PROFITING FROM REDUCING WATER USE:
Running a workshop to stimulate action

GOOD PRACTICE: Proven technology and techniques for profitable environmental improvement
PROFITING FROM REDUCING WATER USE:
Running a workshop to stimulate action

This Good Practice Guide was produced by the Environmental Technology Best Practice Programme

Prepared with assistance from:
Ashact Ltd
This Good Practice Guide is designed for business support and other organisations wishing to run a workshop on water management in the workplace. The workshop is aimed at companies thinking about water use for the first time. It should enable delegates to return to the workplace and take positive action to rethink their water use and implement measures to reduce water use and effluent generation.

The Guide uses knowledge gained from Good Practice Guide (GG152) *Tracking Water Use to Cut Costs*, available free of charge through the Environment and Energy Helpline on freephone 0800 585794 or via the web site (http://www.etbpp.gov.uk). Delegates to the workshop should receive a copy of GG152.

The workshop consists of three presentations and two syndicate exercises. The Guide gives advice on how to run the workshop and contains a Workshop Plan with notes for each slide used during the workshop. These slides are provided as Microsoft® PowerPoint® 97 files on a CD in a pocket in the back cover of the Guide.

Within the Guide you will find a copy of the agenda, delegate handouts, material for the syndicate exercises and material for two post-workshop exercises. These are bound into the Guide as Appendices for you to photocopy for the delegate folders.

The presentations and slides can be used in full or in part, or customised to local needs or the presenter’s requirements with anecdotes and other case study examples. For the workshop to be successful, presenters should be well prepared and understand the business benefits of water management.

Although this Guide aims to tell you all you need to know to run a workshop, further advice and support are available from the Environmental Technology Best Practice Programme through the Environment and Energy Helpline on freephone 0800 585794.
# CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Purpose of this Guide</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Who should use this Guide?</td>
<td>1</td>
</tr>
<tr>
<td>1.3 Workshop objectives</td>
<td>1</td>
</tr>
<tr>
<td>2 Running the workshop</td>
<td>2</td>
</tr>
<tr>
<td>2.1 Workshop structure</td>
<td>2</td>
</tr>
<tr>
<td>2.2 Delegate handouts</td>
<td>2</td>
</tr>
<tr>
<td>2.3 Syndicate groups</td>
<td>3</td>
</tr>
<tr>
<td>2.4 Environmental Technology Best Practice Programme publications</td>
<td>3</td>
</tr>
<tr>
<td>3 Workshop Plan</td>
<td>4</td>
</tr>
<tr>
<td>3.1 Introduction and welcome</td>
<td>4</td>
</tr>
<tr>
<td>3.2 Water uses and why saving water is important</td>
<td>6</td>
</tr>
<tr>
<td>3.3 Syndicate exercise 1 - A small school</td>
<td>13</td>
</tr>
<tr>
<td>3.4 Saving water - practical tips</td>
<td>14</td>
</tr>
<tr>
<td>3.5 Syndicate exercise 2 - A small brewery</td>
<td>19</td>
</tr>
<tr>
<td>3.6 Where do we go from here?</td>
<td>20</td>
</tr>
</tbody>
</table>

**Appendices**

Appendix 1 Workshop agenda 25  
Appendix 2 Slide templates 26  
Appendix 3 Example format for delegate handouts 36  
Appendix 4 Handouts for syndicate exercises 37  
Appendix 5 Feedback questionnaire 52  
Appendix 6 Post-workshop exercises 53
1.1 PURPOSE OF THIS GUIDE

This Good Practice Guide is for people who wish to run a workshop on water management. Other publications in this series are Good Practice Guide (GG106) Cutting Costs by Reducing Waste: Running a workshop to stimulate action and Good Practice Guide (GG174) Profiting from Practical Waste Minimisation: Running a workshop to maintain the momentum. Both of these Guides may prove helpful in organising the administration of this workshop on water management. They are available free of charge through the Environment and Energy Helpline on freephone 0800 585794.

1.2 WHO SHOULD USE THIS GUIDE?

This Guide has been designed for use by business support organisations. Likely users include:

- UK water providers;
- regulatory bodies, eg the Environment Agency and the Scottish Environment Protection Agency;
- local authorities;
- waste minimisation and environmental business clubs;
- other business support organisations.

1.3 WORKSHOP OBJECTIVES

The workshop objectives are to:

- identify water uses and understand why saving water is important;
- outline the benefits of water management based on a water balance approach;
- provide examples of overuse and unnecessary water use;
- provide examples of water saving opportunities;
- provide information on implementing water management schemes in the workplace.

If you need further advice on running the workshop or on any aspect of water management/waste minimisation, please contact the Environment and Energy Helpline on freephone 0800 585794.
2.1 WORKSHOP STRUCTURE

The workshop is planned to last for half a day. A copy of the agenda, with timings for a morning workshop, is given in Appendix 1.

The 73 slides used during the workshop are provided as six Microsoft® PowerPoint® 97 files on a CD in a pocket in the back cover of the Guide. If you do not have access to this software or experience any problems with the files, please contact the Environment and Energy Helpline on freephone 0800 585794. Alternatively, you can use the slides as templates to prepare overhead projection acetates.

The Workshop Plan (see Section 3) gives a list of the slides and the name of the file needed for each presentation. It also contains detailed information on the material covered in each slide - this can be used as background information or used to create speakers’ notes. Appendix 2 contains a reduced version of each slide to help you prepare for the workshop. It is important for the success of the workshop that all presenters are well prepared and understand the business benefits of water management; they do not have to be water management experts. A confident presentation will inspire enthusiasm in the delegates.

The three presentations within the workshop can be used in full or in part. They can also be adapted to local needs or modified with your own anecdotes and case study examples to make it more interesting for your particular audience. The three presentations can be given by the same speaker or by different speakers.

Extra people will be needed to act as facilitators for the syndicate exercises (see Section 2.3). They also need to be well prepared and familiar with the workshop material - especially the calculations involved in these exercises. The answers are given in the notes for facilitators in Appendix 4.

The information required to organise a workshop including a co-ordinator’s checklist, workshop checklist, a sample invitation letter and advice about the venue are outlined in Good Practice Guide (GG106) Cutting Costs by Reducing Waste: Running a workshop to stimulate action.

2.2 DELEGATE HANDOUTS

Each delegate should receive the following items:

- A folder containing:
  - the agenda (put this at the front of the folder) (see Appendix 1);
  - a feedback questionnaire (put this after the agenda) which you will ask delegates to fill in and return at the end of the workshop (see Appendix 5);
  - handouts for the three presentations (see Appendix 3 for a sample layout of these);
  - handouts for the two syndicate exercises plus notepaper (see Appendix 4 for these);
  - copies of the two post-workshop exercises (see Appendix 6).

- Environmental Technology Best Practice Programme literature:
  - Good Practice Guide (GG152) Tracking Water Use to Cut Costs;
  - Environment and Energy Helpline leaflet;
  - publications list.

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1 Available free of charge through the Environment and Energy Helpline on freephone 0800 585794.
Before the workshop, you need to contact the Environment and Energy Helpline on freephone 0800 585794 to ask for copies of GG152 (names and addresses of delegates will be required), the leaflet describing its services and the most recent full publications list. Allow about two weeks for delivery of these.

- Any literature you may want to include about your own organisation.

### 2.3 SYNDICATE GROUPS

During the workshop, delegates are asked to work in syndicate groups, ideally of 6 - 8 people. You will need to organise a facilitator for each syndicate group. As emphasised previously, facilitators need to be well prepared and need to be clear about how the answers for the syndicate exercises are achieved. They may find it helpful to have a ‘dry run’ before the workshop, using work colleagues as delegates.

There are two group exercises - working in the same groups for both exercises is recommended to minimise the time needed for introductions and to encourage teamwork.

Handouts for the delegates to use during the two syndicate exercises are provided in Appendix 4. Notes for facilitators are also provided (after each delegate handout) which explain what delegates are expected to achieve during the syndicate exercises. These notes also include tips for running the exercises.

After each syndicate exercise, it is intended that the delegates and facilitators return to the main presentation room where there will be an opportunity to discuss each exercise. Facilitators may like to ask for volunteers from their group to present the results for each exercise. However, due to time constraints, it may be more appropriate for the facilitators to outline their group’s findings. Groups should be advised before the discussion sessions whether or not they will be presenting their findings.

### 2.4 ENVIRONMENTAL TECHNOLOGY BEST PRACTICE PROGRAMME PUBLICATIONS

A number of Environmental Technology Best Practice Programme publications are mentioned during the workshop - these are listed below. You may find it useful to have copies of these to show to the delegates during the presentations. GG152 is the only publication delegates need for the workshop.

- Good Practice Guide (GG152) *Tracking Water Use to Cut Costs*
- Good Practice Guide (GG67) *Cost-effective Water Saving Devices and Practices*
- Good Practice Guide (GG26) *Saving Money Through Waste Minimisation: Reducing Water Use*
- Good Practice Guide (GG27) *Saving Money Through Waste Minimisation: Teams and Champions*
- New Practice Case Study (NC11) *Rinsing and Chemical Recovery System Achieves Large Savings*
- Good Practice Case Study (GC21) *Improved Cask Washing Plant Makes Large Savings*
- Good Practice Case Study (GC22) *Simple Measures Restrict Water Costs*
- Good Practice Case Study (GC61) *Low-cost Measures Save Water at Multi-site Company*
- Good Practice Case Study (GC110) *Water and Cost Savings from Improved Process Control*

Depending on the background of your delegates, you may also wish to have copies of some of the sector-specific advice published by the Environmental Technology Best Practice Programme available to show to them. Phone the Environment and Energy Helpline on 0800 585794 or visit the Programme’s web site at http://www.etbpp.gov.uk to select appropriate publications. Remind delegates that they can obtain their own free copy of relevant publications from the Helpline or the web site.
The workshop consists of a short introduction, three presentations and two syndicate exercises (see Table 1).

<table>
<thead>
<tr>
<th>Presentation title</th>
<th>Microsoft® PowerPoint® 97 file</th>
<th>Slide numbers</th>
<th>Presenter’s notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction and welcome</td>
<td>GG229-A.PPT</td>
<td>1 - 4</td>
<td>Section 3.1</td>
</tr>
<tr>
<td>Water uses and why saving water is important</td>
<td>GG229-B.PPT</td>
<td>5 - 34</td>
<td>Section 3.2</td>
</tr>
<tr>
<td>Syndicate exercise 1</td>
<td>GG229-C.PPT</td>
<td>35 - 36</td>
<td>Section 3.3</td>
</tr>
<tr>
<td>Saving water - practical tips</td>
<td>GG229-D.PPT</td>
<td>37 - 52</td>
<td>Section 3.4</td>
</tr>
<tr>
<td>Syndicate exercise 2</td>
<td>GG229-E.PPT</td>
<td>53</td>
<td>Section 3.5</td>
</tr>
<tr>
<td>Where do we go from here?</td>
<td>GG229-F.PPT</td>
<td>54 - 73</td>
<td>Section 3.6</td>
</tr>
</tbody>
</table>

Table 1 Workshop structure

In the following sections, background information for the presenter is denoted by the use of italics. The plain text can be used to form the basis of the presentation.

### 3.1 INTRODUCTION AND WELCOME

<table>
<thead>
<tr>
<th>Slide number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water workshop</td>
</tr>
<tr>
<td>2</td>
<td>Workshop objectives</td>
</tr>
<tr>
<td>3</td>
<td>Workshop handouts</td>
</tr>
<tr>
<td>4</td>
<td>Agenda</td>
</tr>
</tbody>
</table>

**Slide 1**  **Water workshop**
Welcome delegates to the workshop and introduce yourself and other presenters.

**Slide 2**  **Workshop objectives**

The objectives of the workshop are to:

- identify water uses and understand why saving water is important;
- outline the benefits of water management based on a water mass balance approach;
- provide examples of overuse/unnecessary water use;
- provide examples of water saving opportunities;
- provide information about implementing water management schemes in the workplace.
Slide 3  Workshop handouts

Check that each delegate has a copy of the following:

- A folder containing:
  - the agenda;
  - a feedback questionnaire (which you will ask delegates to fill in and return at the end of the workshop);
  - handouts for the three presentations;
  - handouts for the two syndicate exercises plus notepaper;
  - copies of the two post-workshop exercises.

