

A Simple Guide to Conducting a

SCHOOL STORMWATER AUDIT

**A stormwater audit addresses catchment issues
in the school grounds eg erosion and litter.**

This unit is designed for stages 2 to 6.



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Introduction

A Catchment is just what it sounds like: an area of land that catches rainwater and sends it down to the lowest point. What happens to water on the way over and through the ground, creeks, lakes, lagoons, wetlands and on to the ocean is of concern to every living thing in the catchment (See appendix 12).



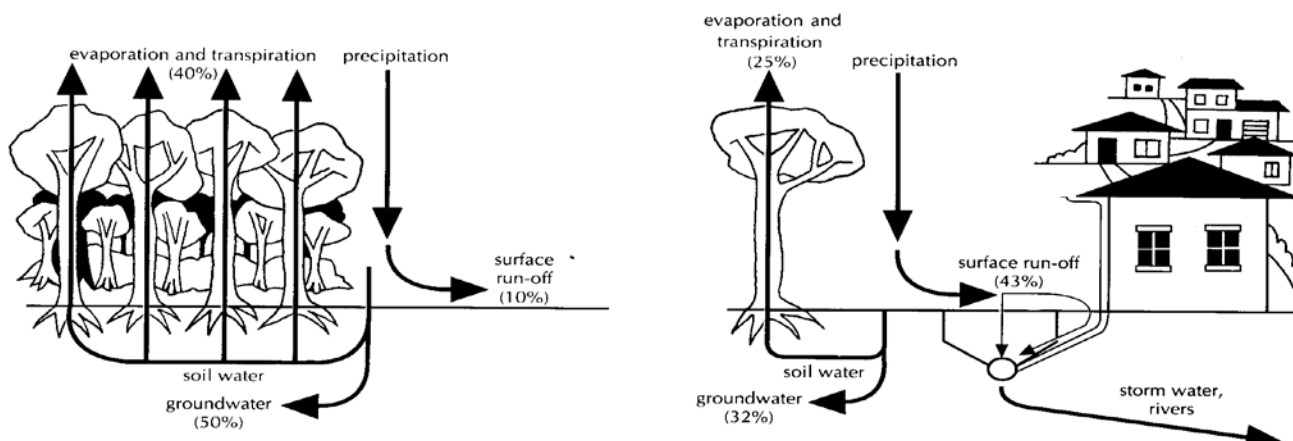
Why Do A Stormwater Audit?

The rainwater that runs over or through school grounds is called stormwater. It can transport eroded soil, litter, fertilizer and other pollutants to places lower in the catchment.

Increasing the area covered by hard (impervious) surfaces such as pavements and roofs results in increased stormwater flows and reduced replenishment of groundwater. Downstream these changes result in more flash flooding and more severe drought impacts.

By studying what happens to rainwater after it falls on our school we can better appreciate our place and responsibilities in the catchment. This can lead to better and safer school grounds e.g. by fixing eroded areas of the playground. We can also reduce our downstream impacts e.g. by stopping our litter leaving the school.

(See 'Appendix 1' for the difference between stormwater and sewage.)



Urbanisation results in more flash flooding (from increased surface run-off) and reduced drought proofing (less groundwater)

How to do a stormwater audit at your school

Preparation

You will need the following equipment:

- A map/plan of the school
- Aerial photo and/or topographic map of the school and its catchment
- Digital camera to record the day

Identify your local catchment

- Locate your school on an aerial photo and/or topographic map. (*Rumbalara can supply catchment photos and maps of your school*). Draw a line around the catchment boundary (the highest points from which water flows into the same watercourse).
- Identify and discuss the different types of land-use in your catchment and how each type could impact downstream. Land-use may be agriculture, industrial, residential, transport, mining, commercial, waste disposal sites etc.
- Look at the posters (www.rumbalara.eec.education.nsw.gov.au) of undesirable behaviour - washing the car on paved surfaces, throwing cigarette butts onto the ground etc.

