

Unit 6: Wastewater Treatment

Level 3 – (Grade 3 & 4)

Did you know?

All the wastewater in Rutherglen & Wahgunyah, North East Victoria that has been flushed or emptied down the drain or toilet and treated at the Wahgunyah/Rutherglen Wastewater Treatment Plant (WTP) is re-used on pastures, parks and gardens, the golf course, bowling green, tennis court and the local High School sporting oval.

For more information on wastewater reuse visit the North East Water website: www.newater.com.au



If based on inquiry learning or blooms	Activity	Duration	Page
Understand, Apply & Analyse	1. Wastewater Treatment Part 1: Introduction to Wastewater Treatment Part 2: Excursion to a Wastewater Treatment Plant Part 3: The Wastewater Treatment Flowchart	Part 1: 1 hour Part 2: 4 hours Part 3: 1 hour	3 4 4-14
Understand, Evaluate & Create	2. Water comes, Water goes? Wastewater Part 1: Water Terms Part 2: Water comes, Water goes? Wastewater Part 3: Never Ever pour it down the sink!	Part 1: 45 minutes Part 2: 1 hour Part 3: 45 minutes	15 16 16
VELS Links		17-19	
TOTAL: 8.5 hours			

Unit Overview

Students will gain a greater understanding of what happens to our waste water once it disappears down the drain or is flushed down the toilet. Students explore how the Wastewater Treatment Plant (WWTP) treats all our wastewater from the sewer system and how it can be reused after it is treated. This unit follows on from **Unit 5: Water Use & Conservation** and can be undertaken as part of **Unit 4: Water Treatment**.

Background

North East Water operates 18 different Wastewater Treatment Plants (WWTP) within our region. Not all WWTP's are the same, many different processes are used to treat our wastewater and we also reuse our wastewater in many different ways throughout the catchment. For more information on Wastewater please contact North East Water's Education Officer, 1300 361 622 or education@nerwa.vic.gov.au



Keyword & Definitions

The following keywords and definitions will be explored throughout this unit. In order for students to become familiar with the terminology the keywords and their definitions can be used as 'words of the week'. Have students write out the keywords and definitions and put them up in the classroom or write them on the board for easy reference.

Word	Definition
Aerobic bugs	Bacteria that thrive in oxygen rich water. They eat the waste and remove chemicals in the wastewater
Aeration lagoon	A lagoon that have large mixers stir the water in the tank and mix in oxygen for the oxygen loving bugs who remove chemicals in the water
Anaerobic bugs	Bacteria that thrive in water low in oxygen. They eat the waste and remove chemicals in the wastewater
Chlorine	A chemical added to the water to kill any remaining bugs to ensure the water is clean and safe
Disinfection	Chlorine is added to the water to kills any bugs still remaining
Facultative lagoon	A lagoon that has a layer of water with oxygen loving bugs (aerobic) and layer of water underneath with bugs who don't like oxygen (anaerobic) who both munch on the organic matter in the wastewater as food
Grey water	Water that is used in the house which can be reused again in the garden or other parts of the house i.e. washing machine water diverted to the garden, shower water collected in buckets reused in the toilet
Inlet screen	In the direction of the current of a river or creek Wastewater is screened as it enters the WWTP to remove grit, rags and anything else that has been tipped down the drain, toilet or sewer system
Raw water	Water from a natural source that has not been treated at a Water Treatment Plant i.e. The Murray River water
Reticulated or Potable water	Water that has been treated at a Water Treatment Plant and is pumped to houses, businesses and industries
Re use	Once the wastewater is treated it can be re-used on parks, gardens, on farms, sporting ovals or school grounds
Septic tank	This is a tank that collects wastewater or sewage water from a house (not connected to a sewage plant) and treats it on your property
Sewage	Water that has been used and is flushed down the drain or toilet and enters the sewer system. This wastewater gets treated at a sewage plant or in a septic tank
Sludge	The solid waste that has been removed from the water. It is sent to the drying beds where it is turned over with a bulldozer until it dries out and looks like dirt. This dirt can be sent to farms where it is put on paddocks to make crops grow better
Stormwater	Rain water that flows off the roofs of houses and buildings and goes down the gutter into the stormwater pipes and flows into nearby creeks and rivers
Tank water	Rain water that is collected from roofs of houses and building and diverted into tanks for us to use
Wastewater	Water from houses, schools and businesses is flushed down the toilet or emptied down the drain. It enters the sewer system and travels to the WWTP or it may go to a septic tank
Wastewater Treatment plant (WWTP)	The place where wastewater goes to get treated. The plant removes the chemicals and bugs in the wastewater for it to be reused or discharged into the river
Ultraviolet	UV light from the sun (or from lights) is used to help kills any of the bugs in the water once that have eaten the organic matter

Activity One: Wastewater Treatment

Overview:

This activity explores the concept of where our water goes once it has been flushed down the toilet or emptied down the sink.

Duration:

Part 1: Introduction to Wastewater Treatment: 1 hour, page 3

Part 2: Excursion to a Wastewater Treatment Plant: 2 hours, page 4

Part 3: The Wastewater Treatment Flowchart: 1 hour, page 4

Equipment:

- Access to the Internet and other research resources
- Water treatment flow chart cards - Wodonga WWTP (page 5)
- The Wet Wild and Wonderful WWTP diagram (page 9)
- The Wet Wild & Wonderful recycled wastewater in town diagram (page 11)
- The Wet Wild & Wonderful recycled wastewater out of town diagram (page 12)
- Wastewater Treatment Plant (WWTP) Excursion activity sheet (page 13)

Part 1: Introduction to Wastewater Treatment

1. North East Water uses many different processes to clean, treat and even reuse our wastewater. Find out and explore how North East Water treats your wastewater from your school and houses at your local or regional Wastewater Treatment Plant (WWTP). Use the North East Water website to find out how your town treats its wastewater <http://www.newater.com.au/wastewater/>. Break students into groups and ask each group to investigate the meaning of the following water treatment terms using the water treatment flow chart cards (page 5).