- Environmental Technology Best Practice Programme literature:
  - Good Practice Guide (GG152) Tracking Water Use to Cut Costs;
  - Environment and Energy Helpline leaflet;
  - publications list.

Have copies of this literature available to show delegates.

As workshop organisers, you may want to include your own literature.

Slide 4  Agenda

AGENDA

08.30  COFFEE AND REGISTRATION
09.05  Water uses and why saving water is important
   Presentation 1 lasting 20 minutes
09.25  Syndicate exercise 1 - A small school
   Group exercise lasting 45 minutes
10.10  Syndicate exercise discussion (15 minutes)
10.25  Saving water - practical tips
   Presentation 2 lasting 20 minutes
10.45  COFFEE
11.00  Syndicate exercise 2 - A small brewery
   Group exercise lasting 45 minutes
11.45  Syndicate exercise discussion (15 minutes)
12.00  Where do we go from here?
   Presentation 3 lasting 20 minutes
12.20  LUNCH (Mention where the lunch will be held.)

Introduce the speaker for the first presentation.
3.2 WATER USES AND WHY SAVING WATER IS IMPORTANT

Slide 5  Water uses and why saving water is important
The aim of the presentation is to outline water uses, why saving water is important, water and effluent costs, examples of overuse/unnecessary use, benefits of water management and how to assemble and present relevant data in a mass balance.

Slide 6  The water cycle
Purpose of the slide: to emphasise that the workplace is part of a larger system where water is being recycled naturally.

The workplace is actually a part of a much larger system - the water cycle. Water providers are also part of this system: they offer a water service. Reducing water use reduces the environmental impact resulting from the treatment of water and effluent. It also means more water is available for other organisms in lakes and rivers.

Slide 7  Water distribution
Purpose of the slide: to convey that water coming into and going out of the workplace costs money.

The slide shows a simplified example: water enters a site with three processes via a single meter (M). The flow is divided into three, with one stream for each process. Effluent from process 2 is used for process 3 and all effluent leaves the site through one metered drain. There can be several mains water pipes supplying a site and several drains leaving the site. Effluent can be discharged to a watercourse as well as the sewer. However, this example illustrates that the consumption of water and production of effluent is metered - the more you use/produce, the more it costs!
Slide 8  Why is saving water important?

Purpose of the slide: to identify three reasons/motives why saving water is important.

Some sites have a finite water supply (eg from the town’s water distribution system or a nearby river), making it difficult to increase supply as the site increases. Increased availability may be expensive. Managing water more efficiently can prevent site expansion being limited by the availability of water or the need for an increased water supply.

Costs can be reduced by reducing:
- the amount of water used;
- the amount of effluent discharged.

Water is a limited, natural resource. Reducing the amount of water used and the amount of material lost in effluent reduces the impact on the environment - especially aquatic life.

Slide 9  Water-related waste

Purpose of the slide: to convey that waste can be reduced and that this can produce significant savings.

All companies, even efficient companies, produce waste. This is a fact of life. Waste costs (material value, manufacturing costs, disposal costs and, in some cases, lost product revenue) make up, on average, 4% of a business’s turnover. Water can be a high proportion of this waste. For companies that haven’t tried any waste savings measures, 25% of this waste (ie 1% of business turnover) can usually be saved by implementing a systematic waste minimisation programme.

Slide 10  Water - key issues?

Purpose of the slide: to establish that water supply and effluent disposal cost money and that one way of reducing costs is to reduce water use.

Reducing the amount of water used will reduce water bills. Reducing the amount of effluent discharged to sewer can reduce high effluent charges. It is important to note that water saving measures that reduce the volume of individual effluents with a low pollution load will increase the average concentration of the overall effluent. Companies are, therefore, advised to contact their water providers to discuss their discharge consents.

Companies that haven’t installed water saving devices can achieve up to a 50% reduction in the amount of water used. Companies that adopt a systematic approach to water reduction can typically achieve a further 20% decrease in the amount of water used. If competitors have implemented water saving measures, then this is an incentive for others to follow suit.

Slide 11  Water supply charges

Purpose of the slide: to establish the way in which water use is related to cost.

Water supply is usually measured by a meter in units of pence/m³. At this point, it is worth mentioning that 1 m³ = 1 000 litres = 220 gallons.

Water providers impose a standing charge for the use of the mains water pipe(s) supplying a company and then charge for the volume of water supplied. The latter is calculated from the change in the meter reading. The more water used, the more it costs.

In 1999/2000, charges in the UK ranged from 46 pence/m³ to 86 pence/m³ for water supply and from 57 pence/m³ to 155 pence/m³ for combined water and effluent charges.
Slide 12  

Trade effluent charges

Purpose of the slide: to establish the way in which effluent production is related to cost.

Water providers usually charge for trade effluent discharged to sewer on the basis of the Mogden Formula. This attempts to link charges for a particular customer to the cost of treating the effluent, i.e. customers pay according to the volume and strength of their effluent. The Mogden Formula is outlined in Appendix 6 of Good Practice Guide (GG152) Tracking Water Use to Cut Costs. Unit costs for trade effluent discharge are expected to continue to increase as sewage treatment works invest in the new plant needed to comply with EC and UK legislation.

The components of the Mogden Formula include a charge for the reception and conveyance of effluent (R) and a charge for primary treatment based on effluent volume (V). Some components are banded, e.g:

- R can have three bands, i.e. 0 - 50 000 m³, 50 000 - 250 000 m³, >250 000 m³;
- V can have two bands, i.e. 0 - 350 000 m³, >350 000 m³.

Slides 13 - 14  

Discharge to controlled waters

Purpose of the slides: to establish the way effluent production is related to cost.

Slide 13

There is an annual charge for all consents to discharge to controlled waters made up of four factors multiplied together.

Annual charge = A x B x C x D

The first three of these consent condition categories relate to the maximum daily volume discharged (A), contents (B) and receiving waters (C). Categories A, B and C are banded; each band is allocated a value or ‘factor’. The ‘financial factor’ (D) has a fixed value, which is reviewed every year by the regulators. In 1999/2000, it was £477.

Slide 14

The contents category (B) is divided into seven bands (A - G) of pollutants. For example, band A includes pesticides, herbicides, fungicides, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) and is allocated a factor of 14. Band B includes metals, sulphides and cyanides and has a factor of 5.

The receiving waters category (C) covers discharge to: groundwaters or land (factor of 0.5); coastal waters (0.8); surface waters (1.0) and estuarial waters (1.5).

Table 2 shows the factors for the bands in category (A).

<table>
<thead>
<tr>
<th>Maximum daily volume (m³)</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td>0.3</td>
</tr>
<tr>
<td>5 - 20</td>
<td>0.5</td>
</tr>
<tr>
<td>20 - 100</td>
<td>1.0</td>
</tr>
<tr>
<td>100 - 1 000</td>
<td>2.0</td>
</tr>
<tr>
<td>1 000 - 10 000</td>
<td>3.0</td>
</tr>
<tr>
<td>10 000 - 50 000</td>
<td>5.0</td>
</tr>
<tr>
<td>50 000 - 150 000</td>
<td>9.0</td>
</tr>
<tr>
<td>&gt;150 000</td>
<td>14.0</td>
</tr>
</tbody>
</table>

Table 2  Band factors for volume category (A)
Slide 15  Water supply and trade effluent charges

Purpose of the slide: to illustrate weekly charges for water use and effluent disposal using an example.

The example process operates for 16 hours/day and 5 days/week using 1 m³/hour of water and producing 1 m³/hour of effluent. The effluent is discharged to sewer. The process incurs water supply costs of £36 - £69/week and trade effluent charges of £10 - £61/week. Total water supply and effluent charges for this process are, therefore, £46 - £130/week.

In this example, effluent costs are based on charges for the reception and conveyance of effluent (R) and the effluent volume (V) only. Trade effluent costs would increase dramatically if charges based on effluent chemical oxygen demand (COD) and suspended solids (SS) were added.

Slide 16  Overuses of water

Purpose of the slide: to emphasise that overuse of water is common and avoidable. Savings can often be made quickly with little effort and cost, ie no-cost and low-cost measures resulting in high gain.

Point to each bullet point in turn.

Water use can be excessive or unnecessary, eg when hoses and taps are left on. Not all water use is known about or authorised. There can be unidentified connections, cross connections, broken valves, incorrectly set valves, incorrectly set control systems and leaks.

Underground leaks are often hard to detect, but areas of lush vegetation, eg patches of long grass or unusually green and vigorous plants during dry weather, may indicate a leak. All taps and visible pipes should be checked for water leaks - especially in areas where no data on water use are available. Unused equipment, eg an unused hose, which might cause a leak should be removed.

Slide 17  Water losses from a tap

Purpose of the slide: to demonstrate that all levels of water loss can be expensive. A dripping tap is one common example. There is a lot of information on this slide and you don’t need to go through all these examples. The main message is that if one dripping tap costs over £500/year, think how much water loss other systems could account for. It is a good idea to repeat that 1 m³ is 1 000 litres.

Water leaks can be expensive. A single dripping tap can result in water supply costs of £2 - £288/year and combined water and effluent costs of £3 - £519/year.

Table 3 shows how these values are derived. The lower figures quoted above are for a loss of one drop/second and the upper figures for a 3 mm stream.

<table>
<thead>
<tr>
<th>Flow rate</th>
<th>Water supply costs (£/year)*</th>
<th>Water supply and effluent costs (£/year)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>One drop/second</td>
<td>2 - 3</td>
<td>3 - 7</td>
</tr>
<tr>
<td>Drops breaking to a stream</td>
<td>14 - 27</td>
<td>18 - 48</td>
</tr>
<tr>
<td>3 mm stream (638 ml/minute)</td>
<td>153 - 288</td>
<td>193 - 519</td>
</tr>
</tbody>
</table>

* Lowest cost represents an area with low water charges of 46 pence/m³ or low combined water and effluent charges of 57 pence/m³. Highest cost represents an area with high water charges of 86 pence/m³ or high combined water and effluent charges of 155 pence/m³ (1999/2000 charges).

Table 3   Annual costs of a dripping tap
Slide 18  Typical water losses
Purpose of the slide (follows on from previous slide): to show there are other examples of leaks (industrial rather than commercial). Again you don’t need to go through all these examples. Real examples will be covered in the second presentation.

Water leaks from pipes and valves can also be expensive. The slide shows annual water and effluent charges for three common examples. These examples result in annual water supply costs ranging from 4 pence to £6 306 and annual water and effluent costs of between 5 pence and £11 376.

Table 4 shows how these values are derived. The lower figure is for a loss of one drop/second and the upper figure for a 3 mm stream.

<table>
<thead>
<tr>
<th>Flow rate</th>
<th>Water supply costs (£/year)*</th>
<th>Water supply and effluent costs (£/year)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>One drop/minute</td>
<td>0.04 - 0.07</td>
<td>0.05 - 0.12</td>
</tr>
<tr>
<td>0.1 litre/minute</td>
<td>24 - 45</td>
<td>30 - 82</td>
</tr>
<tr>
<td>7 - 14 litres/minute (420 - 840 litres/hour)</td>
<td>1 678 - 6 306</td>
<td>2 112 - 11 376</td>
</tr>
</tbody>
</table>

* Lowest cost represents an area with low water charges of 46 pence/m³ or low combined water and effluent charges of 57 pence/m³. Highest cost represents an area with high water charges of 86 pence/m³ or high combined water and effluent charges of 155 pence/m³ (1999/2000 charges).

Table 4  Annual costs of leaking valves and pipes

Slide 19  Water consumption saving incentive
Purpose of the slide: to emphasise that it is not just leaking taps that result in unnecessary costs. Water use in a variety of common processes can be reduced.

Overuse or inefficient use of water is not just confined to leaks from taps and pipes. The other opportunities to reduce water use shown on the slide refer to washroom facilities and industrial applications. Solutions to most of these problems will be explained in more detail - and with examples - in the next presentation (after the first syndicate exercise).

Slide 20  Typical benefits
Purpose of the slide: to outline potential benefits from water management.