Investigating the school's stormwater

- Take a walk around the school to describe all the stormwater features, e.g. rainwater tanks, drains, sumps, ponds, creeks, wetlands. Take photos as you go and record your observations in the 'stormwater observations' sheet. (Appendix 2)

On the school plan/map:

- Colour all hard (impervious) surfaces **red** (e.g. roof, concrete, asphalt).
- Locate *erosion sites* and other problem areas. Colour in **brown** any areas where the grass won't grow. Colour in **blue** any areas that get flooded or become muddy when it rains. Put a **black cross (X)** where downpipes are causing erosion.
- Mark any sumps (□) and circle those that need maintenance. Sumps are designed to trap sediment and need to be cleaned out regularly.



- Mark with a **(p)** places where pollution could be a problem (e.g. litter, lawn clippings, evidence of paint being tipped down the drain).
- Mark with an **(s)** the places where stormwater leaves the school, (stormwater outlets/downstream litter discharge).

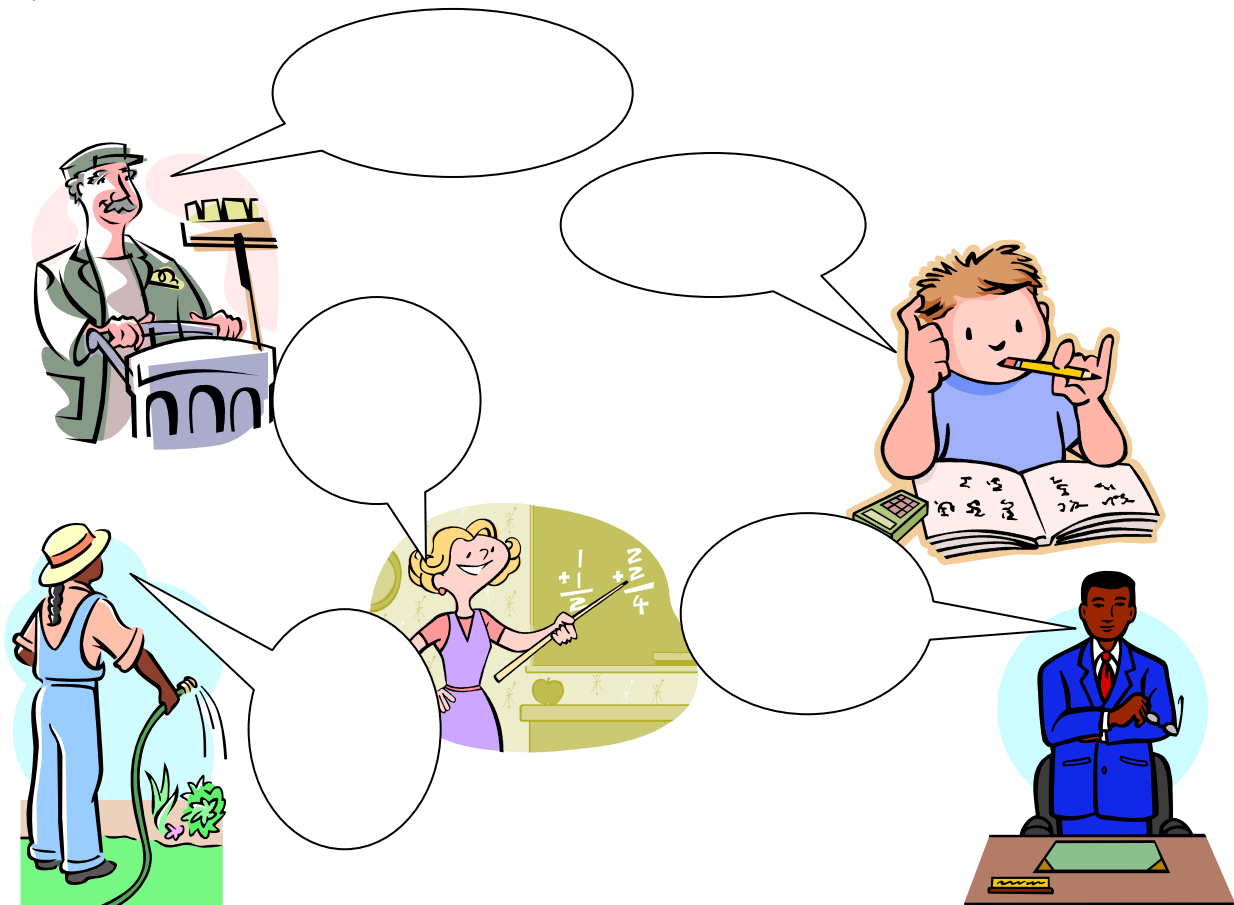


See example in Appendix 3.

