings are made.
BATHS AND SHOWERS

81 Taking a bath uses nearly 3 times the amount of water compared with taking a shower. There is considerable scope, particularly in staff residences, but also where wards are being renovated or newly built, to reduce the number of baths and increase the provision of showers.

TAPS

82 Staff awareness campaigns should draw attention to the cost of leaving taps running unnecessarily. Leaving a tap running at full flow costs about £4 per hour for each tap. At one district general hospital tap restrictors were fitted to over 2,500 hot and cold taps thus reducing the flow of water from 20-25 litres to 12 litres per minute. The payback on this scheme was ten months. Consideration should also be given to the use of percussion taps in appropriate circumstances. Percussion taps deliver water for a given predetermined period (typically 10 seconds) and help to avoid the waste of water when taps are inadvertently left running. The use of taps activated by infra red sensors is common in many West European countries and were not found in any hospitals visited during the study.

HIGH WATER PRESSURE

83 Water is normally supplied to hospital sites at a pressure 3-4 bar. This pressure is sufficient for water to be raised to the top of a three storey building and still have enough pressure remaining to flow through outlets at a good rate. Where it is required to supply water to a higher building, it is normal to increase the supply pressure in the hospital by the use of a booster pump set. At one hospital, the pressure was at least three times higher than normal. This resulted in any leaks on the hospital site being far greater than would normally be the case. An example of the effects of this at one site was the cooling water supplied to the autoclaves which was three times the manufacturer's flow rate costing an extra £3,500 per annum. Such high pressure can also cause damage to fittings and equipment.

HUMIDIFIERS

84 Several types of humidifiers installed in air conditioning plant use mains cold water to form an aerosol that mixes with the incoming air to raise the relative humidity to provide comfort conditions. Spinning disc humidifiers which are commonly used in hospitals comprise an electrically driven disc into which water is admitted via a control valve. The centrifugal action of the spinning disc causes a fine aerosol to be produced which humidifies the air. At one hospital the motors were not functioning correctly and as a result no humidification was taking place and water was running to drain in an uncontrolled manner. This was costing £2,800 per annum.

HYDROTHERAPY POOLS

85 The frequency with which hydrotherapy pools are drained varied from once a fortnight to annually. Hospitals that drained the pools very frequently had not considered either the necessity or the costs of this action. A proper evaluation of the frequency of draining hydrotherapy pools needs to be undertaken and policies adopted. Hydrotherapy pools can be fitted with covers to prevent evaporation but it is essential that regular microbiological monitoring is undertaken to guard against harmful organic growth.
WATERING GROUNDS AND GARDENS

86 Watering hospital grounds and gardens consumes 900 litres of water an hour for each sprinkler. Few hospitals had considered the extent to which grounds should be watered or the type of plants grown. Potable water was generally used for watering gardens rather than non-potable alternative supplies.

87 At two hospitals water costing £7,500 per annum was being supplied to ornamental ponds in an uncontrolled way. The water was then running to drain continually. One pond contained fish but the aeration unit had failed some years previously and had not been repaired or replaced. The second pond contained no fish.

CLEANING VEHICLES

88 At one hospital, vehicles were cleaned every day, and no consideration had been given to the cost of this process or to formulating a policy for the efficient use of water.

RECYCLING WATER

89 The Building Services Research Information Association (BSRIA) is currently carrying out research on the feasibility of recycling water and has concluded that it is likely to be an economic possibility for larger users of water. This was confirmed by the Audit Commission study which found a number of opportunities for hospitals to reuse or recycle water. Recycling hot water also has the added financial incentive of recovering energy.

90 Cooling water supplying the condensers in the stills in a hospital pharmacy had been running to drain for two and a half years even though the stills had been taken out of use. This cost the hospital £15,000.

91 At Torbay Hospital a scheme to recycle water from a pharmacy still was installed. The distillation process involves passing steam through a heat exchanger. The cooling medium is mains cold water which gains heat as it passes through a condenser and which would normally then run to drain. This water is now recycled and heat energy is recovered. Further details of this scheme are included in the Audit Guide. Savings of £87,500 have been made since this scheme began thirteen years ago.

92 A visit to a private sector laundry identified double recycling of water in the washer extractors. This practice not only saved the cost of the water and effluent but also heat energy was recovered. This practice which has been promulgated by ETSU (Energy Technology Support Unit of the Department of Trade and Industry) could be extended to hospital laundries with the exception of foul wash.
3. ENVIRONMENTAL AWARENESS

In September 1990, the Government published a White Paper entitled *This Common Inheritance: Britain's Environmental Strategy*, in which were set out the principles and objectives underlying Government policy for improving the environment within the UK. The Government undertook to ensure better use of resources in the Government estate and the rest of the public sector. The NHS has its part to play in fulfilling this commitment. It also has a responsibility to protect the public health by reducing the impact of its own activities on the environment.

