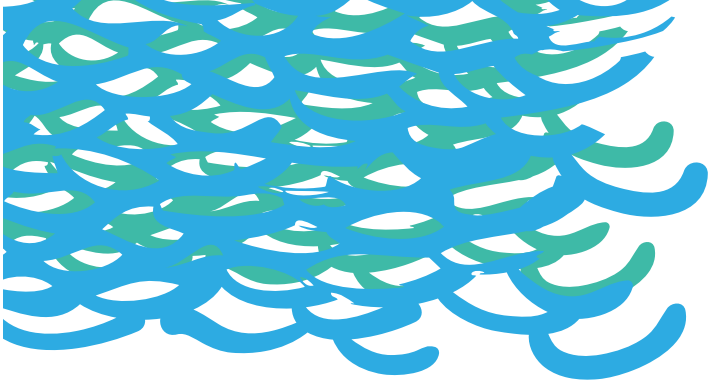




Waterwise Waterways

DRAIN ARTWORK



INTRODUCTION

It is often said that our waterways, such as the rivers, streams and creeks – are like the arteries of the environment. They play an important role in the functioning of the greater system – in this case, the catchment. They provide water for habitat, household use, industry, agriculture and recreation. And just like our arteries need looking after to ensure they're in good working order, so do our waterways.

The Campbelltown region plays a significant role in the health of the Georges and Nepean River catchment. Our actions here in Campbelltown have an impact on water quality, and the condition of the water as it travels downstream towards the bays and oceans.

The Waterwise Waterways drain artwork program, facilitated by Campbelltown City Council, will assist teachers in educating students about stormwater processes, and encourage behaviours that can reduce our impacts on the environment.

The program aims to increase stewardship of our catchments by harnessing the creativity and enthusiasm of our local youth to drive positive change.

BACKGROUND INFORMATION

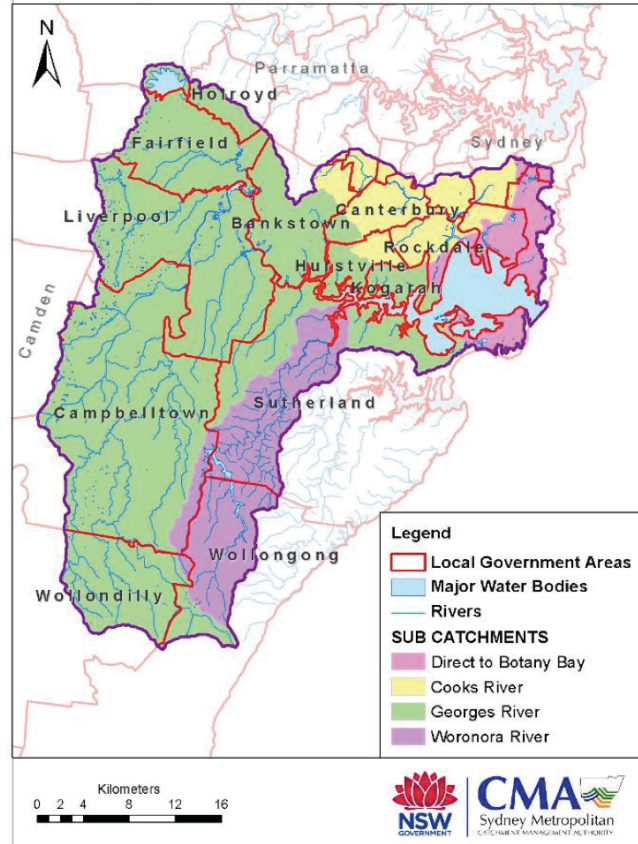
WHAT IS A CATCHMENT?

As the name suggests, a catchment is an area of land that catches water as it rains. Catchments are often bounded by hills, and as this water flows over the landscape, it finds its way into streams and down into the soil, eventually feeding the river. Some of this water stays underground and continues to slowly feed the river in times of low rainfall. Every inch of land on Earth forms part of a catchment.