In a large school the class could be divided into teams to survey different parts of the school grounds or different features e.g. erosion, sumps, pollution.

Interviews

Survey some of the people in the school to find out about their attitudes, knowledge and ideas on stormwater. *Appendix 6-10* contains prepared interview questions for the cleaner, general assistant, the principal, teachers and students. You may ask other questions as well. Write down their answers and then try to put together a report on stormwater in the school, behaviour and attitudes.



Suggested Excursions/Activities

1. Water monitoring. A program of regular monitoring is a good way to get to know the local waterway. Start with temperature and turbidity and find out how these parameters change naturally throughout the year and after rain events. Collect a water sample and bring it into the class for testing (it's not necessary to take the whole class out to the waterway each time). Once a week would be good but also after rain is important. Set up a graph on the classroom wall or as a spreadsheet on the computer to record all the changes. Include rainfall and temperature measurements if possible. *Waterwatch* provides support for this type of activity. See the following website for some ideas:
<http://www.environment.nsw.gov.au/stormwater/HSIEteachguide/stg2activity41.htm>
2. Follow the local creek and describe its features. Report on wildlife, clean water, natural vegetation, erosion, litter, weeds etc.
3. Complete a creative arts activity that focuses on stormwater. See the following website for ideas.
Culturally Creative Stormwater Education Program-
<http://www.culturallycreative.com.au/> Click on 'Creative workshops'
4. Participate in an interactive story where students gain an understanding of creek pollutants- 'A day in the life of an urban creek'
<http://www.environment.nsw.gov.au/stormwater/HSIEteachguide/stg2activity31.htm>
5. Write a story of how water may travel to the sea. Provide a list of key words to students that they may use in their story.
6. Construct a model of a catchment using a tray of soil. Shape the soil so there is low and high areas. Place a block under the tray, so the tray is on a gentle slope. Place another container at the bottom of the tray to collect any water. Pour the water slowly to see where the water collects. Change the slope of the tray, increasing the steepness by altering the block. Compare the difference in soil movement and the speed of the water flow over the soil. Discuss which catchment is more likely to have erosion problems. Cover the soil in mulch and pour the same amount of water again. What effect does ground cover have on movement of soil? What land uses may affect the soil erosion in a catchment?
Also see 'Making a model catchment' for ideas:
http://www.goldcoast.qld.gov.au/attachment/goldcoastwater/primary_activity_9.pdf

Developing an Action Plan



Discuss your findings.

Does your school have any erosion or drainage problems?

Is litter leaving the school?

What actions would rectify these problems?

This could be done as a brainstorming session. For each problem you identify come up with a list of solutions (See Appendix 4).

Writing Up Your Report

Bring together all your results in a brief report with the following contents:

1. Background	Include information such as: - name and location of school, the school aerial photo/catchment map, number of students and teachers at the school, photos of stormwater audit participants, organisers, date of the audit etc.
2. Our School In Action	Some photos and quotes from the day
3. Results	Insert the Stormwater Observations sheet here (Appendices 2 & 3)
4. Problems and Solutions	Insert your findings from the "Developing an Action Plan" session.
5. Progress	Identify where this activity fits into the school's teaching/learning programs. Make sure that the Audit gets done every year. Evaluate progress against previous years.

Include your report as part of your school's environment management strategy and send it to your school's P & C to see if they can help implement some of the actions.

Include your report in your School Management Plan. Rumbalara EEC can assist in developing your stormwater action plan.

Implement the actions and celebrate your success. Let the community know how your school is caring for the catchment.