Reducing water consumption results in less effluent being produced. These reductions may, in turn, increase process efficiency (due to energy savings from processing smaller volumes). All of these improvements result in cost savings. Producing less effluent or re-using/recovering substances in the effluent reduces the risk of polluting the environment and thus the risk of liability.

Slide 21  Where do we start?
Purpose of the slide: carrying out a water survey will enable you to produce a water mass balance. Knowing how much water is used and where it is used is the crux of water management.

Carrying out a water survey will help delegates to understand:

- **Where the water comes from.** Is it obtained from the mains supply, groundwater abstraction (pumped from a borehole), surface water abstraction (pumped from a river/lake) and/or collected rainwater? Water may be stored on site, eg in a rainwater storage tank.
- **Where water is used and the amount of water used.** Walk around the site at different times to see where water is used. This is particularly useful if you have shift working or during periods of non-production, eg out of hours and when machinery is switched off.
It can also be useful to check that water supply and use are controlled. For example, machinery may be switched off, but its cooling water system may have been left on. It is important to identify whether all water use is necessary and whether it is the best option. For example, equipment may not need cooling water. Again, just walking around the site can provide valuable information.

- **Where the water goes.** Sites usually have three drainage systems - effluent, surface water and foul sewer. However, water can sometimes be re-used in another process before being discharged.

- **The cost of water used in processing.** This should be calculated. Remember, this is not just the direct costs (i.e., water supply and effluent treatment costs), it also includes indirect costs such as maintenance, pumping, heating, and cooling.

**Slide 22 A simple water balance**

*Purpose of the slide: to emphasise that understanding the water distribution on a site is vital when setting up a water management/waste minimisation scheme.*

Once details of the delegates’ own site are properly understood, it is important to evaluate and use that information to select the options available for reducing water use and effluent generation. A water balance will highlight any no-cost and low-cost options that can be implemented quickly and can often result in immediate large savings (i.e., high gain).

**Slide 23 Water use in brewing**

*Purpose of the slide: to identify some uses of water during brewing as an example of an industrial process. The detail is not important. The slide illustrates how many different uses of water there can be in a complicated process.*

The ‘core business’ can use water in many different processes. In a brewery, for example, a large volume of water is used for equipment cleaning, rinsing, processing and packaging (typically 70% of total consumption). The final product typically contains 15% of total water consumption. Water is also used to clean floors (often with hoses). Cooling water is required for temperature control during processing and cooling equipment such as pumps.

*Packaging in a brewery means kegs, casks and bottles.*

**Slide 24 Where do businesses use water?**

*Purpose of the slide: to show that water is not only used for the ‘core business’. Services such as steam and cooling water may also be needed for processing. Point to each service in turn.*

In addition to the core business, water is used for services or utilities such as the boiler house. Steam generation raises several issues. The condensate is a source of both hot and high grade water - thus providing opportunities for water re-use and heat recovery. ‘Blowdown’ (an effluent is discharged to drain) also needs to be considered. A high proportion of water processed by a cooling tower is re-used. However, evaporation also occurs and some water has to be discharged to minimise the build-up of impurities.

Rainwater run-off may have to be treated on site if it becomes contaminated, or at the sewage works if it drains to the foul sewer. However, stored rainwater can be used.

Looking at the site as a whole, water may also be used in the offices, canteen, warehouses, vehicle bays, etc. Water use in these areas is often overlooked. However, a considerable amount of water is used in toilets, sinks, showers, laundry facilities, food preparation, washing-up, etc.
Slide 25  Water inputs, water outputs
Purpose of the slide: how to identify water use and effluent production in terms of location, costs from bills and existing records.

For water inputs, it is necessary to understand the site's water distribution in terms of the source of water used and the location of the main pipes and meters. The next step is to identify the main points-of-use and, finally, gather existing data such as site water distribution plans, flow records and water bills.

Similarly, for water outputs it is necessary to understand the drainage system, identify the main points-of-generation and gather existing data such as flow records and effluent bills.

Slide 26  How do we measure flow?
Purpose of the slide: to show how to determine how much water is used/effluent generated for each process.

Measuring water use and effluent generation can be simple but effective. It may involve:

- reading existing meters (most companies will have a meter installed on the main supply pipe);
- using the ‘bucket and stopwatch’ approach;
- comparing a given system with known information, e.g., manufacturers’ brochures/guidelines.

Alternatively, measurements can be more complicated, involving the use of flowmeters and in-situ recording equipment such as rectangular notch or ‘V’-notch weirs (the depth of water above the weir is accurately monitored to infer volume flow rate).

Slides 27 - 34  Survey and review procedure
Purpose of the slides: series that builds up to show how to prepare a water balance. If using overhead projection acetates, do not build up the series but just use the last one (i.e., Slide 34).

Slide 27
The first thing to do on any site is understand fully what goes on - this can only be done by carrying out a water survey. It is, therefore, the first, and most important, action. The survey is the foundation on which decisions will be based.

Be well prepared by gathering together site plans, drawings, etc. To assess current practices, walk around the site during the day, out of hours and during periods of non-production.

Slide 28
Identify and quantify all water uses and sources of effluent. As mentioned earlier:

- identify the source of each water input (mains, groundwater, surface water, rainwater);
- understand the drainage system (surface drain, effluent drain and foul sewer);
- identify any sources of water loss, e.g., product and evaporation;
- read flowmeters or use a bucket and stopwatch approach to calculate water consumption and effluent production.

The calculation of water consumption by a cooling tower and water release from a steam vent is outlined in Appendix 5 of Good Practice Guide (GG152) Tracking Water Use to Cut Costs.

Slide 29
Based on the simple concept that what comes in must go out, an initial attempt to balance the water books can be made to check that nothing has been missed. Remember to be consistent with the use of units - use litres or cubic metres or gallons (1 000 litres = 1 m³ = 220 gallons).
Slide 30
It is very likely that the flows will not balance. Check calculations and, where necessary, repeat the measurement of inputs and outputs. A series of measurements may need to be taken on different days or at different times to obtain representative flow data. The aim should be a balance of ±10% or better. A discrepancy of more than 20% suggests that there is an error.

Slide 31
The completed balance can be used to evaluate water use and effluent generation to identify opportunities to make reductions. Consider the three Rs of water minimisation: **Reduce**, **Re-use** and **Recycle**.

For example:
- **Reduce.** Is the water use necessary or known? This may be remedied by switching off taps and hoses, repairing leaks and replacing faulty valves.
- **Re-use and recycle.** Can rinse water be re-used? Can water be re-used and heat recovered from condensed steam?

Examples where water consumption can be reduced are discussed in the second presentation.

Good Practice Guide (GG152) *Tracking Water Use to Cut Costs* outlines how to identify opportunities to reduce water use (see pp. 25 - 27). GG152 should be part of the delegate folder.

Slide 32
Evaluate options by ranking them in order of importance. This may depend on cost, volume of water used/effluent generated or an area where enthusiastic staff are considered likely to succeed.

A data assessment table will help to summarise key data collected about a site’s inputs and outputs. Ranking options will help to highlight areas for reducing waste.

An example data assessment table is shown in Overhead 56 and Appendix 9 of Good Practice Guide (GG174) ‘Profiting from Practical Waste Minimisation: Running a workshop to maintain the momentum’.

Slide 33
A strategy can then be defined that addresses issues according to their importance. It is important to identify some no-cost and low-cost measures that can often result in immediate savings. Some examples of no-cost and low-cost measures are discussed in the second presentation.

Slide 34
The strategy can then be implemented. It is important to continue to monitor water use and effluent production both to assess whether the implemented water saving measures are effective and to identify any others. This is particularly important in light of any changes in water and effluent charges or in process requirements and technology.

The water balance can be used as a tool for continual improvement. This will be discussed in more detail in the third presentation.

### 3.3 SYNDICATE EXERCISE 1 - A SMALL SCHOOL

<table>
<thead>
<tr>
<th>Slide number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Syndicate exercises</td>
</tr>
<tr>
<td>36</td>
<td>Syndicate exercise 1 - A small school</td>
</tr>
</tbody>
</table>
**Slide 35**  **Syndicate exercises**

Introduce the first syndicate exercise in the main presentation room.

Explain to delegates:

- This is the first of two syndicate exercises, both lasting 45 minutes. Exercise 1 uses the water balance approach to calculate water consumption and exercise 2 looks at implementing water saving devices.
- Small groups of delegates will relocate to different rooms to carry out the exercises.
- Delegates are recommended to remain in the same group for both exercises.
- After each exercise, the delegates will have a chance to discuss their findings in the main presentation room.
- For calculations, remember 1 m³ = 1 000 litres.

*The ideal for the syndicate exercises is 6 - 7 delegates to a group and one group per room. Each group needs a facilitator.*

**Slide 36**  **Syndicate exercise 1 - A small school**

The first syndicate exercise illustrates how the water balance approach can be used to calculate water consumption in a small school. This is then compared to the actual consumption (calculated from information in the text). Any discrepancy between the calculated (theoretical) and the actual consumption will need to be discussed.

Although a school has been chosen for this exercise, it could just as easily be an office, a hotel or an industrial processing plant.

To avoid problems of repetition during the discussion session, one group may be asked to present their findings and then the other groups asked to raise any other points.

*Handouts for delegates and notes for facilitators are given in Appendix 4.*

### 3.4 SAVING WATER - PRACTICAL TIPS

<table>
<thead>
<tr>
<th>Slide number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Saving water - practical tips</td>
</tr>
<tr>
<td>38</td>
<td>Water consumption</td>
</tr>
<tr>
<td>39 - 40</td>
<td>Keep alert - look for...</td>
</tr>
<tr>
<td>41 - 44</td>
<td>Water saving devices and practices - commercial activities</td>
</tr>
<tr>
<td>45 - 52</td>
<td>Water saving devices and practices - industrial sites</td>
</tr>
</tbody>
</table>

**Slide 37**  **Saving water - practical tips**

*The aim of the presentation is to outline examples of water saving devices and practices for both commercial and industrial sites.*

**Slide 38**  **Water consumption**

*Purpose of the slide: to give delegates a feel for the amount of water used in everyday processes.*

This slide shows the amount of water typically used by everyday items such as toilets, showers, baths, dishwashers, etc. Note that washing a vehicle with a hose uses considerably more water than with a bucket and sponge. It is important to realise that the way in which a task is done can radically affect water use.
Ways of reducing some of the values shown on the slide will be discussed later.

Most WC cisterns installed in the UK before 1986 have a minimum flush of 9 litres. Since 1986, the maximum flush has been set at 7.5 litres. This was recently lowered to 6 litres.

**Slides 39 - 40** Keep alert - look for...

**Purpose of the slides:** to illustrate common overuses/unnecessary uses of water.

Here are some examples of overuse or unnecessary use of water:

**Slide 39**

Leaks are common and can arise from:

- damaged pipeline connections, flanges and fittings;
- worn valves;
- flooded floats (balls) on water tank or cistern valves;
- corroded pipework and tanks.

As illustrated by the following examples, rapid detection and repair of a single leak can justify metering and monitoring costs.

A company carried out a water monitoring survey of different areas of its site. This survey revealed markedly different water use between washrooms of a similar size and with a similar level of use. A leaking pipe, a broken tap (left continuously running) and a faulty valve (excessive water used for flushing) were subsequently discovered. Repairs reduced water use by 500 m³/year. For combined water and effluent charges of 57 pence/m³ - 155 pence/m³, this reduced volume represents savings of £285 - £775/year.

A brewery identified continued water use during periods of non-production and subsequently found four faulty control valves. Replacing these valves cost £750, but this saved the brewery £18 600/year in water and effluent charges. This represents a payback period of just a few weeks.

**Slide 40**

A common example of unnecessary use is leaving hoses switched on or taps left running.

For example, a bottle of milk kept cool in the absence of a refrigerator by keeping it in a sink under a constant flow of water from the cold tap can cost up to £1 000/year. Buying a small refrigerator solves the problem.

Taps can be left on to obtain cold water for drinking purposes. For example, if the cold pipe passes through a hot area it can make the water tepid. Understanding and managing the routing of the pipe system can solve such problems.

Hot taps can also be left on - wasting both water and energy. For example, a soap manufacturer kept the hot tap turned on to keep soap samples molten. This cost £2 900/year in associated water and effluent charges; the problem was solved by buying a water bath with a temperature control.

