

## 6 WASTEWATER TEACHER'S NOTES

*There are many ways to use the resource material provided in this package and the following day by day approach is just one suggestion. Please feel free to adapt and experiment with these ideas.*

*We are always keen to hear about how you are using this material and to receive your feedback about the resource.*

*EcoWater Solutions is developing a range of educational material relating to water and water use. A visiting speaker is also available to spend time with your class. Please contact us for further details.*

For many people, wastewater is 'out of sight, out of mind'. There is usually little thought about what happens to the dirty water after we pull the plug, have a shower, do a load of washing or flush the toilet. Whether we have a septic tank or a sewer connection, all of our wastewater finds its way back into the natural world where it has a social, economic and environmental cost. Aucklanders manage to pour an average of 280,000 litres of wastewater effluent into the Manukau Harbour each day. The cost of treating wastewater and protecting our already overburdened environment, will rise significantly over the next twenty years. Traditional ways of dealing with wastewater ~ "pipe it well away and forget about it!" ~ have their origin in Roman times. These are becoming unsustainable with large populations and the modern range of water polluting products which we use every day. This unit is designed to make students aware of wastewater, how it is produced, and its cost in social, economic and environmental terms. There is some excellent material available (free) from Watercare Services Ltd. When ordering this, we recommend that teachers enquire about making a class trip to the Mangere Wastewater Treatment Plant.

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### Day One

- Discuss with students all the different ways we use water around the house (shower, bath, handbasin, kitchen sink, dishwasher, laundry, toilet). Talk about what happens to the wastewater once we pull the plug, do a load of washing, flush the toilet etc.
- Work on Activity Sheet One, either individually or as a group task.

*Educational material on wastewater is available from Gladys Balmer, Watercare Services Ltd ph 256 2808. Gladys also arranges class visits to the treatment plant.*

*Wastewater  
Activity Sheet 1*

### Notes

**Activity Sheet 1** Wastewater flows from baths, showers, toilets etc into the house drains, and from these into the property's sewer pipe ('sewer lateral'). Sewer laterals from all the houses in a street are connected to the Council sewer pipe network. All sewer pipes are buried well underground. The Council's sewer pipe network connects with large sewer pipes called 'Interceptors'. These are owned by Watercare Services Ltd and carry wastewater to their wastewater treatment plant at Mangere. People with septic tanks treat their own wastewater on site, but the effluent still seeps into the environment.

Most people think that wastewater (or 'sewage') is mostly body wastes. In reality, wastewater is 99.9% water. In this activity, students list everything which is in wastewater. (This also makes a good 'brainstorming' activity for class or smaller groups). Students will quickly list the more obvious such as body wastes, but may need some guidance to think of less obvious things such as hair shampoo, hair, food scraps, fat, laundry powder, fabric conditioners, toilet paper, 'flush in the loo' chemicals, detergent, household cleaners, dirt etc.

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## Day Two

Wastewater  
Activity Sheet 2

- Introduce students to the idea that wastewater treatment is designed to prevent diseases from spreading and to protect the environment. It is interesting to make comparisons with other times and places where there is an absence of public sanitation.

(The United Nations estimates that 34,000 people in the world die each day from water carried diseases. (Approximately the same as 100 jumbo jet crashes per day!)

- Activity Sheet 2

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## Day Three

Wastewater  
Activity Sheet 3

- Talk about how we have dealt with wastewater in the past. Activity Sheet 3 covers the key points.

### Notes

**Activity Sheet 3** The main message here, is that wastewater systems are usually adequate until population pressure produces 'the critical number'. The Auckland region is now reaching this point again. Water pollution and beach closures are becoming commonplace. The ARC estimates that more than \$1billion needs to be spent to remedy the situation. Much of this burden will fall on the children you teach, so it is important that they begin to understand the issues if they are to be informed participants in future consultation and debate.

- Activity sheets 4 & 5 give a 'big picture' view of how we use water then collect and treat the wastewater.

### Notes

**Activity Sheet 4** This sheet revises earlier work on the water cycle and shows how important it is to the way we deal with wastewater. It can be useful to think of humans as 'interrupting' the natural water cycle by their water collection and disposal activities.