The Water Act 1989 marked the beginning of a series of regulatory and statutory instruments governing the use and the protection of water resources and in 1991, the NHS lost Crown Immunity on water and sewage. The study examined the hazardous substances put to drain within the NHS. This approach was chosen as a measure of the response to the loss of Crown Immunity.

Some hospitals visited did not display an adequate or comprehensive understanding of their responsibilities to comply with environmental legislation. It was rare to find a policy towards discharges to drain covering the entire hospital site. Consequently, there was a lack of overall management of these discharges. Hospitals should give priority to the development of a strategy for dealing with this problem. This paper identifies the departments which are potential sources of pollution in hospital sites (Exhibit 5). It is essential that these departmental managers collaborate to exchange information and provide an assurance to senior management that the hospital is complying with the relevant legislation. At one hospital visited there was an annual meeting of managers to co-ordinate the hospital's approach to the management of effluent.

50% in some way had not met statutory or regulatory obligations in respect of the discharge of certain substances to drain or to controlled waters (Exhibit 15, overleaf).

A range of staff interviewed typically said:

'... It is not worth worrying about...'?

'...Effluent is too dilute to do any damage...'

But many of the hospital staff interviewed were not even aware of which substances were being put to drain. At only one health authority was significant coverage given to the disposal of substances to drain within the waste disposal policy. The policy includes a list of chemicals that can be discharged to drain, and guidance is given on appropriate disposal methods for those that cannot. This work had arisen from the implementation of the Control of Substances Hazardous to Health Regulations (COSHH) 1989.

What then should the NHS do to fulfil its responsibilities as a steward of the environment? This Common Inheritance sets out the key principles for sound environmental management:
### Discharge to ‘controlled’ waters:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Site of Pollution</th>
<th>Act/Regulation</th>
<th>Outcome of incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>2 local brooks</td>
<td>Water Resources Act 1991</td>
<td>Fine</td>
</tr>
<tr>
<td>Disinfectant</td>
<td>Local stream</td>
<td>Water Resources Act 1991</td>
<td>Warning</td>
</tr>
<tr>
<td>Cooking Oil</td>
<td>Local stream</td>
<td>Water Resources Act 1991</td>
<td>Warning</td>
</tr>
</tbody>
</table>

### Discharge to sewer:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Act/Regulation/Guidance</th>
<th>Outcome of incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury and sewerage co.</td>
<td>Water Industry Act 1991</td>
<td>Warning from water</td>
</tr>
<tr>
<td>at hospital.</td>
<td></td>
<td>Change in practice</td>
</tr>
<tr>
<td>Solvents by</td>
<td>Water Industry Act 1991</td>
<td>Practice undetected</td>
</tr>
<tr>
<td></td>
<td>Control of substances</td>
<td>relevant authorities</td>
</tr>
<tr>
<td></td>
<td>Hazardous to Health Regulations 1989</td>
<td></td>
</tr>
<tr>
<td>Tissue: Human by</td>
<td>DoE Waste Management</td>
<td>Practice undetected</td>
</tr>
<tr>
<td></td>
<td>Paper No. 25</td>
<td>relevant authorities</td>
</tr>
<tr>
<td></td>
<td>Health and Safety Commission Guidance on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clinical Waste</td>
<td></td>
</tr>
</tbody>
</table>

Source: Audit Commission

— basing any policy on the best evidence and analysis available;

— assessing the environmental risks involved and taking precautionary action when appropriate.

The Audit Commission carried out a joint study, with the health authority, of discharges to drain at the University Hospital of Wales, Cardiff, (see Box B). The results showed that the effluent discharge from the hospital was within the limits set by Welsh Water for both trade and domestic sewage. However, when the EC Urban Waste Water Directive comes into force by 2005, the hospital will almost certainly have to comply with lower limits. The University Hospital of Wales will be ideally placed to alter its disposal methods to comply with lower limits because it now has a wealth of information on which to base its policies and environmental management practices.

99 The NHS should base control of any potentially polluting processes or practices on the best information available. Another principle espoused in This Common Inheritance, and one well known to any healthcare worker is: Prevention is better than cure. Prevention can also be cheaper than cure, whereby action taken to change, or in most cases institute, appropriate management practices may avoid more costly end-of-pipe solutions taken in response to damage caused. This strategy also reduces the risk of prosecution.
Hospitals should:

(a) audit the discharge of substances to drain;

(b) test the effluent discharge according to criteria used by the water and sewerage companies;

(c) manage the discharge to drain based on the information gained under steps (a) and (b).

This process can be enhanced by educating hospital workers about the reasons for managing the discharge of substances to drain.

A tool that can be used to aid in the identification of those departments on a hospital site that may need to increase the level of management of their discharge is the environmental performance assessment in the Audit Guide. This performance assessment has been devised specifically for application in the healthcare environment and will enable managers to focus on the sources of discharges that may be causing a problem.