**Slides 41 - 44** Water saving devices and practices - commercial activities

**Purpose of the slides:** to illustrate ways in which water use can be reduced quickly and with short payback periods using everyday examples such as urinals, sinks, toilets and hoses. Such successes provide an incentive for continued commitment.
Reduced sink/bowl filling. Does the sink need to be full to be used? It may be possible to use less water or to use/install a smaller sink.

Showers. These generally use less water than a bath. The variety of shower systems includes high volume-low pressure and high pressure-low flow systems - the latter are more efficient in terms of water use.

Flush control in toilets. Urinals are often set to flush regardless of use, thus wasting a lot of water, especially out-of-hours. Flush frequency can be optimised for hygiene purposes by installing a passive infrared (PIR) sensor. A PIR sensor can be used to detect activity in selected areas and thus control water supplies. Such devices cost about £160 each and can be operated by battery (lifetime of 3 - 4 years) or mains electricity. Other options include timed control (appropriate if work hours are predictable) or a single valve that can be closed manually by the last person to leave.

The volume of water used to flush a toilet can be reduced using a number of devices.

Flush volumes can be optimised by reducing the cistern size or by installing a cistern volume adjuster (CVA). This is a heavy-gauge polythene bag, which is filled with 1.5 - 2 litres of water and placed in the cistern. The device is simple and cheap - some water providers supply them free of charge - and results in a 20% reduction in water use per flush. ‘Hippo the Water Saver’ is a common example of a CVA. It is important to note that CVAs are not appropriate for use in all types of cisterns.

The cistern dam works by retaining a proportion of the water in the cistern behind a ‘dam’ or partition, thus preventing this water from being discharged in the flush. The partition consists of a flexible synthetic compound that can be fitted between the front and back wall of the cistern.

Dual flush systems operate a 6-litre flush for solid waste and a 3-litre flush for liquid waste.

There are currently two types of waterless toilet.

- Composting. A large tank or composting chamber is installed below the toilet bowl to collect the waste. Liquid waste can be collected every couple of months, diluted and used as fertiliser for trees and flowers. It is not appropriate for use on fruit and vegetables. Solid waste is collected every couple of years and can also be used as fertiliser. The tank can be heated to increase composting and evaporation rates. This generates a smaller volume of waste and thus requires a smaller chamber. However, the use of electricity to provide the heat increases the operating costs.

- Incinerating. A liner is dropped into the toilet bowl before use. Pressing a foot pedal drops the waste and liner into an incineration chamber below the bowl where electrically-powered heaters reduce the waste to ash. The ash may be disposed of with household refuse - although this is not always possible. However, the cost of the electricity may outweigh the saving from reduced water use.

There are currently two types of waterless urinal.

- Siphonic trap. A siphonic trap containing a barrier fluid is inserted in the urinal bowl. The urine passes through the siphon and drains to sewer, while the low-density barrier fluid (a deodorising disinfectant) remains in the siphon. Disadvantages include the need for specialised cleaning and addition of more barrier fluid every 1 - 2 weeks depending on use. A retrofit siphonic trap costs about £90 (1999 prices). Barrier fluid currently costs £20 - £45/urinal/year.

- Deodorising pad. A deodorising pad is inserted into the urinal bowl. Depending on use, the pad needs changing approximately once a week.
Automatic taps. Percussion or push taps are self-closing taps which close when they are not in use, thus eliminating the possibility of water being left running. Such taps have a cut-off mechanism which can be adjusted so that the water stops flowing in 1 - 30 seconds. They contain an adjustable flow restrictor, which enables them to be set to deliver a lower instantaneous flow rate than conventional screw-operated taps. Percussion taps cost about £20 (1999 prices) and are estimated to reduce water use by over 50% compared with conventional taps.

Spray taps. These work by forcing water through small holes in the tap outlet, thus producing a mist or spray. Spray taps are estimated to reduce water use by 60 - 70% compared with conventional taps.

Example
A multi-site wholesaler, whose core business did not use a large volume of water, installed 975 percussion taps, 235 CVAs and 115 PIR flushing controls in 109 of its 160 sites. Installation of these devices cost £59 400, but produces annual savings of £106 700 in water and effluent charges. These savings gave a payback period of seven months. For more details, see Good Practice Case Study (GC61) Low-cost Measures Save Water at Multi-site Company, available free of charge through the Environment and Energy Helpline on freephone 0800 585794.

Trigger-operated hoses. Trigger nozzles can significantly reduce the amount of water used by hoses. They can also provide more control of the strength and direction of the spray. For example, a garden hose can use nearly 1 m³ of water every hour. If the hose is hidden under a bush and forgotten (which can happen) or left flowing down a drain, then at a water cost of 55 pence/m³, this will cost £13.20/day. A lightweight, trigger-operated spray gun costs about £10 (1999 prices). The payback period in this case - allowing £15 for fitting - would be about two days.

Leakage control and use of flow control have been mentioned earlier. Overflow elimination is covered in the next slide. Tamper prevention. To eliminate unauthorised valve operation, a cloth or leather strap can be used to tie a valve shut. These can be cut in cases of emergency. Undesirable heat loss or gain. Pipes can be lagged to retain heat and thus avoid the practice of water in adjacent pipes being run to drain until it achieves the correct temperature. The amount of water used to cool an item/piece of equipment will depend on the amount of heat that needs to be removed. If a large change in temperature needs to be achieved, more water will be required. If the water is subsequently cooled in a cooling tower, water loss through evaporation may be considerable. Managing streams of water at different temperatures may reduce water loss through evaporation.
Slide 46

Overflow elimination. Most overflows run to drain without being measured. The overflow pipe is often hidden, so overflow water may not be known about. Better management of water control can solve this problem, eg making all overflows clearly visible, repairing faulty control valves and installing shut-off valves.

Example
To 'relax' fabric before dyeing, a textile company immersed it in a series of water baths maintained at different temperatures. For effective operation, these baths need to be full. Since the fabrics have different absorbencies, the manually-controlled valves were left fully open to ensure that the baths remained topped up. Consequently, the baths overflowed. Optimising the valve settings resulted in a 31% reduction in water use, equivalent to an annual saving of £26 500 in water and effluent costs. In addition, energy savings due to heating less water amounted to £3 800/year. For more details, see Good Practice Case Study (GC110) Water and Cost Savings from Improved Process Control, available free of charge through the Environment and Energy Helpline on freephone 0800 585794.

Slide 47

A piece of equipment can be efficient, but its allocated use may not be. This can be illustrated using a hose as an example.

If a hose is turned on for 2 hours/day at a flow rate of 1 m$^3$/hour for 360 days/year regardless of use, this can amount to a cost of £1 116/year in water and effluent charges (assuming a charge of £1.55/m$^3$). However, if the hose needs to be on for only 20 minutes/day, this could save £930/year in water and effluent costs and consume only 17% of the water used previously. If the hose needs to be on for 2 hours/day but only 5 days/week, then this could result in a saving of £310/year in water and effluent costs and consume 72% of the water used previously.

Slide 48

Flow restriction/pressure control. Where a precise or high flow is not crucial, eg for general washing purposes, simple pipe restrictions can be used to limit the instantaneous flow from a device. Where steady flow is required, then pressure control devices may be more appropriate - especially on variable pressure supplies. A brass, pressure control valve for a small pipe costs £30 - £60 (1999 prices).

An example of automatic supply shut-off is the use of lever valves instead of screw valves to provide automatic shut-off for hoses.

Example
To provide a constant flow of water irrespective of water pressure, an electroplating company installed meters and pressure-equalising flow restrictors for each rinse tank inlet. As the water pressure increases, a rubber controller expands and reduces the size of the orifice within the chamber. Each valve cost £15 - £35 (1995 prices), but saved 164 m$^3$/day (a 42% saving in water consumption) and £36 000/year in water and effluent charges (61 pence/m$^3$ in 1995). Such a valve cost £25 - £55 in 1999. For more details, see Good Practice Case Study (GC22) Simple Measures Restrict Water Costs, available free of charge through the Environment and Energy Helpline on freephone 0800 585794.

Slide 49

Countercurrent rinsing. Rinse water can often be used more effectively by rinsing a product in a series of tanks or stages. In countercurrent rinsing, the product is rinsed first in dirty water and then in progressively cleaner water. At the same time, the rinse water moves progressively from the last rinse towards the first rinse.
Example
A metal finishing company now collects its most contaminated rinse water and pumps it to an evaporator, where water is evaporated at atmospheric pressure, leaving a concentrated solution of process chemicals. The chemical-laden liquid is returned directly to the plating process and the water is used for countercurrent rinsing. Mains water consumption has fallen by over 70% from 25.5 m³/day to 7.3 m³/day, producing savings of 4 370 m³/year worth £3 625 in reduced water supply and effluent disposal costs (1995 prices). For more details, see New Practice Case Study (NC11) Rinsing and Chemical Recovery System Achieves Large Savings, available free of charge through the Environment and Energy Helpline on freephone 0800 585794.

Slide 50
- **Re-use of wash water.** Effluent is often sent directly to the drain. However, there are often opportunities to re-use low-grade water to wash down/rinse floors and containers as a first wash. Used water can often be re-used following treatment to remove impurities by technologies such as filtration, sedimentation/flotation, absorption/adsorption and ion exchange. However, treatment may produce a slurry that requires disposal.

Example
A cooker manufacturer previously used 10 m³/hour of mains water to cool an air compressor; the cooling water then flowed to drain. Installing a recirculation system at a cost of £9 000 (1995 prices) cooled and recycled the water. Water consumption was reduced by 30%, saving £26 000/year. This gave a payback period of four months. For more details, see Industry Example 5 of Good Practice Guide (GG26) Saving Money Through Waste Minimisation: Reducing Water Use, available free of charge through the Environment and Energy Helpline on freephone 0800 585794.

Slide 51
- **Sprays/jets.** These provide directional water use and thus reduce water consumption. Spray nozzles and hoses have a different action; the water from a hose knocks off the dirt, whereas the water from a nozzle cuts through the dirt.

Example
The spray nozzle used to wash casks in a brewery was redesigned. The improved design resulted in more thorough washing, more efficient use of water, and significantly reduced maintenance costs. For more details, see Good Practice Case Study (GC21) Improved Cask Washing Plant Makes Large Savings, available free of charge through the Environment and Energy Helpline on freephone 0800 585794.

Slide 52
- **Scrapers/squeegees/brushes.** A lot of water is used if hoses are used to clean surfaces. Scrapers, squeegees and brushes can be used to remove solid material before it dries out, thus minimising water use. This practice can also save time.

- **Cleaning-in-place (CIP) technology.** This is the term given to cleaning process plants in-situ. It often includes the re-use of final rinse water for use as a first rinse and the re-use of concentrated cleaning chemicals.
3.5 SYNDICATE EXERCISE 2 - A SMALL BREWERY

Slide 53    Syndicate exercise 2 - A small brewery

The second syndicate exercise looks at implementing water-saving devices in the washroom areas of a small brewery. Given the plan of the brewery site, delegates need to calculate water consumption in the washrooms and then assess the costs and benefits of installing various water-saving devices. They need to discuss whether the recommended water-saving devices are the best choice.

To avoid problems of repetition during the discussion session following the syndicate exercise, one group may be asked to present their findings and then the other groups may be asked to raise any other points.

If there is insufficient time during this exercise or during the workshop in general, time can be made up during this exercise by allocating a different washroom facility to different groups, eg:

- Group A Water consumed through the use of urinals
- Group B Water consumed through the use of washbasins
- Group C Water consumed through the use of WCs.

If this is the case, the discussion session after the exercise may need to include the findings from each washroom facility prepared by the different groups.

Handouts for delegates and notes for facilitators are given in Appendix 4.

3.6 WHERE DO WE GO FROM HERE?

Slide 54    Where do we go from here?

The presentation outlines how to implement a water management scheme in the workplace. Delegates should be able to use the information from presentations 1 and 2 to develop a water balance and plan an appropriate strategy.
Slide 55  Where do we go from here?
*Purpose of the slide: to outline the aims and structure of the presentation.*

This presentation explains how to implement a water management/waste minimisation scheme in the workplace and provides information on advice from external sources such as the Environmental Technology Best Practice Programme.