• Wastewater	• Facultative
• Wastewater Treatment Plant (WTP)	• Disinfection
• Inlet screen	• Ultraviolet
• Aeration Lagoon	• Chlorine
• Aerobic bugs	• Sludge
• Anaerobic bugs	• Re use
2. In groups students are to match the water treatment flow chart cards title cards with the definition cards to explore the different processes of the WWTP. For example Ultra Violet Disinfection + UV light kills the bad bugs that are left in the water. The water treatment flow chart cards are based on the Wet Wild and Wonderful WWTP diagram (page 9). Other cards can be created to represent your local WWTP.
3. Allow groups to view other classmates card matching order and discuss the correct definitions of the WWTP process (correct matches are given using the colour code and sequence of the flowchart cards page 5).
4. The cards can be used in Part 3 of this activity: The Water Treatment Flowchart (page 4)

Part 2: Excursion to a Wastewater Treatment Plant

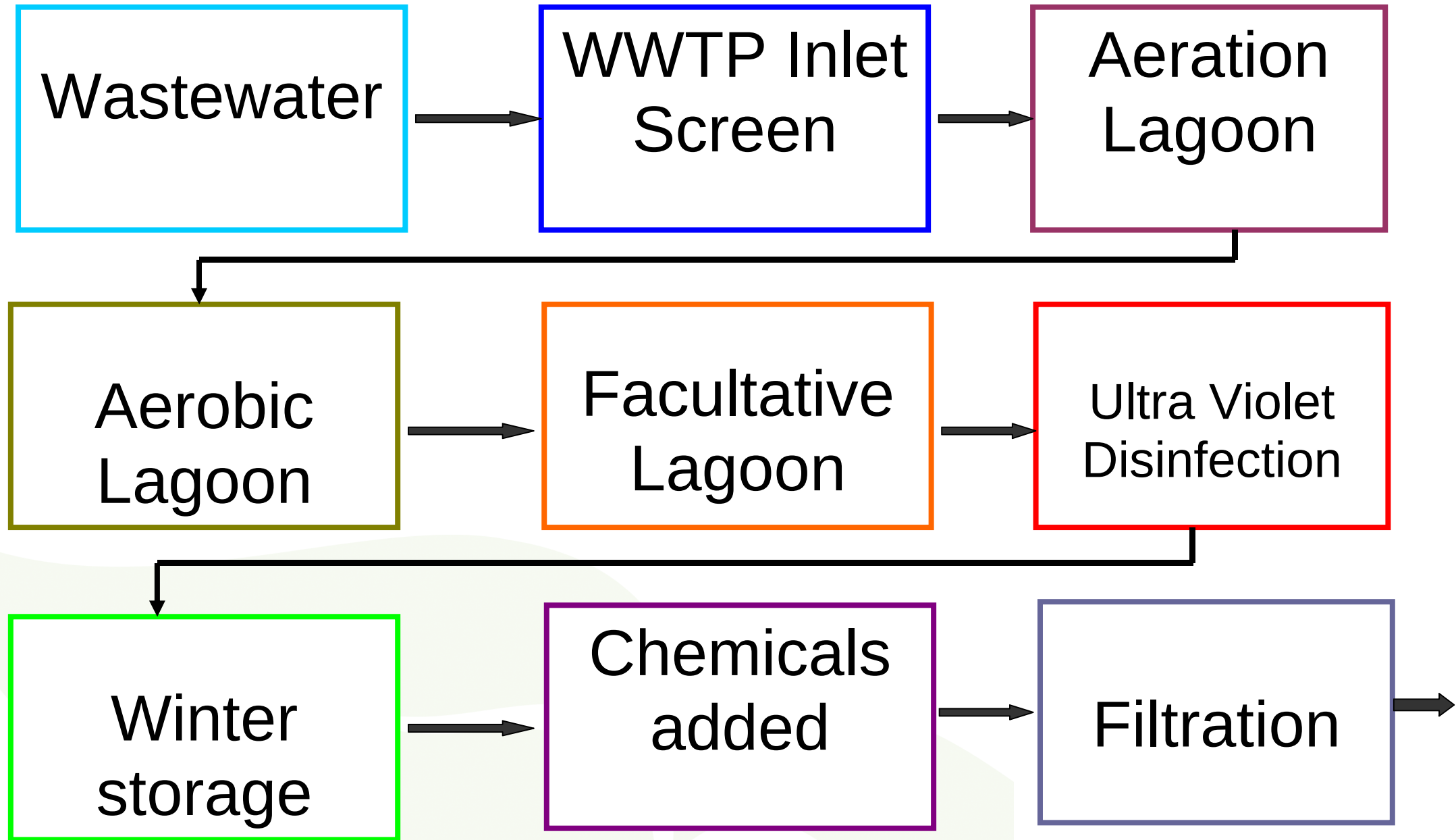
1. Contact North East Water's Education Officer education@nerwa.vic.gov.au to arrange a visit to your local or regional Wastewater Treatment Plant (WWTP) to see where the wastewater goes after it leaves your house and school and what it takes with it.
2. Prior to your excursion use the Wastewater treatment diagram, from the Wet Wild and Wonderful resource (page 9) to explain to students the process of how our wastewater gets treated and how it is reused. This activity can be done instead of undertaking the field trip.
3. When looking at the WWTP process using the Wet Wild and Wonderful WWTP diagram (page 9) ask students to colour in the diagram. Have students use different colour pencils to illustrate how the water may look as it changes from when it enters the WWTP and goes through the treatment process as it gets cleaner and eventually gets reused or released back into the environment.
4. Prior to the WWTP excursion give students a copy of the question sheet from the Wet Wild and Wonderful resource (page 13) to prompt students to ask questions, but do not allow them to answer them during the visit. After the visit have students fill in the answers to the questions and discuss the different wastewater treatment processes.
5. North East Water reuses wastewater many ways in and out of our towns, including watering some of our school ovals and sports grounds. Use the diagrams on pages to look at how wastewater can be reused in and out of town (pages 11 & 12).

