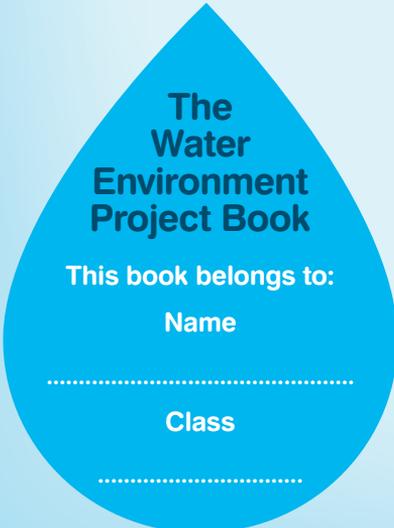




# The Water Environment Project Book



The  
Water  
Environment  
Project Book

This book belongs to:

Name

.....

Class

.....



## Where does our water come from?

Once upon a time, people had to fetch their water in buckets from pumps, wells, rivers or streams. Today, your water reaches your home through a big network of pipes, treatment plants and pumping stations known as the Yorkshire Grid.

Yorkshire Water makes sure there's enough water for us to use whenever we need it by using the following resources:

**Reservoirs** – these are artificial lakes made by building a wall, called a dam, across a valley to catch the water which drains off the surrounding hills.

**Rivers** – river water is safe to drink once it's been treated. The main rivers used by Yorkshire Water are the Wharfe, Esk, Ure, Hull, Ouse and Derwent.

**Boreholes and springs** – A borehole is a huge well which lets Yorkshire Water get water from deep underground. There are boreholes in many parts of Yorkshire, particularly the east. This water is naturally filtered and cleaned as it passes through rocks and needs very little treatment before it's safe to be delivered to our homes.

On average, 45% of Yorkshire's water comes from reservoirs



Water makes up 80% of our brains so it's important that we drink enough to be able to concentrate – especially in class!



## Why does water need to be treated?



To make your water safe to drink, Yorkshire Water treats it at over 55 water treatment works. Here's how;



### Screening

The water passes through a huge metal strainer (called a "screen") to remove things like leaves and twigs.



### Flocculation

Chemicals are added to act like a magnet for "baddies" like dirt and dangerous germs (called "bacteria"). The chemicals form a sort of jelly (called "floc").

### Clarification

To remove the floc, air is bubbled through the tanks to make the floc float to the surface, where it is scraped off.



### Granular Activated Carbon

Used to remove the "baddies" killed by the ozone gas, as well as traces of metals such as manganese, which can also be found in the water.



### Ozone tank

Ozone is a gas which is a powerful disinfectant. It is bubbled through the water to kill any remaining "baddies".

### Filtration

The water is passed through filters filled with sand to remove any last bits of floc.

### Chlorination

Chlorine is then added to the water. This kills off any bugs that are in the pipework as the water travels from the water treatment works to your house.

The water then goes to an underground storage area called a service reservoir ready to be piped to your home.



## Investigate!

Can you name the nearest river to your school? Use a map to find out where it goes after it has passed your school. Does it join another river, or flow into the sea?

In 1854, Dr John Snow was the first person to link illness (cholera) with contaminated water. A discovery which led to the disinfection of water supplies.

## Make your own water filter

### You will need

- A plastic bottle cut in half (ask an adult to do this)
- Napkins or paper towels
- Gravel, sand and cotton balls for your filter
- Dirty water (You can make it by adding soil, food colouring, pieces of paper, or tiny pieces of wood).

### What to do

1. Put the top half of the bottle upside-down (like a funnel) inside the bottom half. The top half will be where you build your filter; the bottom half will hold the filtered water.
2. Layer the filter materials inside the top half of the bottle. Think about what each material might remove from the dirty water and in what order you should layer the materials.
3. Pour the dirty water through the filter. What does the filtered water look like? (DON'T DRINK IT!)
4. Take the filter apart and look at the different layers. Can you tell what each material removed from the water is?

### Things to think about

- Wipe the bottle clean and try again. Try putting materials in different layers or using different amounts of materials.
- Can you think of any other materials you could use in your filter to make it work even better?

Around 95% of the water you use is returned to us as waste water via your washing machines, sinks, toilets and drains.



## What happens to the dirty water when it leaves your home?

The dirty water you pour or flush away has to be made clean again. Yorkshire Water does this at over 600 waste water treatment works.

The water from your sink, bath or toilet goes into a pipe called a drain. All the drains in your neighbourhood join a larger pipe called a sewer and a number of sewers then join together to form a trunk sewer. Sewers can be anything from 100mm to 5.5m wide!

The waste water (or "sewage") travels down the sewer to a treatment works, where it is cleaned and returned to a stream or river to rejoin the water cycle.