Slide 56  Workplace - commitment
*Purpose of the slide: to emphasise the need for commitment from everyone in the company.*

The key to the success of any scheme is obtaining commitment from staff and the company. To demonstrate commitment to waste minimisation at work, set up a management team and encourage interested parties to join this team. Prepare a policy statement, which should be approved by senior management and made part of the company's corporate policy. It is also important to communicate with staff and educate/train them about the need to minimise waste.

Identify some no-cost and low-cost schemes that will produce quick savings and will provide an incentive for continued commitment from senior management.

Slide 57  Policy statement
*Purpose of the slide: to explain the contents of the policy statement.*

The policy statement should outline the proposed water management/waste minimisation scheme and describe its aims and objectives. To be successful, the scheme must be realistic in terms of aims and payback periods. Priority areas for reducing water use and effluent production should also be identified. The scheme may need to be expanded to include long-term measures.

Slide 58  Education in the workplace
*Purpose of the slide: to stress the importance of educating staff and keeping them informed.*

Educating staff about water management/waste minimisation encourages teamwork - a vital element for success. Start by outlining initial proposals and explaining the benefits to the business of taking action to reduce water use and effluent generation.

Staff participation and feedback are also essential to achieve continued commitment. One of the roles of the management team should be to keep staff informed with regular meetings, newsletters, posters on notice-boards, information transmitted by e-mail, etc.

Slide 59  Management requirements
*Purpose of the slide: to outline the role of the management team.*

The budget for the management team should include the amount of time and resources the team feels is necessary to implement the water management/waste minimisation programme. A realistic budget also needs to be allocated to water management/waste minimisation measures.

A member of the management team - often referred to as the Champion - should act as a liaison officer both inside and outside the workplace. For example, the Champion should be the link between the company and other organisations such as the Environmental Technology Best Practice Programme, manufacturers, contractors, etc.

One of the management team's first tasks should be to undertake a detailed survey of the company and prepare a water balance.
Slide 60  Quick savings  
Purpose of the slide: to highlight the benefits of quick savings from no-cost and low-cost schemes.

Quick savings provide a good start and set the scheme rolling. Use the information from the water survey and water balance to identify some no-cost and low-cost measures with immediate results. When evaluating potential water saving opportunities, calculate current costs and compare them with the expected savings. It is important to calculate the true cost of each option and to work out the payback period. For example, maintenance costs are often overlooked. Expressing the expected savings in terms of company turnover is also helpful.

Slide 61  Long-term savings  
Purpose of the slide: to explain that some water management measures may merit further investigation but provide long-term savings.

Extra savings may be applicable with a view to the long-term. It may be possible to identify some areas that can benefit from further investment. Some water-saving measures may use technology specific to individual sectors, but may be more expensive and, consequently, have longer payback periods. It is important to choose the correct scheme to suit individual needs and to calculate the true cost of each measure in terms of payback period and operating/maintenance costs.

Remind delegates of the sector-specific advice given in free publications available from the Environmental Technology Best Practice Programme through the Environment and Energy Helpline.

Slide 62  Water balance: understanding where costs arise  
Purpose of the slide: to show how the water balance can be used to identify costs.

The water balance can be used as a tool for regular assessment of water and effluent costs. In the case of mains water supply, water is charged according to the volume used. After the water is processed, discharge of the subsequent effluent also incurs costs. Some effluent may need to be treated prior to discharge. On-site pretreatment will incur a cost and discharging the effluent will also incur a cost. Water may be re-used/recycled. The technology used to re-use/recycle water will incur costs and disposal of any solid waste/effluent resulting from this process will also incur costs. All of these factors need to be taken into account before implementing or modifying a water management scheme.

Slide 63  Water balance: a tool for continuous improvement  
Purpose of the slide: to demonstrate that preparing a mass balance is not just a one-off exercise.

The water balance can be used regularly every year to compare historical information with the current scheme. The initial review can be used as a base-line. Monitoring water use by taking regular measurements allows annual/seasonal trends to be highlighted and costs to be calculated. Once the current situation has been assessed, it can be compared to the base-line and the aims of the water management/waste minimisation scheme reviewed. In the light of changes in inputs or increases in effluent and energy costs, it may be necessary to reassess the situation and decide new targets. By implementing new measures and monitoring their impact, a cycle of continuous improvement is established.

Slide 64  Environmental Technology Best Practice Programme: advice and guidance  
Purpose of the slide: to reinforce the idea that help is at hand from advice services such as the Environmental Technology Best Practice Programme.

The Environmental Technology Best Practice Programme is a Government-funded programme which provides free information and advice for all businesses in the UK. It aims to help businesses cut their costs while improving their environmental performance by encouraging them to reduce their waste at source and, where appropriate, use cost-effective cleaner technology.
Slide 65  Environmental Technology Best Practice Programme: summary of assistance

Purpose of the slide: to outline the services provided by the Programme.

The Programme runs the Environment and Energy Helpline, produces a range of free publications and runs seminars, workshops and site visits. All of these services are accessible through the Programme’s web site.

Slide 66  Environment and Energy Helpline

Purpose of the slide: to outline the services provided by the Environment and Energy Helpline.

The Helpline is able to provide up to two hours of free expert advice on any environmental or energy efficiency problem. For smaller companies, there is also the option of a free, half-day site visit. Such counselling visits are at the discretion of the Helpline Manager. All publications produced by the Environmental Technology Best Practice Programme can be ordered through the Helpline and are free of charge.

Slides 67 - 73  Getting started...back at work

Purpose of the slides: to get delegates to start thinking about what they will do when they get back to work. The slides outline the contents of the two exercises given in Appendix 6. Delegates are not expected to complete these exercises during the workshop, but to use the information from the workshop within the context of their workplace. In some cases, the first post-workshop exercise may be given to delegates as an exercise prior to the workshop. However, in most cases, delegates will receive it on the day of the workshop.

Check that all delegates have copies of the post-exercise handouts given in Appendix 6.

Slide 67

This slide shows the first post-workshop exercise - a step-by-step questionnaire. To complete this questionnaire, delegates will need to identify supply pipes, existing flowmeters and the volumes and costs of water used/effluent generated. From this information, delegates can calculate average daily use (ADU). There is also a checklist for delegates to use to keep a record of events.

Slide 68

Purpose of the slide: to show delegates how to start post-workshop exercise 2.

The second post-workshop exercise starts by asking delegates to sketch their workplace - beginning by using the ‘grey box’ to draw the part of the site they are directly involved with.

Slide 69

Delegates then need to add the sources of water used and the sources of water-based waste. They should mark the direction of flow and use one colour for water supplied and another colour for effluent.

Slide 70

Finally, delegates need to add the areas that they may not use personally (ie outside the grey box) and communal areas such as the toilets, canteen and staff shop (also outside the grey box).

Slide 71

The handout for this exercise contains a table to list the processes that use water together with the source and fate of the water. The approximate volume of water used in each process should be added to the table. For example, a washing machine uses mains water and the effluent is discharged to the effluent drain. The washing machine is estimated to use 15 m$^3$ of water/year. This is based on a domestic washing machine using 60 - 80 litres/cycle, four times a week.
Slides 72 - 73

The delegates can use the diary given in the handout to plan their water management/waste minimisation scheme at work. For example, they may choose to start using the approach shown on Slide 73. In the first week, attend the workshop and then plan to have a draft of policy statement written by the end of the week. During the second week, show the policy statement to senior management and seek their approval. Then identify any interested parties and set up a management team.

At the end of the presentation, refer to the feedback questionnaire in the delegate folder. Ask the delegates to complete the forms before they leave, if possible. Emphasise that any criticisms or recommendations would be welcome.
# PROFITING FROM REDUCING WATER USE

Date: .............................................

Venue: .............................................

## AGENDA

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.30</td>
<td><strong>Coffee and registration</strong></td>
</tr>
<tr>
<td>09.05</td>
<td>Water uses and why saving water is important</td>
</tr>
<tr>
<td>09.25</td>
<td>Syndicate exercise 1 - A small school</td>
</tr>
<tr>
<td>10.10</td>
<td>Syndicate exercise discussion</td>
</tr>
<tr>
<td>10.25</td>
<td>Saving water - practical tips</td>
</tr>
<tr>
<td>10.45</td>
<td><strong>Coffee</strong></td>
</tr>
<tr>
<td>11.00</td>
<td>Syndicate exercise 2 - A small brewery</td>
</tr>
<tr>
<td>11.45</td>
<td>Syndicate exercise discussion</td>
</tr>
<tr>
<td>12.00</td>
<td>Where do we go from here?</td>
</tr>
<tr>
<td>12.20</td>
<td><strong>Lunch</strong></td>
</tr>
</tbody>
</table>
This Appendix contains a reduced version of all the templates for reference while you prepare your presentation.

A CD with a copy of all the slide templates as Microsoft® PowerPoint® 97 files is provided in a pocket in the back cover of the Guide. If you do not have access to this software, please contact the Environment and Energy Helpline on freephone 0800 585794 for help.

The 73 slide templates are provided in six Microsoft® PowerPoint® 97 files as shown in Table A1.

<table>
<thead>
<tr>
<th>File name</th>
<th>Slide numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>GG229-A.PPT</td>
<td>1 - 4</td>
</tr>
<tr>
<td>GG229-B.PPT</td>
<td>5 - 34</td>
</tr>
<tr>
<td>GG229-C.PPT</td>
<td>35 - 36</td>
</tr>
<tr>
<td>GG229-D.PPT</td>
<td>37 - 52</td>
</tr>
<tr>
<td>GG229-E.PPT</td>
<td>53</td>
</tr>
<tr>
<td>GG229-F.PPT</td>
<td>54 - 73</td>
</tr>
</tbody>
</table>

Table A1 Microsoft® PowerPoint® 97 files needed for the workshop
**Water uses and why saving water is important**

**The water cycle**

**Water distribution**

**Why is saving water important?**

- Usual reasons are to:
  - Reduce water consumption
  - Reduce costs
  - Reduce environmental impact

**Water-related waste**

- All companies produce waste
- Waste can constitute, on average, 4% of business turnover
- Water management can contribute to savings in business turnover

**Water - key issues?**

- Are we using too much water?
- Are we paying too much in effluent charges?
- Have we tried saving water?
- Could we save any (more) water?
- Have our competitors implemented water saving measures?

**Water supply charges**

- Metered consumption
- Charged in pence/m³
- 1 m³ = 1000 litres
- 46 - 86 pence/m³ in the UK (1999/2000)

**Trade effluent charges**

- Mogden Formula
- Charges linked to cost of treatment
  - Receiving effluent
  - Volume of effluent
  - Strength of effluent
Discharge to controlled waters

Annual charge

\[ \text{Charge} = A \times B \times C \times D \]

- \( A \): Volume factor (maximum daily volume)
- \( B \): Contents
- \( C \): Receiving waters
- \( D \): Financial factor

Discharge to controlled waters

<table>
<thead>
<tr>
<th>Contents</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band A: pesticides, PCBs, PAHs</td>
<td>14</td>
</tr>
<tr>
<td>Band B: metals, sulphides, cyanides</td>
<td>5</td>
</tr>
</tbody>
</table>

Receiving waters

- Groundwaters or land: 0.5
- Coastal waters: 0.8
- Surface waters: 1.0
- Estuarial waters: 1.5

Water supply and trade effluent charges

Example:
- 1 m³/hour water consumption
- 1 m³/hour effluent production

Costs (1999/2000):

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water supply</td>
<td>£36 - £69/week</td>
</tr>
<tr>
<td>Effluent to sewer charges</td>
<td>£10 - £61/week</td>
</tr>
</tbody>
</table>

Overuses of water

- Excessive or unnecessary use
- Unknown or unauthorised use
- Unidentified or cross connections
- Broken valves
- Incorrectly set valves or control systems
- Leaks, etc

Water losses from a tap

- One drop/second: 4.8 m³/year
  - £3 - £7/year
- Drops breaking to a stream:
  - 31 m³/year
  - £18 - £48/year
- 3 mm stream:
  - 336 m³/year
  - £193 - £519/year

Typical water losses

- One drop/minute:
  - 79 litres/year
  - 5 - 12 pence/year
- 0.1 litre/minute:
  - 53 m³/year
  - £30 - £482/year
- 0.3 litre/minute:
  - 3,680 - 7,360 m³/year
  - £2,112 - £4,111/year

Water consumption saving incentive

<table>
<thead>
<tr>
<th>Water saving</th>
<th>Per project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial applications</td>
<td>40% combined</td>
</tr>
<tr>
<td>Toilets, urinals, showers and taps</td>
<td>15%</td>
</tr>
<tr>
<td>Industrial applications</td>
<td>15%</td>
</tr>
<tr>
<td>Closed loop recycle</td>
<td>15%</td>
</tr>
<tr>
<td>Automatic shut-off</td>
<td>15%</td>
</tr>
<tr>
<td>Continuous renewal</td>
<td>15%</td>
</tr>
<tr>
<td>Spray jet upgrades</td>
<td>10%</td>
</tr>
<tr>
<td>Re-use of wastewater</td>
<td>50%</td>
</tr>
<tr>
<td>Cleaning-in-place (CIP)</td>
<td>60%</td>
</tr>
</tbody>
</table>

Typical benefits

- Water consumption
- Effluent production
- Efficiency
- Cost
- Environmental benefits
- Liability
Where do we start?