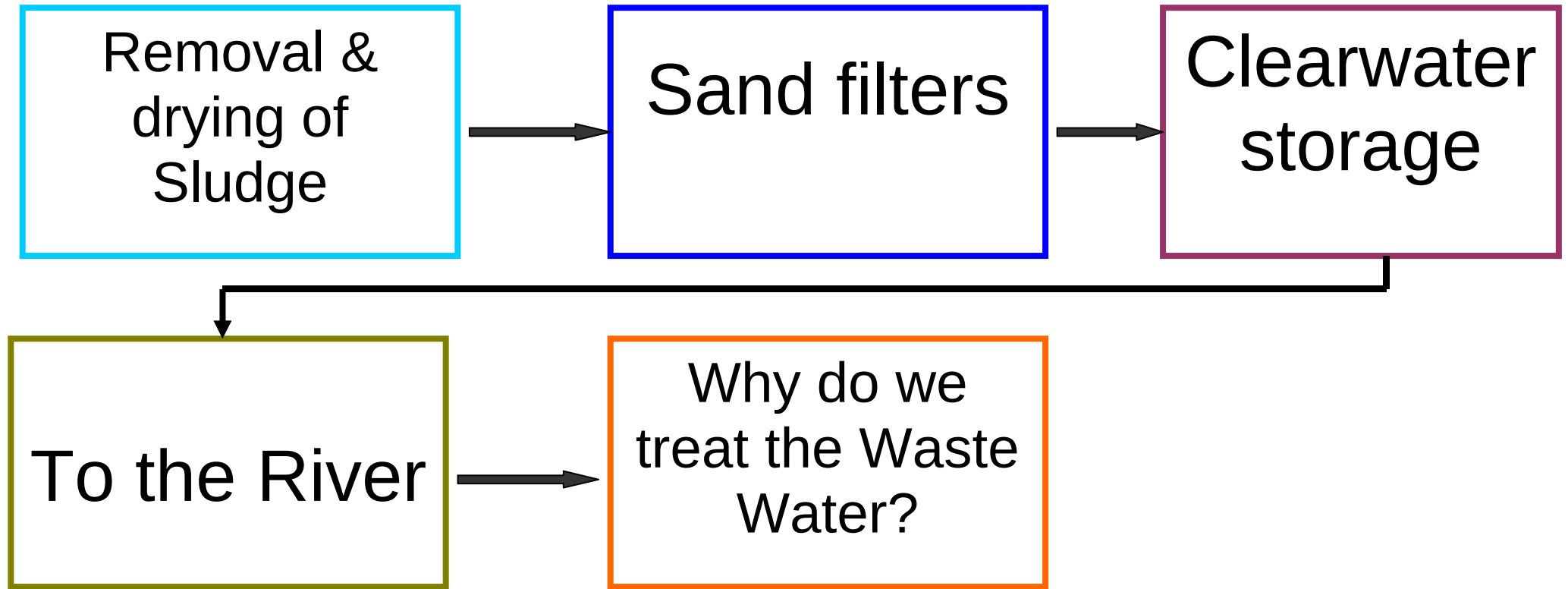
Part 3: The Wastewater Treatment Flowchart

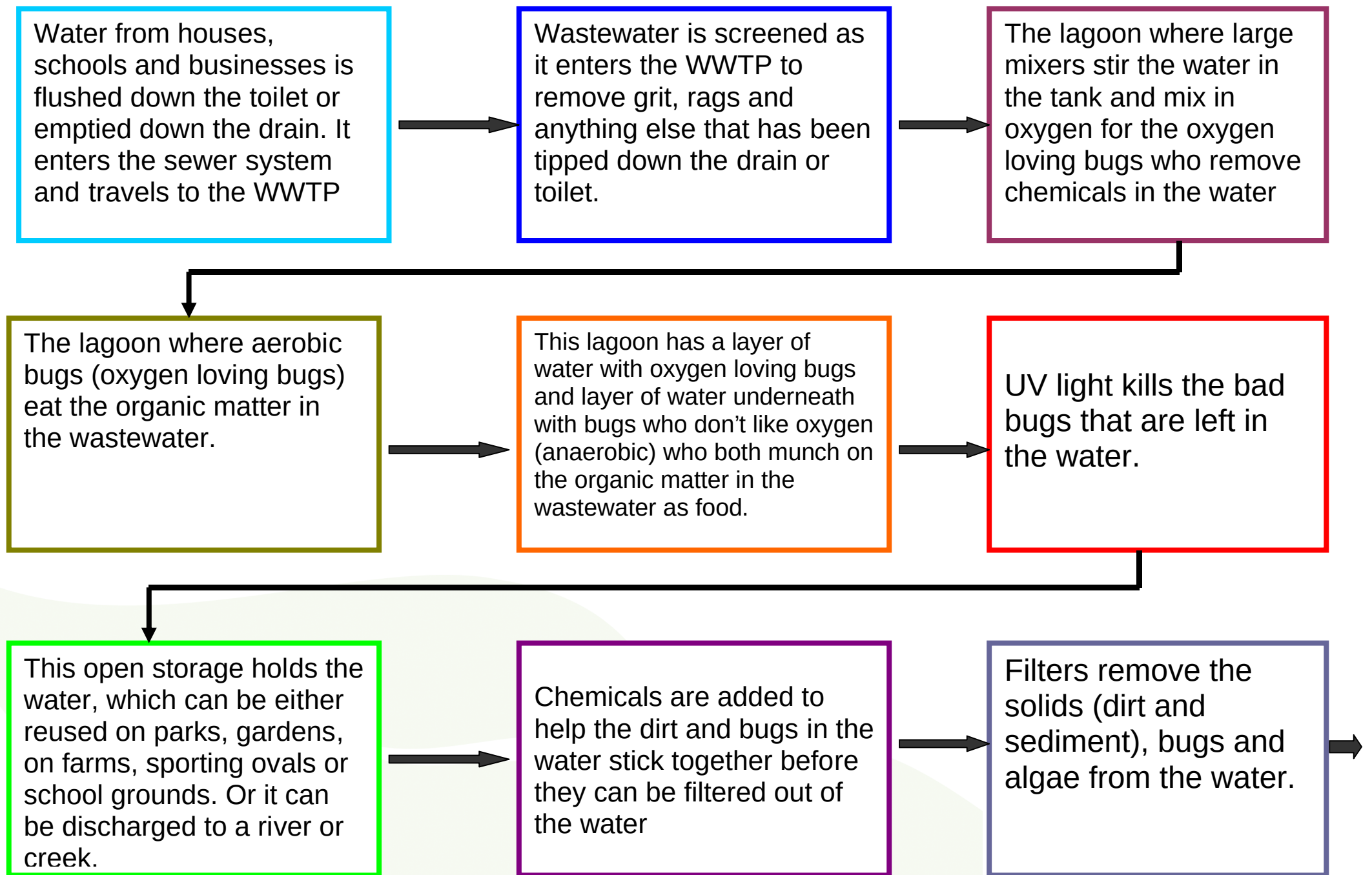
Students are to use the following flowchart (page 5) to further explore the processes of a WWTP. This activity can be undertaken after a visit to a WWTP or once the class has gone through the WWTP process using the Wet Wild and Wonderful WWTP diagram and defined the processing terms.