Other Resources

- Look under Resources on the Rumbalara website, www.rumbalara.eec.education.nsw.gov.au or contact Rumbalara on 43247200.
- Aerial photos of your locality can be accessed from: Google Earth <http://earth.google.com/>
- Stormwater posters may be obtained from 'The Dept of Conservation (DEC) ...Environment Line' - 131 555
- Gosford City Council- Contact the Environmental Education Officer on 4325 8222.
- Wyong Shire Council - Contact the Environmental Education Officer on 4350 5555.
- Catchment Management Authority - "Hunter-Central Rivers CMA"
www.hcr.cma.nsw.gov.au
- NSW Office of Environment and Heritage- Storm water Teaching Guide-
<http://www.environment.nsw.gov.au/stormwater/HSIEteachguide/index.htm>
- ABC Catchment Detox Game
<http://catchmentdetox.net.au/how-to-play/>



Appendix 1: Stormwater & Sewage

Stormwater is separate from and different to the sewerage system. All wastewater from inside premises should enter the sewerage system to be transported to a sewage treatment plant where it is treated before being discharged into the ocean.

<p>What is stormwater?</p> <p>The water that runs off our properties and roads after rain is stormwater.</p> <p>Because of the way we have changed the environment, stormwater impacts in 2 ways:</p> <ol style="list-style-type: none"> 1. Changes to the hydrology: in urban areas a large proportion of the land surface has been paved or covered with impervious surfaces (e.g., roads and buildings). This leads to increased water run-off during rainfall. The stormwater system includes street gutters, drains, rooves, underground pipes and channels that transport rainwater to waterways. As the stormwater runs over the land surface, it picks up pollutants such as leaves, soil and dissolved chemicals and carries them to local waterways. Stormwater is not treated before it flows into the waterways. 2. It carries Pollutants: stormwater pollution is the single biggest threat to the health of our waterways. In high rainfall events, large volumes of water enter rivers and creeks, transporting sediment, nutrients, toxic chemicals, herbicides, pesticides, oils and grease, animal waste and sewage overflows. Stormwater pollution is more significant in urban areas, where large areas of paved surfaces result in increased run-off. 	<p>What is sewage?</p> <p>The sewerage system includes underground pipes and main lines which transport sewage (waste water from toilets, washing machines etc) from homes, industries and businesses to sewage treatment plants. Some things people put down the drain / sink are difficult to treat. You can help by keeping things such as oil, grease, chemicals, nappies and plastics out of the system.</p> <p>Sewage treatment involves:</p> <ol style="list-style-type: none"> 1. screening for the removal of things such as paper, plastics and solids (Primary Treatment) 2. the use of bacteria to break down wastes (Secondary treatment). 3. a further filtering process and the addition of chlorine to disinfect the effluent (tertiary treatment) <p>(on the Central Coast only primary and secondary treatment are employed)</p> <p>At the end of the process two products are left:</p> <ul style="list-style-type: none"> • Effluent - Water containing dissolved salts and other chemicals. It is pumped into the ocean. The recycling of this treated water for irrigation is helping to reduce pressure on our limited water supplies however its use has to be monitored to ensure that the nutrients don't reach our waterways. • Sludge - The solid waste that settles to the bottom of the sedimentation tanks. It is used in compost and as a soil conditioner (Bio Solids)
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Appendix 2: Stormwater Observations

Map Reference	ISSUE / PROBLEM	SOLUTION/ COMMENT

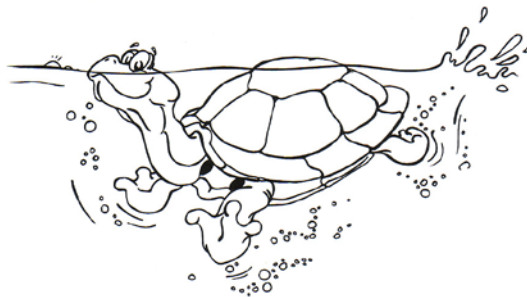
Appendix 3: Record your observations on a school map