Water survey:
- Water source
- Water uses and volumes
- Is it necessary?
- Disposal
- Cost

A simple water balance

Based on a very simple concept: what goes in **must** come out (somewhere)

Where do businesses use water?

How do we measure flow?
- Simple but effective
  - Reading existing meters
- Bucket and stopwatch
- More complex, eg flowmeter

Water use in brewing

<table>
<thead>
<tr>
<th>Type of water</th>
<th>Point of use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash water</td>
<td>Numerous cuts</td>
</tr>
<tr>
<td>Cold and hot prior</td>
<td>Numerous cuts</td>
</tr>
<tr>
<td>Boilage</td>
<td>Vessels and floors</td>
</tr>
<tr>
<td>Cold feed water</td>
<td>Boiler floor</td>
</tr>
<tr>
<td>Chill water</td>
<td>Heat exchanger</td>
</tr>
<tr>
<td>Hot water</td>
<td>Tank new</td>
</tr>
<tr>
<td>Cooling water</td>
<td>Condensing tanks</td>
</tr>
<tr>
<td>Chiller circuits</td>
<td>Fermentation tanks</td>
</tr>
<tr>
<td>Pumps</td>
<td>Chiller units</td>
</tr>
<tr>
<td>Spray water</td>
<td>Pumps</td>
</tr>
<tr>
<td>Cooling water</td>
<td>Kitchen and bottle washing</td>
</tr>
</tbody>
</table>

Survey and review procedure

Phase 1: Preparation
- Survey preparation

Phase 2: Water survey
- Water in:
- Water out:
Survey and review procedure

Phase 1 - Preparation
- Survey preparation

Phase 2 - Water survey
- Water in
- Water out
- Does it balance?

Phase 3 - Actions
- Identify options
- Evaluate options
- Define strategy

Survey and review procedure

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Phase 1 - Preparation
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Survey and review procedure

Phase 1 - Preparation
- Survey preparation

Phase 2 - Water survey
- Water in
- Water out
- Does it balance?

Phase 3 - Actions
- Identify options
- Evaluate options
- Define strategy

Syndicate exercises

Exercise 1
Water balance

Exercise 2
Implementing water saving devices

1 m³ = 1 000 litres = 220 gallons

Syndicate exercise 1
A small school

- Water balance
- Calculate water consumption
- Compare with actual consumption
- Discuss

- 45 minutes
Saving water - practical tips

Water consumption

<table>
<thead>
<tr>
<th>Item</th>
<th>Average water use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilets</td>
<td>7.5 - 9 litres/flush</td>
</tr>
<tr>
<td>Sinks</td>
<td>3 - 6 litres/visit</td>
</tr>
<tr>
<td>Showers</td>
<td>20 - 50 litres/visit*</td>
</tr>
<tr>
<td>Baths</td>
<td>10 - 170 litres/visit</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>20 - 50 litres/visit</td>
</tr>
<tr>
<td>Laundry (washing machine)</td>
<td>60 - 100 litres/visit</td>
</tr>
<tr>
<td>Vehicle washing</td>
<td>50 - 100 litres/vehicle (bucket)</td>
</tr>
<tr>
<td>Hose</td>
<td>50 - 900 litres/minute (hose)</td>
</tr>
<tr>
<td>Households (full-time)</td>
<td>20 - 50 litres/minute/person</td>
</tr>
<tr>
<td>Employees (full-time, no tenants)</td>
<td>40 - 90 litres/minute/person</td>
</tr>
</tbody>
</table>

* Higher use for power showers

Keep alert - look for...

- Leaks
- Broken valves
- Incorrectly set valves or control systems

Keep alert - look for...

- Excessive or unnecessary use
  - Hose pipes
  - Taps

Water saving devices and practices

Commercial activities

- Reduced sink/bowl filling
- Showers
- Flush control in toilets

Commercial activities

- Cistern volume adjuster
- Cistern dam
- Dual flush
- Waterless toilets/urinals

Commercial activities

- Automatic taps, eg Good Practice Case Study GC61
- Spray taps

Commercial activities

- Trigger-operated hoses
Water saving devices and practices

**Industrial sites**

- General water use
  - Leakage control
  - Use of flow control
  - Overflow elimination
  - Tamper prevention
  - Undesirable heat loss or gain

- Overflow elimination
  - Valves
  - Sensors
  - e.g. Good Practice Case Study GC110

Water saving devices and practices

**Industrial sites**

- Water use efficiency
  - Constant use
  - Use when required

- Flow restriction/pressure control, e.g. Good Practice Case Study GC32
- Automatic supply shut-off

Water saving devices and practices

**Industrial sites**

- Countercurrent rinsing
  - e.g. New Practice Case Study NC11

- Re-use of water
  - e.g. Good Practice Guide GG26
  - Industry example 5

Water saving devices and practices

**Industrial sites**

- Spray/sjets, e.g. Good Practice Case Study GC21

- Scrapers/squeegees/brushes
- Cleaning-in-place (CIP) technology
Syndicate exercise 2
A small brewery

- Water-saving devices
  - Assess water consumption in washrooms
  - Assess costs and benefits of various water-saving devices
  - Discuss the options
- 45 minutes

Where do we go from here?

- Waste minimisation at work
- National and local free advice services

Workplace - commitment

- Management team
- Policy statement
- Approval from senior management
- Training/informing staff

Policy statement

- Aims
- Priorities
- Expand to include long-term ideas if necessary

Education in the workplace

- Outline initial proposals to staff
- Keep staff informed

Management requirements

- Budget for the management team
- Budget for waste minimisation
- Liaison officer(s)
Quick savings
- Immediate results
- True cost of these measures
- Calculate expected savings

Long-term savings
- Extra savings
- Identify further investment
- Calculate the true cost of these measures

Water balance: understanding where costs arise

Water balance: a tool for continuous improvement

Environmental Technology Best Practice Programme: advice and guidance
- Free advice and information for all UK businesses
- Funded by Government
- Aims to help UK companies improve their competitiveness while improving their environmental performance
  - by reducing waste at source
  - through cost-effective cleaner technology

Environmental Technology Best Practice Programme: summary of assistance
- Free Helpline 0800 585794
- Free publications, software and videos
- Seminars, workshops and site visits
- Web site: www.etbpp.gov.uk

Environment and Energy Helpline
- Free expert advice for up to two hours
- Any environmental or energy efficiency question
- Free half-day site visits for smaller companies (< 250 employees)
- Ordering service for free publications
0800 585794

Getting started ... ... back at work
Draw the part of the site that you work in

... add the water uses

... the whole picture

Water distribution

Diary - plan your commitment at work

Example ... 1st month

MONTH 1

Week 1:
- Workshop
- Draft a policy statement

Week 2:
- Seek approval of policy statement from senior management
- Identify key interested parties
The delegate handouts accompanying the three presentations can be prepared using the print option of ‘Handouts (3 slides per page)’ in Microsoft® PowerPoint® 97. This option provides space for delegates to make notes during the presentation. An example of this format is shown below.
This Appendix contains copies of:

- the delegates’ handout for syndicate exercise 1 (a small school);
- notes for facilitators for syndicate exercise 1;
- the delegates’ handout for syndicate exercise 2 (a small brewery);
- notes for facilitators for syndicate exercise 2.
SYNDICATE EXERCISE 1 - A SMALL SCHOOL - DELEGATES’ HANDOUT

The school’s headteacher is worried by high water and sewage charges. Water costs (based on a charge of £1.00/m³) jumped from £3 000 for the financial year 1997/1998 to £6 000 for the financial year 1998/1999.

Your task

You are a science teacher at the school and you have been asked by the headteacher to assess water use at the school, incorporating the study into a sixth-form project. You have no other information from previous years and do not know whether this last year represents an overcharge. As part of your report to the headteacher, construct a water balance for the school to see if the large increase is explicable. Discuss what you would do.

Setting the scene

The school has 300 pupils, ten teachers and ten auxiliary staff. Classes consist of 30 pupils and each pupil has four classes a day. There are ten classrooms, a canteen (equipped with two large dishwashers), a sports hall with changing rooms and showers, two science laboratories (they share a domestic dishwasher) and a kitchen for food and nutrition classes.

Water is supplied directly to the school through a water main equipped with the water provider’s meter.

Data collection

Consulting the timetable and walking around the school enables your science class to obtain the following information.

On average, two-thirds of pupils and all staff use the canteen for lunch. Each pupil has two science classes a week, but only one of these involves practical work. There is one food and nutrition class a week, where the pupils spend half the lesson preparing meals and washing up afterwards. Each pupil has two sports classes a week (one indoor and one outdoor) and pupils are expected to shower afterwards. There are two outdoor taps used for garden hoses. One is located near the headteacher’s office and is used to water the rose bushes. The other is located near the garage where the school minibus is kept.

With help from the caretaker during one science class, some of the pupils were asked to calculate the average flow rate of the garden hose. Using a bucket and stopwatch, they calculated the flow to be approximately 5 litres/minute. On average, the rose bushes are watered once a week throughout the year for one hour and the minibus is washed using the other hose for one hour every four weeks during term-time.

Another group of pupils was asked to calculate the volume of water in a WC cistern and the amount of water used when they washed their hands in a washbasin. The water from a number of cisterns was siphoned off using tubing and a large plastic syringe, collected in a bucket and then poured into a measuring cylinder. The cistern was found to hold 9 litres of water. To calculate the volume of water used to wash their hands, the pupils put the plug in the sink, washed their hands and marked the water level. They then let the water drain away and used a measuring cylinder to add clean water until the level was reached. They found that hand washing used 3 - 5 litres of water. You tell your pupils that each urinal uses approximately 3 litres/hour of water and that they operate on a 24-hour basis (regardless of use), 5 days a week. The pupils calculate that during the 40 weeks a year of term-time, the use of water for WC toilets, urinals and washbasins in the washrooms amounts to 1 500 m³.
The food and nutrition class calculated that each pupil used 5 litres of water to wash up after they had prepared a meal. Pupils have to wash their hands before they start cooking.

The science class was told that the dishwasher was used once after each practical class and once during the week by the technician preparing for the practical classes. On days when practicals were held, all pupils had to wash their hands before they left.

You have found out from the canteen that food preparation and washing-up uses 15 litres of water/person/day.

As part of a fact-finding homework task, pupils report that a domestic dishwasher uses 20 - 40 litres/cycle and that showers use 30 litres/person.
SYNDICATE EXERCISE 1 - NOTES FOR FACILITATORS

You will be the workshop facilitator for the same group of delegates for both syndicate group exercises. For this exercise, you will work through the water balance for a small school with your syndicate group.

Introduce yourself.

Tell the delegates:

- They are allowed 45 minutes for this exercise.
- You recommend that they spend the first five minutes taking it in turns to introduce themselves, explaining who they are, the name of their company, the nature of their company's business and the part they play in its organisation. Keeping the same delegates in each syndicate group for both exercises means that introductions will not be necessary for the second exercise. This will help them to establish a team environment and save time.
- You recommend that they spend five minutes reading through the exercise and underlining relevant data/information.
- Calculators should not be needed. For the purposes of this exercise, the exact values are not essential - some assumptions will be made and figures will be rounded up/down to make calculations easy.