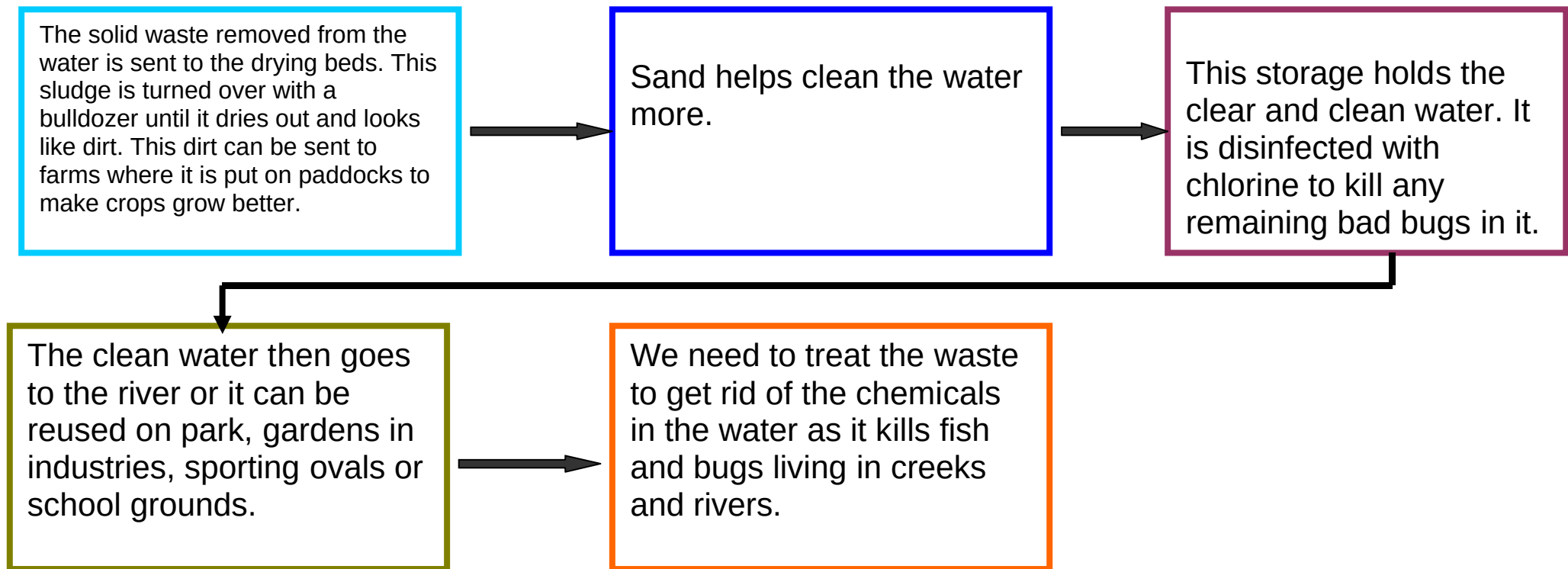
1. Ask students to break into their groups from Activity One, Part 1: Introduction to Wastewater Treatment (page 3)
2. Explain to students that they are going to create a flow chart of the WWTP process. Using their water treatment matching cards (based on the Wet Wild and Wonderful WWTP diagram page 13).
3. If wanting to investigate your local WWTP process ask students to make up cards using sticky notes for parts of the WWTP process they have seen on their excursion or identified through research.
4. Students in groups are to put their WWTP flowchart cards in order from the beginning of the Wastewater Treatment Process to the end, as in a flowchart (page 5). Tell students that they will need to decide as a group the order in which the cards should go and be able to justify their reasons.
5. After each group has created their flowchart allow each group to view other groups' flowchart order.
6. Regroup the class and discuss in turn each flowchart of the Wastewater Treatment process. Allow time for students to ask questions of other groups flowchart order.
7. Go over the Wastewater treatment process flowchart from the beginning to end using the cards and the Wet Wild and Wonderful WWTP diagram. (The correct flowchart sequence is set out in the order of the Flowchart starting on page 5) and discuss the treatment process.