Cleaning the water is important for the environment too. Untreated (or "raw") sewage sometimes contains chemicals from farms and factories which can be harmful to animals and plants. Raw sewage also contains "baddie" compounds which micro-organisms gobble up, and use up all the oxygen in the water. If untreated sewage gets into a river, all the oxygen that plants and fish need to keep them alive would quickly be used up.

Did you know...

Yorkshire Water have a network of around 20,000 miles of underground pipes, collecting waste water from Yorkshire's homes!

## Pipeline puzzle

Dave the plumber bought two pipes and a joint to fix them together. He spent £3.30. A pipe costs twice as much as a joint. How much does a joint cost?

H<sub>2</sub>O

uz/937

H<sub>2</sub>O

## Can you find the solution to this problem?

Which substances dissolve in water and which are only suspended in it? If the substance has dissolved, the solution (the mixture of water and dissolved stuff) should look the same throughout. The particles will have broken up and will be spread evenly in the water. If the mixture stays cloudy, and the particles hang there and then settle to the bottom, you've made a "suspension" rather than a "solution".

### You will need

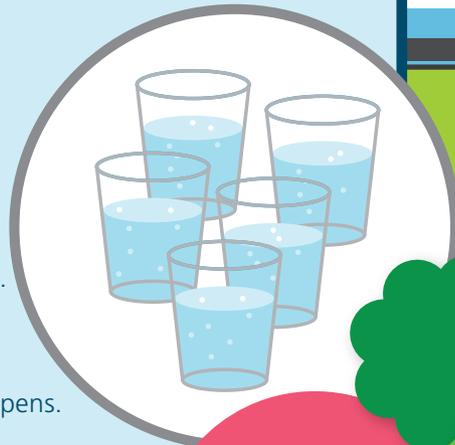
- 5 beakers
- 1 teaspoon each of salt, flour, baking powder, sugar and soil

### What to do

1. Fill the glasses with cold water.
2. Stir a spoonful of salt into the first glass.
3. Stir a spoonful of flour into one glass, baking powder into another, and so on.
4. Wait for a few minutes to see what happens.

### Things to think about

- How can you clean up your five samples of water?
- **Hint 1** – You've read about filters in the sections on water and sewage treatment. Which of your beakers could be filtered?
- **Hint 2** – You know that water evaporates from the oceans and falls back to Earth as rain. Seawater is salty, but rain isn't. Does that give you a clue about getting the salt back out of your water sample?



It takes the poo of 100,000 people to generate 51kw of electricity, enough for 500 light bulbs (source [www.upd8.org.uk](http://www.upd8.org.uk))

Between 70 and 75% of the earth's surface is covered with water, however less than 1% of this water is available for humans to use.



## How is the used water made clean again?

Sewage contains both solids and liquids. The solids need removing and the liquid needs cleaning. Here's how Yorkshire Water do it:

### Screening

Screens (you've read about them in the section on water treatment) remove solids such as wood, rags and paper.

### Primary treatment

The sewage flows into large tanks where most of the remaining solids settle to the bottom. This is called sewage "sludge".

### Final treatment

The cleaned sewage may need to be put through a sand filter or a bed of reeds. Zapping the sewage with ultra-violet light is another way of making sure that any remaining "baddies" are killed.

### Secondary treatment

"goodie" micro-organisms feed on the "baddie" compounds in the water. The liquid sewage may be trickled over stones on which the micro-organisms live, or mixed with the micro-organisms in a tank, in a soup-like mixture. Oxygen is fed into the tank, so that the "goodie" micro-organisms can breathe. After this the sewage flows into large tanks, to allow the solids to settle.

### Water Waste Wordsearch

Find the following words:

- |         |         |
|---------|---------|
| Baddies | Screens |
| Filter  | Sewage  |
| Goodies | Sludge  |
| Liquid  | Solids  |
| Oxygen  | Tank    |

B A D D I E S G E N  
S U S D I L O S A Y  
L B Z P E L O S K C D  
U B R O D F T N Y A I  
D L F I L T E R R U  
G E E S E W A G E Q  
E S E N E G Y X O I  
S T A N K T M E N L  
L B A S C R E E N S



## Where does the sludge go?

During the sewage treatment process, the solids turn into sludge. This has to be disposed of in ways which won't harm the environment.

### The ways used are:

#### Agriculture

Thickened sludge mixed with green waste can be sprayed onto farmers' fields by a tanker to fertilise the soil. It's a good source of nitrogen and phosphorus which plants need to help them grow.

#### Composting

Sludge is mixed with straw or wood chippings and stored in heaps which are regularly turned by a machine for about 2 months. After this, it can be used for land reclamation.

#### Incineration

When sludge has a high content of metal it cannot be used as fertiliser. It has to be dried and then burned in an incinerator. Some water companies now use their incinerators to generate heat.