Early on, you may like to ask for a volunteer to present the group's findings in the main presentation room during the discussion session that follows each exercise. However, time constraints may make it more appropriate for you to outline your group's findings.

As a facilitator, we recommend that you use the following guidelines:

Exercise execution steps

- **Create a schematic of the site.** The first step is to create a schematic of the water-using processes on the school site. Use delegates’ ideas to develop and draw a schematic on a flip chart. Fig A1 shows a suggested schematic.

- **Add readily available data.** You need to decide on the units you are going to use. Using m$^3$/year will give reasonable numbers and allow you to check the annual consumption. Information can then be inserted onto the water balance. However, all you know at this stage is that the flow to the washroom is 1 500 m$^3$/year.

- **Calculate other flows.** For the purpose of the workshop, and to avoid the need to use calculators, keep the numbers simple by rounding up figures, eg 25 hours in a day and 50 weeks in a year. If you are given a range, you will need to ‘guesstimate’. You will use this type of approach for the second exercise.
**Time school in use during term**
Term time = 40 weeks, 5 days a week = 200 days/year.

**Canteen**
Number of people using the canteen each day = \((2/3 \times 300) + 20\) = 220. Call this 200.
Annual water use = 200 people \(\times\) 200 days \(\times\) 15 litres/person = 600 000 litres = 600 m\(^3\).

**Showers**
Number of showers taken each week = 2 \(\times\) 300 = 600.
Annual water use = 600 showers \(\times\) 40 weeks \(\times\) 30 litres/shower = 720 000 litres = 720 m\(^3\).

**Science practical classes**
Water use for hand washing = 300 \(\times\) 40 weeks \(\times\) 4 litres (average) = 48 000 litres = 48 m\(^3\).
Number of times the dishwasher is used per week = \(((10 \text{ classes}) + 1) = 11\). Call this 10.
Annual water use = 10 uses/week \(\times\) 40 weeks \(\times\) 30 litres/use (average) = 12 000 litres = 12 m\(^3\).
Total water use by science classes = 48 + 12 = 60 m\(^3\).

**Food/nutrition classes**
Water use for hand washing = 300 \(\times\) 40 weeks \(\times\) 4 litres (average) = 48 000 litres = 48 m\(^3\).
Water use for washing up = 300 \(\times\) 40 weeks \(\times\) 5 litres = 60 000 litres = 60 m\(^3\).
Total water use by food/nutrition classes = 48 + 60 = 108 m\(^3\). Call it 110 m\(^3\).

**Hoses**
Water used on roses = 5 litres \(\times\) 60 minutes \(\times\) 50 weeks = 15 000 litres = 15 m\(^3\).
Water used to clean minibus = 5 litres \(\times\) 60 minutes \(\times\) 10 weeks = 3 000 litres = 3 m\(^3\).
Total water use by hoses = 18 m\(^3\).

*Compare consumption.* Compare the calculated theoretical consumption with the actual consumption derived from the water bills.

Total calculated water use = 1 500 + 600 + 720 + 60 + 110 + 18 = 3 008 m\(^3\).
In 1997/1998, the school spent £3 000 on water costing £1.00/m\(^3\). \(\therefore\) Volume used = 3 000 m\(^3\).
In 1998/1999, the school spent £6 000 on water costing £1.00/m\(^3\). \(\therefore\) Volume used = 6 000 m\(^3\).
The value obtained from the water balance is similar to the 1997/1998 value calculated from the water bill. However, consumption charged for in 1998/1999 is much higher than the theoretical consumption.
Possible routes of investigation

The following tasks could be undertaken to investigate water use further:

- **Practical/engineering tasks**
  - Estimate the accuracy of the incoming meter. Take a reading at the beginning of a week and another reading at the same time the following week. Is the meter indicating a value that tallies with the estimated consumption?
  - When all water-consuming devices are turned off, is there a sound of water flow in the pipe near the meter or is the meter going round? This may indicate a leak or confirm a faulty meter.
Gather more water-consumption data
- Fit a meter on the supply pipe to the canteen or sports’ showers, or both.
- Gather data on out-of-hours use of the sports’ facilities, eg during training sessions and matches, and estimate water use for showers, etc.
- Calculate how much water has been accounted for and how much is still ‘missing’.

Investigate leaks and unknown uses
- Check all taps and visible pipes for water leaks, especially in areas where no water-use data are available.
- When the school is closed and no work that uses water is being carried out, check whether the water meters are showing water consumption over a period of time. If possible, check in the school drains (those that receive effluent from the school only and do not receive stormwater) for any flow. Note that groundwater incursion may occur into the drains.
- Check for any areas of lush vegetation, eg patches of long grass or unusually vigorous plants, which may indicate an underground leaking pipe.
- Remove any unused equipment that might be a cause of leaks, eg an unused hose.
- Ask the local water provider to visit the site and check for leaks.

Water-saving measures
- Consider water-saving devices and practices for specific areas.

Operational/managerial tasks
- Raise awareness of water-use issues by staff training.
- Encourage water conservation by setting up a staff and pupil suggestion scheme.
- Publicise water saving initiatives using posters, leaflets or newsletters.
SYNDICATE EXERCISE 2 - A SMALL BREWERY - DELEGATES’ HANDOUT

Your task
You have been asked to assess the costs and benefits of installing various water-saving devices at a small brewery and to recommend a strategy to the works manager. Are you happy with the types of saving device recommended?

Setting the scene
The ‘Loads-of-Beer’ Brewery employs a total of 210 people in the main office, canteen, control room, three brewhouses and a packing area (packing and tanker bay). The number and location of the washroom facilities (toilets, washbasins and showers) are shown on the site plan (Fig A2). The brewhouses, canteen and control room operate 24 hours a day (three 8-hour shifts), 7 days a week. Assume that the number of employees needed to work in these areas does not change. All other areas operate on an 8-hour day, 5 days a week.

The water provider, Water R Us plc, currently charges the brewery £1.50/m³ in combined water and trade effluent charges. This cost is due to increase next year.

The utilities manager measured the volume of water used by each of the washroom facilities and reported as shown below.

Water use by washroom facilities at the brewery

<table>
<thead>
<tr>
<th>Facility</th>
<th>Water use</th>
</tr>
</thead>
<tbody>
<tr>
<td>WC</td>
<td>9 litres/flush</td>
</tr>
<tr>
<td>Washbasin</td>
<td>3 litres/event</td>
</tr>
<tr>
<td>Set of urinals</td>
<td>10 litres/flush*</td>
</tr>
</tbody>
</table>

* A single cistern holding 10 litres of water serves each set of urinals (up to 4 urinals). The urinals are currently set to flush every 10 minutes, 24 hours a day, 7 days a week.

The brewery’s Engineering and Environmental Services Department has assessed the potential to save water using information from a water management consultant who had visited the site. Engineering and Environmental Services then investigated different types of water-saving device and identified the most appropriate devices (as shown in the table below). Staff subsequently reported a leak in the safety shower of Brewhouse 1.

Details of water-saving devices

<table>
<thead>
<tr>
<th>Water saving device</th>
<th>Purchase cost</th>
<th>Installation cost</th>
<th>Water saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percussion tap</td>
<td>£20</td>
<td>£5</td>
<td>50%</td>
</tr>
<tr>
<td>Cistern volume adjusters (CVAs) for use with WCs</td>
<td>£4</td>
<td>£1</td>
<td>20%</td>
</tr>
<tr>
<td>Passive infrared (PIR) sensor for use with urinals</td>
<td>£150</td>
<td>£50</td>
<td>*</td>
</tr>
</tbody>
</table>

* Flushing of individual urinals only occurs when the urinal is used (3 litres/flush). If the system is not used for more than 12 hours, an automatic hygiene flush takes place to prevent odours.
Evaluate options

You may find it helpful to complete the following tables and to assume:

- The 210 employees are 105 men and 105 women.
- There is an even distribution of men and women in all areas of the site.
- Every man uses a urinal once and a WC once in an 8-hour shift or day. If a man is working in an area of the site that only has a WC (the brewhouse, packing or the tanker bay), assume that he will use a urinal at the canteen during a break.
- Every woman uses a WC twice in an 8-hour shift or day.
Everyone washes his or her hands after using a urinal or a WC.
The brewery operates for 50 weeks a year.

To simplify the calculation, ignore water use for the hygiene flush for urinals fitted with PIR sensors.
The tables are divided into areas not working shifts and areas working shifts.

**Numbers of each type of facility**

<table>
<thead>
<tr>
<th>Washroom facility</th>
<th>Main office and packing area*</th>
<th>Brewhouses, control room and canteen</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WCs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washbasins</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Includes packing room and tanker bay.

**Typical frequency of use**

These values represent the number of times people use each facility - it does not necessarily mean they use the facility in their area. For example, men working in areas that only have a WC, eg the brewhouse, may use a urinal at the canteen during a break.

<table>
<thead>
<tr>
<th></th>
<th>Main office and packing area</th>
<th>Brewhouses, control room and canteen</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of people present</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>During each 8-hour shift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Urinals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/shift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WCs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/shift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Washbasins</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/shift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/week</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Summary

<table>
<thead>
<tr>
<th></th>
<th>Urinals</th>
<th>WCs</th>
<th>Washbasins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing system</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual water use (m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual water cost (£)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System with water saving device</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual water use (m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual water cost (£)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Annual savings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water (m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost (£)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of water saving device (£)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payback period</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remember, 1 000 litres = 1 m³.
SYNDICATE EXERCISE 2 - NOTES FOR FACILITATORS

It is recommended that you facilitate the same group for both exercises. Therefore, you will not have to introduce yourself and the delegates will already know one another. You should not take the lead in this exercise, but you may need to redirect or advise the group.

Tell the delegates:

- They have 45 minutes to do this exercise.
- You advise them to work as a group - spending 40 minutes developing their strategy and 5 minutes preparing a report of their strategy for the works manager using a whiteboard and/or a flipchart.
- To restrict the report to four sheets.
- They may find it useful to elect one person as a timekeeper and one person to take notes on the whiteboard/flipchart.
- They should have all the information you need - they will need to make some assumptions, so simply outline the assumptions in the report and/or presentation. To make calculations simple, they should round values up or down, eg 400 days in a year, 25 hours in a day.
- They can ask for technical assistance from elected members of the organisers.

Early on, you may like to ask for a volunteer to present the group’s findings in the main presentation room, as part of the discussion session that follows each exercise. However, due to time constraints it may be more appropriate for you to outline your group’s findings.

Exercise execution steps

The team of delegates needs to make assumptions about the number of times people use the toilet. Make sure they don’t spend too much time discussing this - after all, there is no right answer! Suggest that, to save time, they use the assumptions given on their handout, ie:

- The 210 employees are 105 men and 105 women.
- There is an even distribution of men and women in all areas of the site.
- Every man uses a urinal once and a WC once in an 8-hour shift or day. If a man is working in an area of the site that only has a WC (the brewhouse, packing or the tanker bay), assume that he will use a urinal at the canteen during a break.
- Every woman uses a WC twice in an 8-hour shift or day.
- Everyone washes his or her hands after using a urinal or a WC.
- The brewery operates for 50 weeks a year.

This information can be used to present the data in the following manner. This may not be the way in which your group tackles the exercise, but you may find these tables helpful to give you an indication of the expected values.

The tables are divided into areas not working shifts and areas working shifts.

To simplify the calculation, ignore water use for the hygiene flush for urinals fitted with PIR sensors.

The value of £1.50/m$^3$ for combined water and effluent charges is an arbitrary one chosen to make the calculations simple. It is based on an average water supply charge of 69 pence/m$^3$ (range 46 - 86 pence/m$^3$) rounded up to £1/m$^3$ and an average effluent charge (R + V) of 29 pence/m$^3$ (range 12 - 46 pence/m$^3$) rounded up to 50 pence/m$^3$. The value chosen is also just below the maximum of £1.55/m$^3$ for combined water and effluent charges in the UK in 1999/2000.
Numbers of each type of facility

<table>
<thead>
<tr>
<th>Washroom facility</th>
<th>Main office and packing area*</th>
<th>Brewhouses, control room and canteen</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinals</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>WCs</td>
<td>19</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>Washbasins</td>
<td>12</td>
<td>5</td>
<td>17</td>
</tr>
</tbody>
</table>

* Includes packing room and tanker bay.