Appendix 4: Discussion Points – Problems and Solutions

Common problems associated with Stormwater

- Increases in the area of impervious surfaces (roofs, paving, driveways, carparks etc) result in less water soaking into the ground and more runoff. Not only is the volume of runoff greater but so is the velocity of the flow.
- The loss of groundwater reduces the water available to plants during long dry periods.
- This increased velocity and volume of runoff causes erosion and soil loss.
- Eroded soil is carried downstream and causes sedimentation and silting up of water courses.
- water pollution [soil, oil, organic matter, fertilizer, detergents, pesticides and litter are all carried by water.
- habitat destruction - both on land and in creeks, estuaries etc. Stormwater infrastructure results in concrete pipes and kerb and guttering replacing creeks and naturally wet areas being drained. Riparian (creekbank) vegetation is lost. Boggy areas dry out and areas that are seasonally inundated become permanently wet. Frogs, lizards, insects and birds lose important sheltering, feeding and breeding sites.



Some common solutions.

- Make a bog-garden in wet areas to provide habitat for frogs and insects.
- Plant native grasses and sedges along creek-lines or drains to filter and trap sediment and nutrients.
- Slow the runoff from paved surfaces by creating detention basins, and swales.
- Catch runoff from roofs in rainwater tanks.
- Control traffic on areas where the grass can't grow
- High traffic areas might have to be paved to prevent erosion.
- Remove paved areas that aren't required and return them to lawn or garden

Appendix 5: Stormwater Plan- Curriculum Links

Add curriculum links relevant to the learning stage of the students conducting the audit

ACTIVITIES associated with the Stormwater Plan	Syllabus OUTCOMES
<p>Examine long term rainfall patterns for the Central Coast. Explain how a rain gauge is used to measure rainfall</p>	
<p>Use a topographic map to identify the catchment and to locate the school within it. Find out where water goes after it leaves the school site.</p>	
<p>Recall / describe the flow of water on the school grounds during a rain event. Follow the path of water out of the school grounds to drains, creeks and lakes. A hose may be used to identify flow in and out of stormwater drains. Identify stormwater problems on the school site map eg eroded or boggy areas, blocked pipes, litter etc. Mark all stormwater exit points on the school map.</p>	
<p>Measure the area of impervious surfaces in the school grounds and relate to runoff volumes</p>	
<p>Conduct an audit of litter in the school grounds. Identify quantity of each type and where found. Examine and describe the contents of stormwater culverts.</p>	
<p>Describe the materials that get transported by stormwater. A simple experiment can be set up to collect the material washed off a section of the school playground.</p>	
<p>Discuss solutions to the problems. Research what other people are doing to solve similar problems.</p>	
<p>Write a report and present it to the school community.</p>	

Appendix 6: Interview Recording Sheet: General Assistant

1.	Where does the water flow after heavy rain?	
2.	Are there areas of the school grounds that flood or get very muddy after rain?	
3.	Are there problem areas with erosion?	
4.	Are the gardens mulched?	
5.	Are fertilisers used on the gardens or oval?	
6.	Who cleans the gutters and how often?	
7.	Do the stormwater traps get cleaned regularly? ... who does this?	
8.	Can you suggest ways in which stormwater could be improved in this school?	
9.	Where do you think the stormwater flows to after leaving the school grounds?	

Appendix 7: Interview Recording Sheet: Cleaners

1.	What areas of the school are high litter areas?	
2.	Are there any drains or pipes you know of that might be blocked - or get blocked regularly?	
3.	Where does the water flow after heavy rain?	
4.	How are cleaning chemicals and paints disposed of after use?	
5.	Who cleans the gutters and how often?	
6.	Do the stormwater traps get cleaned regularly? ... who does this?	
7.	Can you suggest ways in which stormwater could be improved in this school?	
8.	Where do you think the stormwater flows to after leaving the school grounds?	