#### Energy Generation

Sludge heated to high temperature and then digested can release methane. This gas is collected to produce electricity. The treated sludge is then used by farmers as fertiliser.

In one year alone, Yorkshire Water have to clear 18,000 blockages in Yorkshire's sewers

## Look after your sink and love your loo!

Every day people put the wrong things down toilets and sinks. You wouldn't believe what Yorkshire Water finds in their sewers – nappies, false teeth and even Christmas trees!

While this may sound funny, the problems it can cause are no laughing matter. These items don't dissolve and so can block the pipes and sewers. The dirty waste water then has to find another way to escape. Often it ends up flooding back out of kitchen sinks, toilets or manholes in the street.

Why not FEED THE BIRDS!  
Get yourself a FREE Fat Bird.  
Ask a parent or carer to pour the left over cooking fat, grease or oil into the tray to make a tasty treat for the birds! Visit [yorkshirewater.com/dirty](http://yorkshirewater.com/dirty) to order yours!

## Have you got the foggiest idea about FOG?

Find out and write down some examples of where cooking fat, oils and grease (it's easy to remember it as FOG!) come from.

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## Do you know your Do's and Don'ts?

Have a read through the following statements and tick **Do** if you agree or **Don't** if you disagree.

It's okay to flush nappies down the toilet.

Do  Don't

It's okay to flush wet wipes down the toilet.

Do  Don't

The best place for leftover cooking fat is in a container in the waste bin.

Do  Don't

Leave the hot tap running when pouring cooking fat down the sink and it won't get blocked.

Do  Don't

Leftover food should not be washed down the sink.

Do  Don't

Leftover cooking fat mixed with seeds makes a great meal for garden birds.

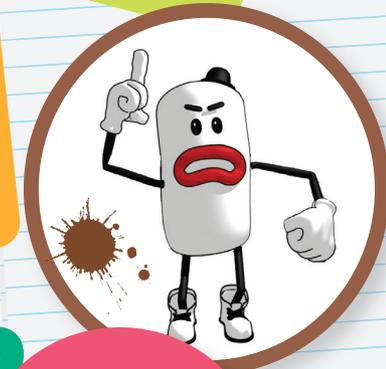
Do  Don't

Always wash leftover food off plates into the sink.

Do  Don't

Always put hair, cotton wool and cotton buds in the bin not down the loo.

Do  Don't



From over 18,000 sewer blockages in Yorkshire! 20% of these were caused by fat and 17% were created by discarded wipes and nappies!

## Bin, recycle or tip?

### Take up our ticklish tick-list challenge

Here's a long list of things which shouldn't be put down the drain. Sort them out and decide how they should be disposed of safely by completing this chart.

Put a tick in the right place to show how each item should be thrown-away safely.

	Household rubbish bin	Recycling centre	Rubbish tip	Composter
Floor/baby wipes				
Stickers				
Nappies				
Toys				
Paper/cardboard				
Paint				
Plastic bags				
Food waste				
Plasters				
Cotton buds/wool				
Hair				
Animal bedding				
Kitchen roll				

# Glossary

Here you'll find explanations of some of the words and terms used in this booklet.

## Agriculture

Farming, cultivation of the soil for crops and animals

## Borehole

A large well that allows Yorkshire Water to get water from under the ground

## Clarification

Passing air through the water to make the floc rise to the surface

## Composting

Disposing of sludge by mixing it with straw or wood chippings

## Derwent

One of the rivers that supplies water for Yorkshire Water

## Esk

One of the rivers that supplies water for Yorkshire Water

## Evaporation

The process by which water passes from a liquid to a gas

## Floc

When chemicals are added to the water dirt and germs are trapped in a jelly like substance called floc

## Ouse

One of the rivers that supplies water for Yorkshire Water

## Incineration

A method of disposing of harmful sludge by burning it at a high temperature

## Landfill

Disposing of sludge by filling areas that were once coal mines or quarries

## Micro-organisms

A tiny single cell life-form which can only be seen under a microscope

## Nitrogen

A chemical element found in sludge which is very beneficial to plants

## Oxygen

A chemical element found in water, essential to plant, animal and fish life

## Ozone

Pale blue gas that is soluble in water and can be used to kill bacteria in water

## Phosphorus

A chemical element found in sludge which is very beneficial to plants

## Pumping Station

Pumps water to, and sewage away from homes and businesses via pipe networks

## Reeds

A plant that grows in water and creates the perfect environment for micro-organisms

## Reservoir

A large man-made lake where water supplies can be stored

## Service reservoir

Where cleaned water is kept before going back to your home

## Sludge

The solid material found in sewage

## Ultra-violet

A form of light that can be used to kill harmful bacteria

## Ure

One of the rivers that supplies water for Yorkshire Water

## Wharfe

One of the rivers that supplies water for Yorkshire Water

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