Activity Sheet 1.1: The Wastewater Treatment flowchart activity cards



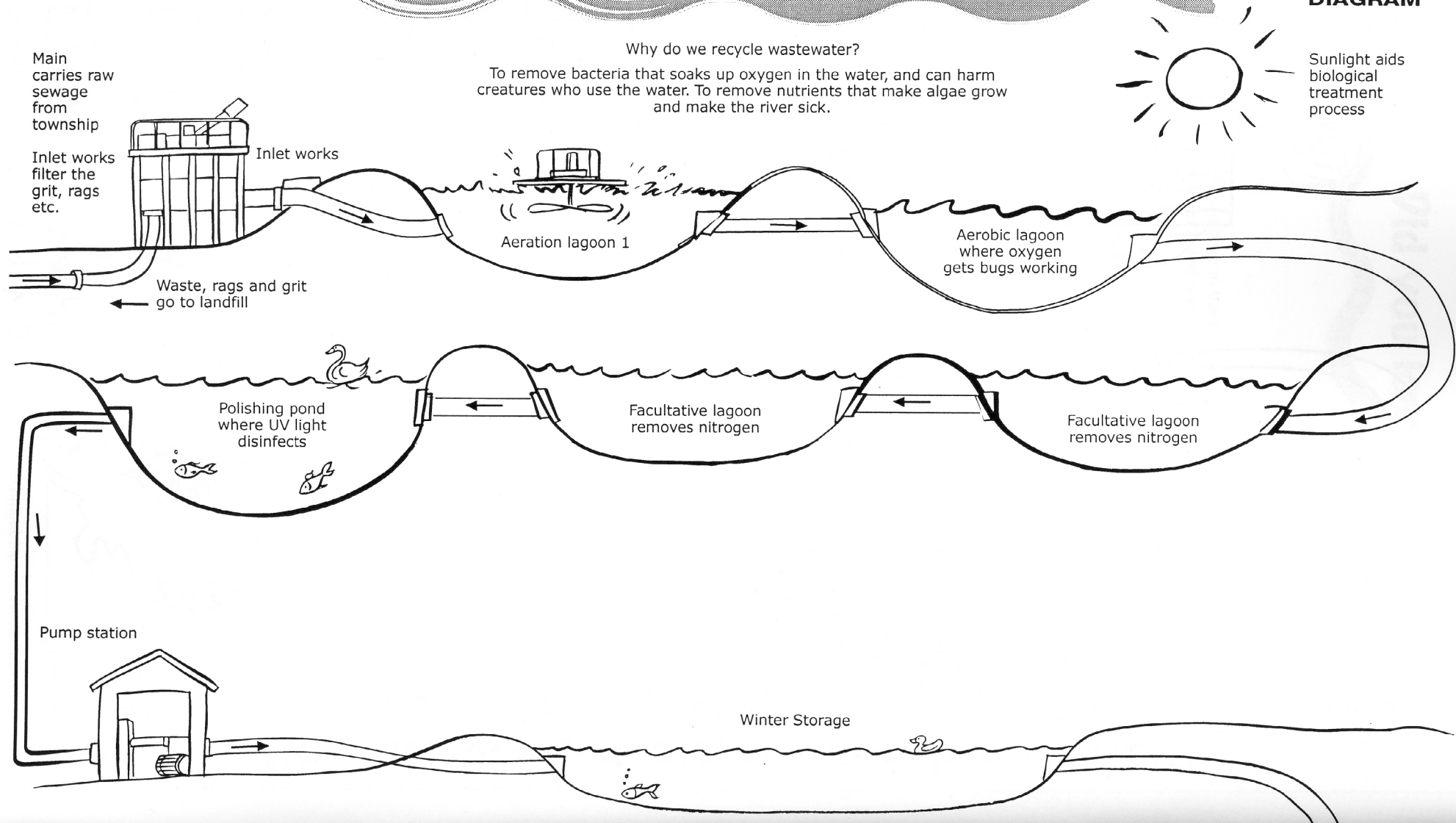


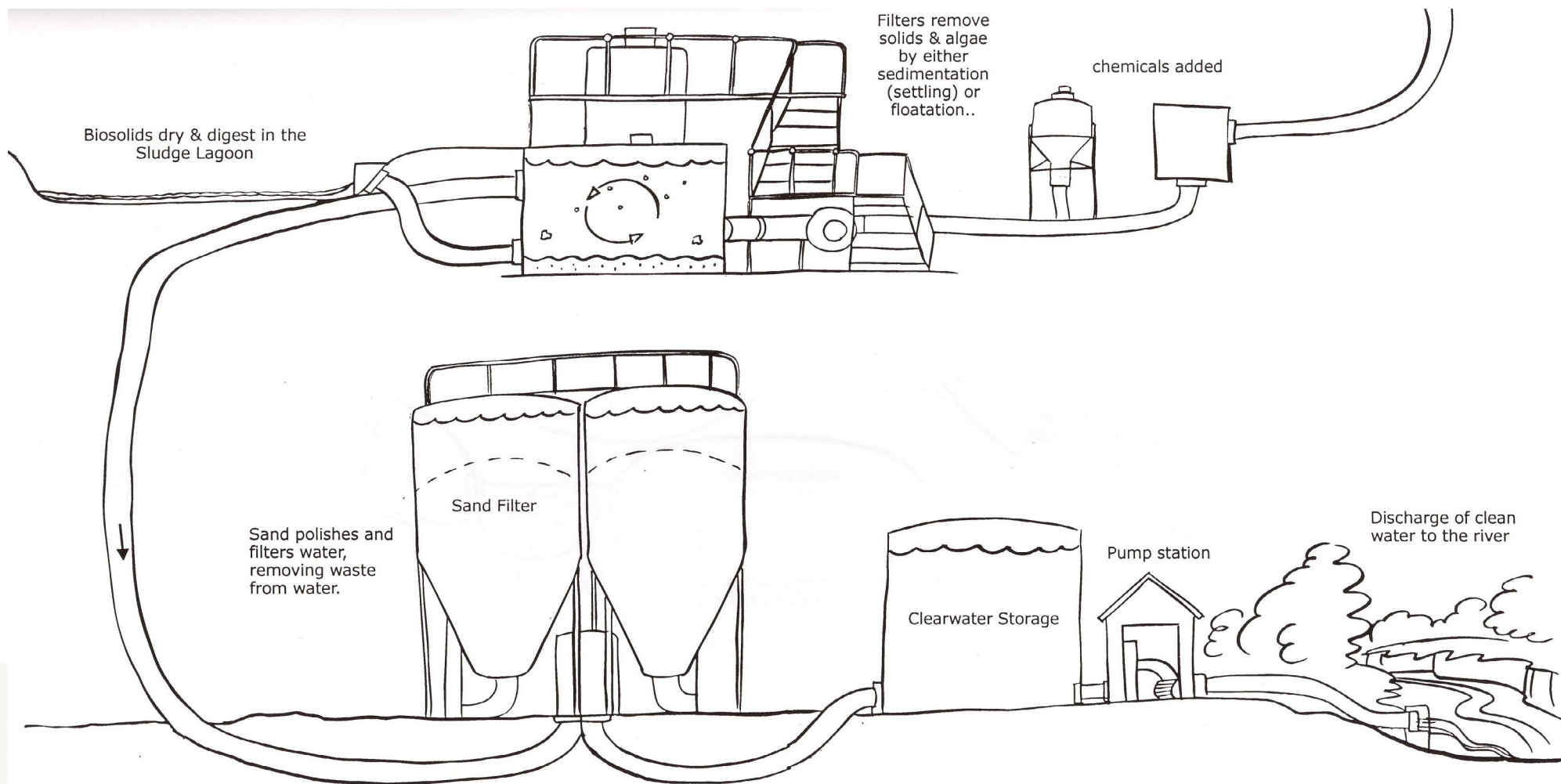




How do we treat our wastewater?