4. THE WAY FORWARD

Over the next year, the Commission's auditors will be reviewing in NHS hospitals in England and Wales the management issues outlined in this report. The review will include management arrangements for water, the effectiveness of monitoring and target-ing systems, the ways in which technology can be harnessed to reduce water consumption and the extent to which hospitals manage the discharge of substances to drain. The audits will for the first time provide data on the consumption of water in hospitals which can be compared to yardsticks of performance. The local audit reports will set out for hospital managers where and how savings can be achieved.

Box B
AN ENVIRONMENTAL AUDIT

The University Hospital of Wales is a large teaching hospital with over 900 acute beds and an outpatient attendance of over 6,000 patients per week. The campus is shared with the University of Wales College of Medicine. Apart from routine diagnostic pathology laboratories, there are over 120 research laboratories on site. The combined number of staff on site is about 4,000.

To determine what was discharged to drain, an audit was conducted for 8 weeks during July and August 1992, from Monday to Friday. A disposal audit sheet was sent to all departments on campus and every potential disposal location was audited for one week. Records were kept of the substance discharged, its chemical/physical state, the amount discharged and the amount of water used to flush the substance to drain. It was found that up to 237 substances were discharged to drain daily, varying in amount from less than 1 ml up to 90 litres.

These results represent valuable baseline data on which to establish future disposal policies. Since the audit, the hospital's waste disposal policy has been further modified to take account of certain disposal practices that may not be the most appropriate. These data, however, are also useful in the assessment of environmental risk, the second key principle for good environmental management.

However, these data are given greater value in the assessment of environmental risk when examined in conjunction with the results of effluent testing. As a complementary exercise to the audit, the effluent discharge at the main sewer outfall of the University Hospital of Wales was analysed by the City of Cardiff Environmental Services. Two samples a day (one mid-morning and the other mid-afternoon) were taken on four days during September 1992. The contents were
analysed for pH value, biological oxygen demand, chemical oxygen demand, suspended solids and flash point

GREATER ATTENTION TO THE SUBJECT

However, if the increasing consumption and cost of water in the NHS is to be contained then greater attention needs to be given to the subject. Managers need to give a much higher profile to the management of this utility. Hospitals must adopt policies for water which include specific consumption targets and which set strategies as to how they can be achieved. The responsibility for the management of water and sewerage in each hospital must be clearly identified. Priority should be given to investment in water saving measures because as this Paper demonstrates the pay back is either immediate or in most other cases less than one year.

EVERYONE MUST RESPOND

Managers cannot achieve the savings by themselves. All staff can make a contribution. Most people are more conscious of the needs of the environment but do not always know how to put this heightened awareness into practice. This Paper shows how it can be done and points to many hospitals who have already made significant progress. Staff in all departments can be more aware of the ways in which they can save water. Reducing the consumption of water in hospitals not only protects the environment but has the happy coincidence of saving substantial sums of money for patient care.
GLOSSARY OF TERMS

Acute Hospital
Hospitals providing acute and partly acute services, including teaching hospitals.

Baseload
That element of consumption that is present 24 hours a day.

Calorifier
A method of heating Water using steam or high temperature pressurised water, usually supplied from a centralised source.

Condenser
An apparatus used in the process of reducing steam to water.

Controlled Waters coastal
Includes ground waters, inland freshwaters, estuarine and coastal waters and related territorial waters.

Leak Correlator
A device used to locate leaks in underground pipes.

Long Stay Hospitals
Hospitals providing geriatric, psychiatric, chronic sick and rehabilitation services.

Non-potable
See potable.

Percussion Tap
A tap that is operated by hand pressure.

Potable
In simple terms, drinkable; more specifically, water that conforms to standards set in the Water Supply (Water Quality) Regulations 1989.

Quartile
A statistical measure of the spread or variability of a distribution. Quartiles divide the range into four equal parts.

Radioisotope
An isotope of an element that is radioactive; in this context, radioisotopes are used in diagnostic tests either in the pathology laboratories or on some patients being investigated in the Radiology Department.

Sewage
Waste matter or effluent produced by either domestic or industrial premises that is carried away by sewage.

Sewerage services
Refers to the infrastructure used to carry sewage and the involved in dealing with it.

Tap Restrictor
A device fitted within the body of the tap which restricts the flow of water.

Trade Effluent Status
There are two categories of effluent; that designated as trade is usually that produced during the course of any trade or industry carried out on trade premises.

Water Demand Profile
A graph of water consumption over a given period (usually 24 hours).
WC Dam  A device that is fitted inside a WC cistern to reduce the flushing capacity.

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BARCODE
Table 1
INTERNATIONAL COMPARISON OF COSTS
Water costs are generally lower in the UK than in most countries

Source: Audit Commission
Exhibit 3
USES OF WATER IN A HOSPITAL

More than half of the water is used in washing and toilet facilities.

Source: Audit Committee
A turn for the better

Water is a precious, costly commodity. Why waste it?