Appendix 8: Interview Recording Sheet: Principal

1.	Does the school do anything to manage stormwater runoff?	
2.	Are there erosion problem areas in the school? How are these managed?	
3.	Who cleans and maintains the gutters in the school?	
4.	Who cleans and maintains stormwater detention basins in the school?	
5.	Has the school put into place strategies to try to reduce litter in the playground? If so, what?	
6.	Can you suggest ways of improving stormwater runoff in the school?	
7.	Where do you think the stormwater flows to after leaving the school grounds?	

Appendix 9: Interview Recording Sheet: Teachers

Name:		
1.	Are students taught about stormwater? If so how?	
2.	Has the school put into place strategies to reduce litter in the playground? If so, what?	
3.	Are there erosion problem areas in the school? How are these managed?	
4.	Are there areas of the school grounds that flood or get very muddy after rain?	
5.	Where do you think the stormwater flows to after leaving the school grounds?	

Appendix 10: Interview Recording Sheet: Students

Name:		
1.	Is there much litter on the school grounds?	
2.	Do you throw your litter in the bin?	
3.	Are there enough bins on the school grounds? Are they in appropriate locations? Or can you suggest places they should be.	
4.	Is there any places where erosion occurs on the school grounds?	
5.	Are there areas of the school grounds that flood or get very muddy after rain?	
6.	Where do you think the stormwater flows to after leaving the school grounds?	



Appendix 11: Example of a Stormwater Plan

Put name of school here

Stormwater Management Plan

Put date of the audit here

Put photos of the kids doing the audit in here



Click here to enter the staff room
or click anywhere on the page to continue

Map of our catchment

Put a map of the catchment here with the school located. Maps can be obtained on Google Earth – locate your school and save as a .jpg file – then insert into your Powerpoint presentation.

Our school plan



Put a map of the school grounds

Number the sites visited for the stormwater audit and then have a slide for each site – include a picture and describe the problem at that site.

Site 1

Issue:

Put a photo of the site here

Solution:



Site ?

Insert a new slide for each site and copy the boxes here to edit

Issue:

Solution:

Put a photo of the site here

The cleaner said...

The teachers said....

The general assistant said...

The Principal said...

Students said.....

Replace the clip art with real photos of these people

Water Quality Monitoring results:

Put a photo of students testing here

Temperature	
Turbidity	
pH	
TDS	



Click on the Waterwatch symbol find out about other water quality data near here (<http://www.waterwatch.nsw.gov.au/waterwatch>)

Our Stormwater Action Plan

Site	Action
1	
2	

Our Target for the next
??? months is to



Staffroom: Instructions & Resources for teachers



This Powerpoint presentation is a way of reporting on your Stormwater Audit.

Teachers and students need to carry out a stormwater before entering information into this Powerpoint presentation. This involves * Identifying your catchment on a map * Investigating the school's stormwater using a map, photos and observations * water quality monitoring (extension activity).

If you need assistance in carrying out a Stormwater Audit contact Rumbalara EEC on 4324 7200 or email: rumbalara-e.school@det.nsw.edu.au