WASTE WATER FACILITY
DIAGRAM

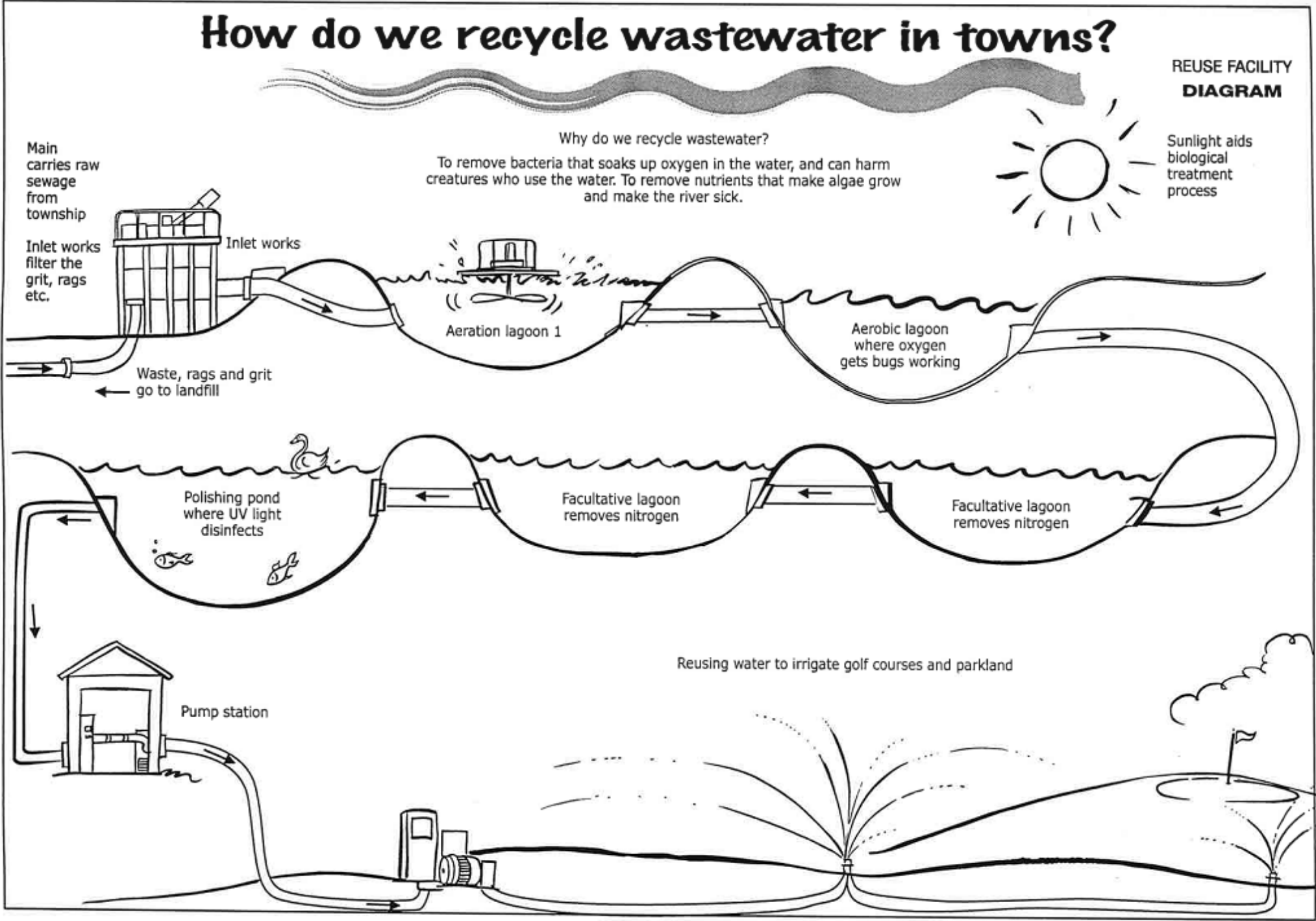


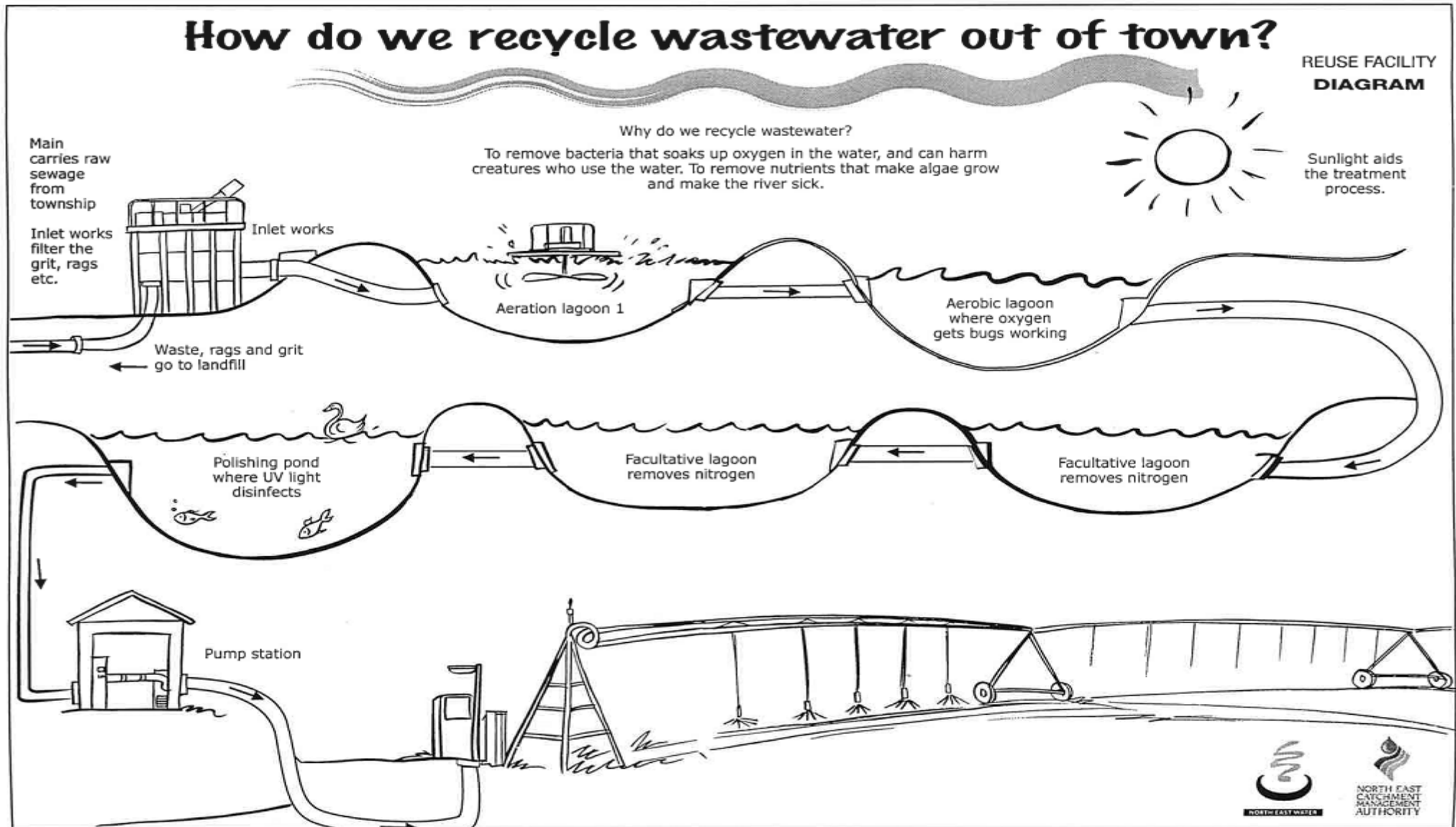


NORTH EAST WATER



NORTH EAST
CATCHMENT
MANAGEMENT
AUTHORITY





Is your wastewater telling you something?

FIELD TRIP
QUESTION SHEET

When you pull out the plug, flush the toilet...where does the that waste go...and whose problem is it? You can find out the answers to these questions on the field trip to the wastewater treatment plant.

Name: _____ Date: _____

School: _____

Name of the Water Treatment Plant (WTP) you visited: _____

1. How much wastewater is processed daily?

2. What kind of rubbish and pollutants are found in our wastewater which should never go down the drain?

3. How does phosphorous get into our drains and wastewater?

4. How does phosphorus affect our environment?

5. What does flocculation mean?

6. What is alum?

7. Why is alum used in processing the wastewater and how does it work?

8. How long does the wastewater take to be processed?

9. How do we reuse the wastewater that has been treated in or our of our town?

10. How many litres are reused in a year?

11. How can we help reduce waste in our waterways?



Activity Two: Water comes, Water goes? - Wastewater

Overview:

This activity builds on the Water comes, Water goes – Distribution activity from **Unit 4: Water Treatment** Activity 4, Part 2 page 15 - where students learnt where water from our taps comes from, how and where we use it and other water sources (tank and grey water). In this activity students explore where our wastewater from our schools and house goes. Students will also reflect on what they have learnt in this Water Treatment unit.

Duration:

Part 1: Water Terms: 45 minutes, page 15

Part 2: Water comes, Water goes? Wastewater: 1 hour, page 16