Typical frequency of use

These values represent the number of times people use each facility - it does not necessarily mean they use the facility in their area. For example, men working in areas that only have a WC, eg the brewhouse, may use a urinal at the canteen during a break.

<table>
<thead>
<tr>
<th>Number of people present</th>
<th>Main office and packing area</th>
<th>Brewhouses, control room and canteen</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>During each 8-hour shift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per day</td>
<td>120</td>
<td>90</td>
<td>210</td>
</tr>
<tr>
<td>Per week</td>
<td>600</td>
<td>630</td>
<td>1230</td>
</tr>
<tr>
<td>WCs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/shift</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/day</td>
<td>60(1)</td>
<td>45</td>
<td>105</td>
</tr>
<tr>
<td>Number of uses/week</td>
<td>300</td>
<td>315</td>
<td>615</td>
</tr>
<tr>
<td>Washbasins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/shift</td>
<td>60(2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of uses/day</td>
<td>240(3)</td>
<td>180</td>
<td>420</td>
</tr>
<tr>
<td>Number of uses/week</td>
<td>1200</td>
<td>1260</td>
<td>2460</td>
</tr>
</tbody>
</table>

Main office and packing area work: 8-hour day 5 days/week
Brewhouses, control room and canteen work: 24-hour day (3 x 8-hour shifts) 7 days/week

(1) (60 men x 1) + (60 women x 0) = 60  
(2) (60 men x 1) + (60 women x 2) = 180  
(3) (60 men x 2) + (60 women x 2) = 240

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**Summary**

The values that have been rounded up/down in the following calculations are underlined.

Brewery’s current combined water and effluent cost = £1.50/m³.

**Urinals**

There are three sets of urinals, ie three cisterns. PIR sensors are the recommended water-saving device. PIR sensors control flushing so that it only occurs when the urinal is used.

Existing system:

- Annual water use = 3 cisterns x 10 litres/flush x 6 flushes/hour x 25 hours/day x 400 days/year = 1 800 000 litres = 1 800 m³
- Annual cost of water = 1 800 m³ x £1.50/m³ = £2 700

System using water-saving device (PIR sensor):

- Annual water use = 600 uses/week x 3 litres/flush x 50 weeks/year = 90 m³
- Annual cost of water = 90 m³ x £1.50/m³ = £135
- Annual water savings = 1 800 - 90 = 1 710 m³
- Annual cost saving = £2 700 - £135 = £2 600
- Cost of water-saving devices for six urinals = (£150 + £50) x 6 = £1 200
- Payback period = 1 200/2 600 = 6 months

**WCs**

CVAs are the recommended water-saving device. They will reduce water use by 20%.

Existing system:

- Annual water use = 2 000 uses x 9 litres/flush x 50 weeks/year = 900 m³
- Annual cost of water = 900 m³ x £1.50/m³ = £1 400

System using water-saving device (CVA):

- Annual water use = 0.8 x 900 m³ = 720 m³
- Annual cost of water = 720 m³ x £1.50/m³ = £1 000
- Annual water savings = 900 - 720 = 180 m³
- Annual cost saving = £1 400 - £1 000 = £400
- Cost of water-saving devices for 24 WCs = (£4 + £1) x 24 = £120
- Payback period = 120/400 = 3 months

**Washbasins**

Percussion taps are the recommended water-saving device. They will reduce water use by 50%.

Existing system:

- Annual water use = 2 000 uses x 3 litres/event x 50 weeks/year = 300 m³
- Annual cost of water = 300 m³ x £1.50/m³ = £450

System using water-saving device (percussion taps):

- Annual water use = 0.5 x 300 m³ = 150 m³
- Annual cost of water = 150 m³ x £1.50/m³ = £225
- Annual water savings = 300 - 150 = 150 m³
- Annual cost saving = £450 - £225 = £225
- Cost of water-saving devices for 17 washbasins = (£20 + £5) x 2 taps x 17 = £850
- Payback period = 850/225 = 4 years

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Questions you may like to ask during the main discussion session (answers in italics)

- Is it worth changing the washbasin taps in the outdoor washroom between the packing room and the tanker bay? *It is probably not worth it because of the low frequency use. Delegates are likely to work out for themselves that the washbasins are probably the least cost-effective of the three options.*

- What should be done about the leaking shower? *The safety shower should be assessed and either repaired or replaced. It is a legal requirement.*

- Do you think that the PIR sensor is the best water-saving device for all the urinals? *Alternatively, you could use a timer switch in the main office area programmed to operate during the 8-hour day and not during evenings or weekends.*

### Summary

<table>
<thead>
<tr>
<th></th>
<th>Urinals</th>
<th>WCs</th>
<th>Washbasins</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing system</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual water use (m³)</td>
<td>1 800</td>
<td>900</td>
<td>300</td>
</tr>
<tr>
<td>Annual water cost (£)</td>
<td>2 700</td>
<td>1 400</td>
<td>450</td>
</tr>
<tr>
<td><strong>System with water-saving device</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual water use (m³)</td>
<td>90</td>
<td>720</td>
<td>150</td>
</tr>
<tr>
<td>Annual water cost (£)</td>
<td>135</td>
<td>1 000</td>
<td>225</td>
</tr>
<tr>
<td><strong>Annual savings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water (m³)</td>
<td>1 710</td>
<td>180</td>
<td>150</td>
</tr>
<tr>
<td>Cost (£)</td>
<td>2 600</td>
<td>400</td>
<td>225</td>
</tr>
<tr>
<td>Cost of water-saving device (£)</td>
<td>1 200</td>
<td>120</td>
<td>850</td>
</tr>
<tr>
<td>Payback period</td>
<td>6 months</td>
<td>3 months</td>
<td>4 years</td>
</tr>
</tbody>
</table>

* Due to rounding, some of the entries may not tally.
PROFITING FROM REDUCING WATER USE

Name: ........................................................................................................
Company: ........................................................................................................
Job title/position: ........................................................................................................
Address: ........................................................................................................

Tel: ........................................................................................................
Number of employees: ........................................................................................................
Type of business (eg textiles): ........................................................................................................

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Venue**

**Speaker 1**

Content

Duration

**Speaker 2**

Content

Duration

**Speaker 3**

Content

Duration

**Workshop exercise 1**

Content

Duration

**Workshop exercise 2**

Content

Duration

**Discussion**

**Overall usefulness**

Are there any other topics you would have liked us to cover in this workshop?
Were there any ways in which the workshop could have been improved?

Please complete and hand in before leaving the event. Thank you.

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This Appendix contains the two post-workshop exercises outlined in presentation 3 (see Section 3.6). It is intended that these exercises are performed after the workshop to form the basis of a ‘water management at work’ scheme.
GETTING STARTED EXERCISE 1

Use this questionnaire to collect information about your existing water management scheme.

Company name: ......................................................................................................................
Nature of business: ..................................................................................................................
Location: .................................................................................................................................
Number of employees: ............................................................................................................

Why save water?
Even efficient companies produce waste. The true cost of waste can be as high as 10% of business turnover. Most companies can achieve savings of at least 1% of their turnover through water management.


Your company turnover: ..........................................................................................................

1% of your company turnover: ..................................................................................................

✔ Add these data to the checklist on page 57.

Key questions
The answers to these questions can be found on your water bills. If you cannot find your water bills, ask the customer centre of your water provider for duplicates.

Water provider: ........................................................................................................................

How much water do you use? Volume: ................................................................. m³/year
Water supply charge Charge: ................................................................. pence/m³
Are you using too much? Cost: ................................................................. £/year

How much effluent do you produce? Volume: ................................................................. m³/year
Effluent treatment charge Charge: ................................................................. pence/m³
Are you producing too much? Cost: ................................................................. £/year

✔ Add these data to the checklist.

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Add these answers/comments to the checklist.

Calculate your average daily use

Use information from your water bills to calculate your average daily use (ADU). You can calculate the average daily volume of water used either from your quarterly bills or from the annual bill.

<table>
<thead>
<tr>
<th></th>
<th>Year 1: ..........</th>
<th>Year 2: ..........</th>
<th>Year 3: ..........</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of water used (m³/year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of water (£/year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average daily use (m³)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Add the ADU values to the checklist.

Trends in water use

A visual representation of the volume of water used per quarter can help to identify trends in water use. Plot your water use profile from recent years on the graph below.
Pipe and meter locations

Do you know where your main incoming water supply pipe is located? .........................
NB. You may have more than one entry point.

Do you know the location of your water meter(s)? ..........................................................

If the answer to these questions is No, then the customer centre of your water provider should be able to tell you over the phone - you will need to quote your account number.

✔ Add this information to the checklist.

Do you have detailed and recent plans of your workplace? ............................................

Do you know the major points of water use on your site? ..............................................

✔ Add this information to the checklist.

Your supply pipe will generally run between your water meter (usually on the boundary of your property) and the first point of entry of water into the building.

Your supply pipe and water meter(s) should be labelled on any detailed plans of your workplace.
To get the most from this workshop, try answering the following questions:

<table>
<thead>
<tr>
<th>Task</th>
<th>Notes</th>
<th>Action to be taken*</th>
<th>Date completed*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Name of water provider</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Your company turnover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Volume of water used (m³/year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Cost of water used (£/year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Volume of effluent produced (m³/year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Cost of effluent produced (£/year)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Calculate average daily use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Does the average daily use seem realistic?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Find your water supply pipe(s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Find your water meter(s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Detailed survey of site?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurate/recent?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Initial ideas on minimising waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Initial ideas on implementation at work</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* If you do not know the answer to a question, make a note of the necessary action to be taken. When you complete the action, make a note of the date.
### CALCULATING AVERAGE DAILY USE (ADU)

**Example**

<table>
<thead>
<tr>
<th>Date</th>
<th>Reading</th>
<th>Consumption (m$^3$)</th>
<th>Time period</th>
<th>ADU (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/07/99</td>
<td>100</td>
<td>100</td>
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GG229 published by the Environmental Technology Best Practice Programme. Helpline 0800 585794
GETTING STARTED EXERCISE 2

Draw a sketch of your place of work (see overleaf) using the following guidelines:

- Draw a sketch of your workplace that you are directly involved with in the grey box.
- Add areas that you don’t use outside the grey box.
- Add communal areas such as the toilets, canteen and staff shop outside the grey box.
- Add the sources of water used using a colour and showing the direction of flow.
- Add the sources of water-based waste using another colour and showing the direction of flow.

It may help to use a table (see page 61) to list the processes that use water. Do you know the source and fate of this water? If so, add these to the table.

Do you know the approximate volume of water used in each process? Add this information to the table.

After a first attempt at compiling a table of the source and fate of water for processes using water in your workplace, consider implementing a systematic programme to reduce water use and effluent generation.

Key stages and activities include:

- documenting the water balance;
- gaining commitment;
- obtaining ideas and support from external sources such as the Environmental Technology Best Practice Programme.
Make a sketch of your workplace.

Key:
<table>
<thead>
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<th>Process</th>
<th>Source of water*</th>
<th>Fate of water**</th>
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* Mains, groundwater (borehole), surface water (rivers and lakes), rainwater, etc.

** Surface drain, effluent drain, foul sewer drain, evaporation, product, etc.
DIARY FOR IMPLEMENTATION OF A WATER MANAGEMENT/WASTE MINIMISATION SCHEME

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The Environmental Technology Best Practice Programme is a Government programme managed by AEA Technology plc.

The Programme offers free advice and information for UK businesses and promotes environmental practices that:

- **increase profits for UK industry and commerce**;
- **reduce waste and pollution at source**.

To find out more about the Programme please call the Environment and Energy Helpline on freephone 0800 585794. As well as giving information about the Programme, the Helpline has access to a wide range of environmental information. It offers free advice to UK businesses on technical matters, environmental legislation, conferences and promotional seminars. For smaller companies, a free counselling service may be offered at the discretion of the Helpline Manager.

FOR FURTHER INFORMATION, PLEASE CONTACT THE ENVIRONMENT AND ENERGY HELPLINE

0800 585794

world wide web:  http://www.etbpp.gov.uk

e-mail address:  etbppenvhelp@aeat.co.uk