**Activity Sheet 5** Most people have no concept of the sheer size of the wastewater pipe network beneath our cities. It may be useful to think about pipes as 'underground rivers of wastewater'. A visit to a wastewater pumping station on the Western Interceptor is a memorable (but smelly!) way to reinforce this concept.

Wastewater  
Activity Sheets 4 & 5

How many words are there in "wastewater"?

a, as, at, we, are, art, ate, awe, ear, eat, era, ere, ewe, rat, raw, sat, saw, sea, see, set sew, tar, tat, tea, tee, war, was, wee, wet, area, arts, ears, east, eats, eras, ewer, ewes, rata, rate, rats, rest, sate, sear, seat, seer, star, stew, swat, tare, tart, tear, teas, tees, test, tree, tsar, ware, wars, wart, watt, wear, were, west, wets, areas, aster, aware, eater, erase, rates, reset, sewer, stare, start, state, steer, straw, strew, swear, sweat, sweet, taste, tater, tears, tease, terse, treat, trees, wares, warts, waste, water, wears, wrest, aerate, eaters, estate, rawest, seater, setter, strata, street, taster, tester, treats, waters, wetter, aerates, restate, sweater, easter

Contact Renette Carter, Watercare  
Services Ltd  
ph 634 7840. Renette is able to  
arranges class visits to a wastewater  
pumping station (30 minute trip)

## Day Four

*Wastewater  
Activity Sheets 6, 7 & 8*

*Gladys Balmer, Watercare Services Ltd ph 256 2808. Gladys arranges class visits to the treatment plant.*

- Work on activity sheets 6, 7 & 8. These help students to understand that:-

we each produce a huge volume of wastewater each year

wastewater consists mostly of water with varying degrees of contamination... by the time water reaches the sewer it becomes equally contaminated

wastewater treatment removes most of the contaminants but there is still a risk to the environment and public health

- Consider making a visit to the Mangere Wastewater Treatment Plant. Students find this a fascinating place and it is the best possible way to help them appreciate the scale of urban wastewater treatment. (2 to 3 hours). It is possible to make the pumping station and treatment plant visits on the same day.

## Day Five

*Wastewater  
Activity Sheet 9*

*Wastewater  
Activity Sheets 10 & 11*

- Talk to your students about inflow and infiltration (see box). This is the most serious problem facing our wastewater system today, and it will impact on their lives in the future (\$\$\$ costs, beach closures, public health).

Stormwater leaking into sewer pipes is a major problem throughout the world. In the Auckland region, nearly 40% of wastewater going to Mangere Wastewater Treatment Plant each year, is stormwater. This causes several problems:

- We have to pay to treat it (costs our city \$3,500,000 each year!)
- During heavy rain, stormwater leaking into sewers can cause them to overflow, polluting people's properties, flowing into streams and causing a health risk.

- Activity Sheet 9 helps students to understand the problem in visual terms. A presentation activity is suggested as follow up. Another good activity is to have a discussion / debate about just who should pay for repair of sewer pipes on private property.

### Notes

About half of the inflow infiltration is thought to come from wastewater pipes which belong to the property owner. Very few people would know whether there is rainwater leaking into their wastewater pipes, since these are buried underground. The problem can only be identified by closed circuit television inspection of suspect pipes. On average, it would cost a property owner \$2,000 to repair their pipes. Who should pay for repair of privately owned sewer pipes is a worldwide issue with lots of pros & cons. For example, there is the aspect of 'public good' involved here. Your students will have their own interesting ideas on the subject.

- Activity Sheets 10 & 11 ~ For homework, Friday afternoon or the last day of term!

For further assistance, contact Sue Langton, EcoWater's Educational Advisor  
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sue.langton@waitakere.govt.nz

Sue has worked as researcher, information centre coordinator and a teacher in secondary schools. Her teaching skills are in Science, Biology and information skills. She is able to assist Waitakere City teachers in the following ways:

- participate in syndicate / departmental planning sessions
- provide professional development sessions for groups of teachers about NZCF linked learning opportunities within the themes of water and water use
- provide a 'helpdesk' service for student research enquiries about water and water use
- supply a range of resource materials with links to other relevant organisations such as Watercare Services and the Auckland Regional Council
- arrange for a visitor from EcoWater Solutions to work with your class as part of a about water / water use study