Part 3: Never Ever pour it down the sink!: 45 minutes, page 16

Equipment:

- **Unit 4 Water Treatment** Part 2: Water comes, Water goes student school plans
- Additional clear paper (ie projector sheet, greaseproof paper) - optional
- Colour in materials (textas, colour pencils etc.)
- Other material if wanting to create 3D images.
- Student workbooks

Activity:

Part 1: Water Terms

Ensure students are familiar with the below terms. This could be done by using internet searches, class discussions or using the dictionary. Add these terms to the class 'words of the week' (page 2) and place in the classroom or on the board for easy reference.

- **Raw water:** Water from a natural source that has not been treated at a Water Treatment Plant i.e. The Murray River water.
- **Reticulated or Potable water:** Water that has been treated at a Water Treatment Plant and is pumped to houses, businesses and industries.
- **Tank water:** Rain water that is collected from roofs of houses and building and diverted into tanks for us to use.
- **Stormwater:** Rain water that flows off the roofs of houses and buildings and goes down the gutter into the stormwater pipes and flows into nearby creeks and rivers.
- **Sewage:** Water that has been used and is flushed down the drain or toilet and enters the sewer system. This wastewater gets treated at a sewage plant or in a septic tank.
- **Septic tank:** This is a tank that collects wastewater or sewage water from a house (not connected to a sewage plant) and treats it on your property.
- **Grey water:** Water that is used in the house which can be reused again in the garden or other parts of the house i.e. washing machine water diverted to the garden, shower water collected in buckets reused in the toilet.