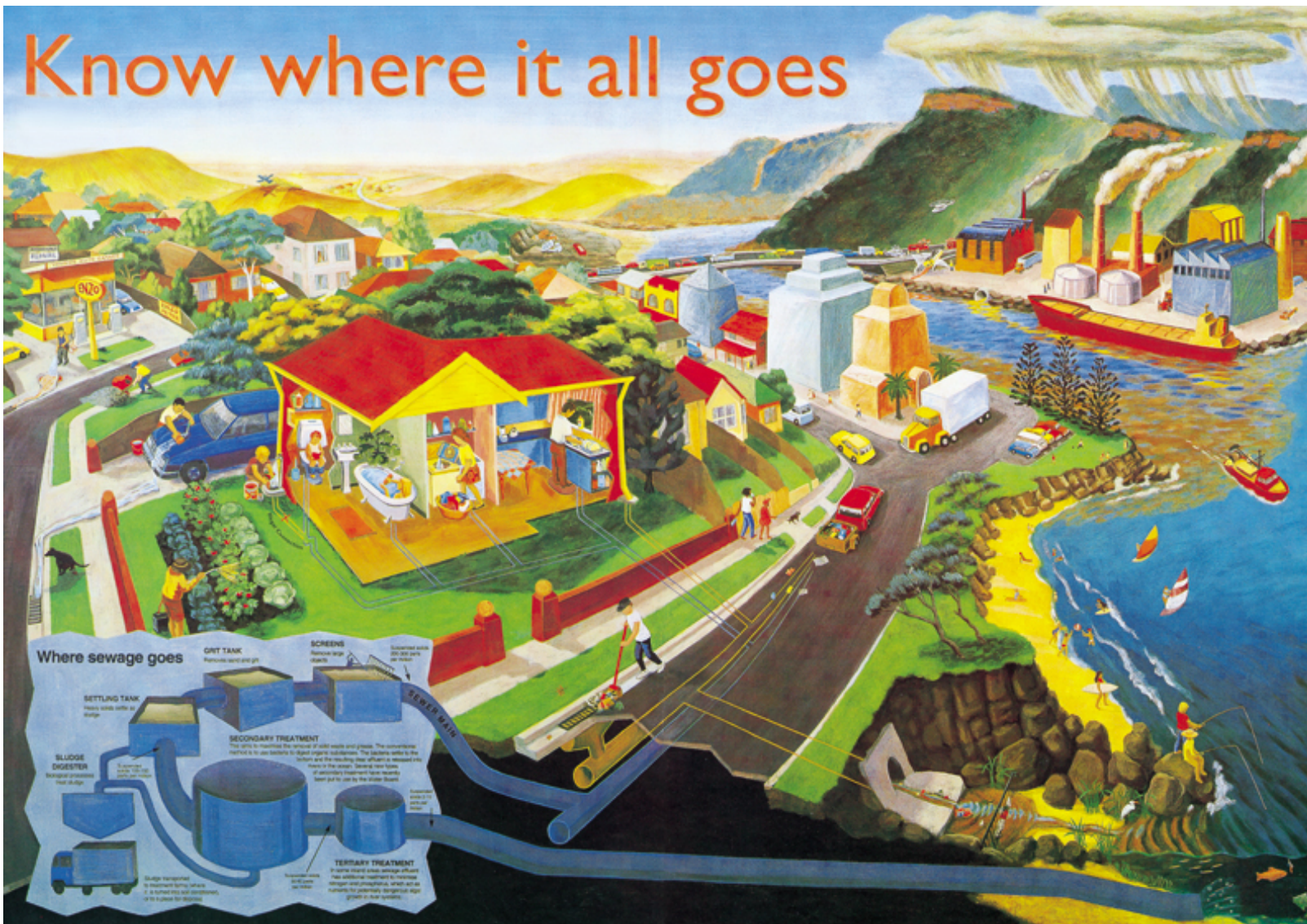
Other Resources:

- Stormwater Teaching Guide available through NSW Department of Environment & Climate Change: www.environment.nsw.gov.au/stormwater/hsieteachguide/index



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Appendix 12: Where does all the water go?



Look closely at the diagram.

Where does the water go that:

- Falls onto the hills?
- Falls onto the roofs of buildings?
- Falls onto the roads and paths?
- Comes from the sinks, toilet and baths in people's homes?

Which water gets treated?

Where does the water end up?

How many sources of water pollution can you see? Name them.

This is to be the last page in this document. Purpose is to track changes to the document.

Amendments:

Date	Author	Reason	Sections
2007	REEC	Creation of Teachers Information Pack	All
17 Nov, 2008	J. Smith	Update Interview sections, Appendices & Resource page	<ul style="list-style-type: none"> • Insert section "Interviews" before "Suggested Excursions / Activities" • Update "Other Resources" • Add Appendices 6-9
16 Dec, 2011	P.Guthrie	Update and review	Updated excursions and activities, other resources, added appendix 10, 12

Distribution:

Issue Date	Description	Issued to:
March, 08	Full audit packs (hard copy folder) distributed via Teachers Information Packs	<ul style="list-style-type: none"> • teachers attending the Teachers Workshop March, 08 • mailed out to all other schools not represented at the workshop