Part 2: Water comes, Water goes? Wastewater

1. Using student's school plans **Unit 4 Water Treatment** Part 2: Water comes, Water goes. Ask students to start thinking about where our wastewater goes.
2. If conducting this activity independent of **Unit 4 Water Treatment** ask students to draw a plan of their school. The plan should include all areas where they use water including: Toilets and bathroom, kitchen, canteen and staff room, laundry, garden and outdoor areas. Ensure students leave enough room on the page to add other places outside their school plan.
3. Students can use a separate clear sheet of paper to include the following additions to their house plan, or they can simply add to the house plan they are already using.
4. Ask students where does all the water from your school and houses go once it goes down the drain?
5. Ask students to draw in the Wastewater Treatment plant near you school plan.
6. In a different colour draw in the sewer pipes connecting your school toilets and drains to the Wastewater Treatment Plant (WWTP) or your school may use a septic tank (draw this in). Encourage students to use other materials to connect their house to the WWTP to remove all their wastewater (straws, pipe cleaners, recyclable material to represent pipes) to create a 3D image.
7. Draw and colour-in in all the areas of your school where you need to connect a wastewater pipe. Toilet, sink, canteen, shower, staff room, washing machine, taps, bathroom basin etc.
8. Again ask students to think of ways they can re-use water. Can they connect the school bubbler drain to the garden via a pipe? Students can use a separate layer of clear paper to draw in their ways to re-use and save water.
9. Regroup the class and discuss the different areas of the school where water is used, where it goes once it's flushed down the drain or toilet, and how it gets to the WWTP.
10. Ask students where they think their water in their own houses goes? Does it go to a WWTP? Or do they have a septic tank? Do they reuse their greywater at home? How is the treated water from the WWTP re-used?

Part 3: Never Ever pour it down the sink!

1. Ask students to write up headings in their workbooks according to the different areas of their house where they use water. This should include the garden, bathroom, toilet, kitchen and laundry.
2. Under each heading get students to think about the types of things the water can take with it when it goes down the drain.
 - Shampoo, toothpaste and soap from the bathroom;
 - Oils and fats, and food scrapes from the kitchen,
 - Toilet paper and other bathroom rubbish (ear cleaners, paper, plastic containers) from the toilet;
 - Grass clippings, leaves, fertilizers, and oil from the car and garden.
 - Other items such as false teeth, toys, money, hair, socks and clothing
3. Regroup students and ask each student to select one point that they have recorded that they want to share with the class, without repeating what has previously been said. Write the points up on the on the board or open up for discussion.
4. Encourage students to think about ways in which these different pollutants and materials can be stopped from going down the drain and toilet.
5. This activity can be extended when visiting the Waste Water Treatment Plant. Students are able to ask plant operators what types of materials and items actually get flushed and drained into the wastewater treatment plant.
6. Students are to create their own Never Ever advertising poster using recyclable materials that show the different products and pollutants collected at a WWTP (as above point 12).

Unit 6 Wastewater Treatment

LEVEL 3: VELS LINKS

Activity	Description of Activity	Links to VELS (DOMAIN: Dimensions)
1. Wastewater Treatment	Part 1 Introduction to wastewater treatment	SCIENCE: Science knowledge and understanding - Use appropriate scientific vocabulary to describe and explain observations and investigations INFORMATION AND COMMUNICATION TECHNOLOGY: ICT for Communicating - Students locate information on an intranet, and use a recommended search engine and limited key word search to locate information from websites
	Part 2 Excursion to a Wastewater Treatment Plant	SCIENCE: Science knowledge and understanding - Use appropriate scientific vocabulary to describe and explain observations and investigations CIVICS AND CITIZENSHIP: Community engagement - Students participate in activities to protect and care for the natural and built environment HEALTH AND PHYSICAL EDUCATION: Health knowledge and promotion - Students describe how physical and social components in the local environment contribute to wellbeing and identify how health services and products address the health needs and concerns of the local community THINKING: Reasoning, processing and Enquiry - Students collect information from a range of sources to answer their own and other's questions - Students provide reason for their answers INTERPERSONAL DEVELOPMENT: building social relationships - Students support each other by sharing ideas and materials, offering assistance, giving appropriate feedback and acknowledging individual differences. Working in Teams - Students cooperate with others in teams for agreed purposes, taking roles and following guidelines established within the task PERSONAL LEARNING: Managing personal learning - Students complete short tasks by planning and allocating appropriate time and resources

Activity	Description of Activity	Links to VELS (DOMAIN: Dimensions)
		ENGLISH: Writing Students order information and sequence events using some detail or illustrative evidence, and they express a point of view providing some information and supporting detail
	Part 3 Wastewater Treatment flowchart	SCIENCE: Science knowledge and understanding - Use appropriate scientific vocabulary to describe and explain observations and investigations ENGLISH: Writing - Students order information and sequence events using some detail or illustrative evidence, and they express a point of view providing some information and supporting detail INTERPERSONAL DEVELOPMENT: Building social relationship - Students work with other to reduce, avoid and resolve conflict Working in teams - Students cooperate with others in teams for agreed purposes, taking roles and following guidelines established within the task
2. Water comes, water goes - wastewater	Part 1 Wastewater terms	SCIENCE: Science knowledge and understanding - Use appropriate scientific vocabulary to describe and explain observations and investigations INFORMATION AND COMMUNICATION TECHNOLOGY: ICT for Communicating - Students locate information on an intranet, and use a recommended search engine and limited key word search to locate information from websites
	Part 2 Water comes water goes, wastewater	THINKING: Reasoning, processing and enquiry - Students provide reason for their answers HUMANITIES: Humanities skills - Draw simple maps and plans of familiar environments observing basic mapping conventions MATHEMATICS: Space - Students locate and identify places on maps and diagrams

Activity	Description of Activity	Links to VELS (DOMAIN: Dimensions)
		DESIGN, CREATIVITY AND TECHNOLOGY: Investigating and designing Students use words, labelled sketches and models to communicate the details of their designs and clarify ideas when asked
	Part 3 Never Ever pour down the drain	SCIENCE: Science knowledge and understanding - Describe natural, physical and biological conditions and human influences in the environment, which affect the survival of living things HUMANITIES: Knowledge and understanding - Describe how people use and affect different environments in Victoria THINKING: Reasoning, processing and enquiry - Students collect information from a range of sources to answer their own and other's questions - Students provide reason for their answers CIVICS AND CITIZENSHIP: Civic knowledge and understanding - Students explain why protection and care for the natural and built environment is important THE ARTS: Creating and making - Students create and present works in a range of arts forms that communicate experiences, ideas, concepts, observations and feelings (partly achieved with this activity)