Catchments can range greatly in size from small urban catchments such as Prospect Creek, which is located in the Canterbury-Bankstown region, to massive catchments such as the Murray-Darling Basin that spans three states. Catchments can be further broken down into sub-catchments, which are simply the smaller areas of land that drain into a particular area through the smaller watercourse features like streams, creeks and wetlands.

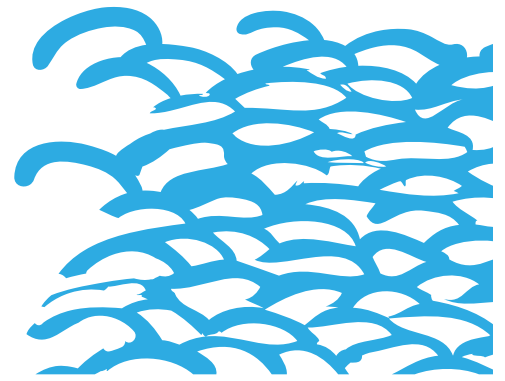
The plants and trees, rivers, creeks, soils and geology of the area are all part of the catchment, and so are the manmade elements of the land – the houses, roads, factories, farms, and businesses that make up the landscape. All of these elements are connected by our waterways. For this reason, everything that occurs within a catchment can affect the health of the waterways and surrounding environment.

Botany Bay Catchment and Major Subcatchments
Georges River Local Government Areas



THE GEORGES RIVER CATCHMENT

BASED ON THIS INFORMATION,
DO YOU HAVE ANY SUB - CATCHMENTS IN YOUR
SCHOOL? IF SO, WHY DO YOU THINK THE WATER IS
CATCHING IN THIS PARTICULAR PLACE?



CAMPBELLTOWN CITY'S CATCHMENTS

Most of the water that runs through Campbelltown City drains into the Georges River catchment, while a smaller area drains into the Nepean River catchment.

The Georges River catchment covers an area of almost 1000 square kilometres, and has become one of Australia's most urbanised and developed catchments, supporting a range of land uses, including a military reserve, National Park, market gardens, agriculture, mining, industrial manufacturing, landfill, and nuclear research facility.

This extensive development and urbanisation has contributed to environmental issues such as stormwater pollution (litter), sedimentation, lack of infiltration, loss of biodiversity and invasion of weeds. As a result of all these impacts, the health of Georges River itself has declined.

However, it is not all doom and gloom. There is still a large area of bushland surrounding the river including remnant floodplain forests of the Cumberland Plain and these woodlands are some of the most pristine in western Sydney.

The map shows the creeks and tributaries of Campbelltown and surrounding areas that feed into the Georges River. You can see that the Georges River catchment is a sub-catchment of the Botany Bay Catchment. This is a perfect example of how everything is interconnected in the environment, and what we do here in Campbelltown for the environment has immediate flow-on impacts for the environment in other parts of Sydney.

WHAT IS STORMWATER?

Stormwater is rainwater plus anything the rain carries along with it. Stormwater moves through the catchment, pushed by gravity from the highest to the lowest points, into creeks, rivers, lakes and eventually the ocean.

Because landscape features are connected by our waterways, activities that occur on land affect what happens in the waterways that are downstream. Unlike sewage, stormwater is not treated. In some cases it's filtered through traps called Gross Pollutant Traps (GPT), but it still flows directly from streets and gutters into our catchments, rivers, and the ocean.

As rainwater travels through the catchment, it carries everything with it that it picks up along the way, including many contaminants such as litter, chemicals and soil, which can cause problems in our waterways such as salinity, reduced water quality and algal blooms.

This is why it is so important that we look after our local drains. By watching what we put into the streets and gutters of our home, workplace and our school, we can stop pollution entering into the stormwater system in the first place.

COMMON STORMWATER POLLUTANTS

Stormwater pollution is the most common source of pollution leading to poor river health! There are many different types of stormwater pollution:

- **LITTER**

Such as plastic bags, wrappers, bottles and cigarette butts can pose a danger to wildlife that often mistake these items for food and ingest them. There is also the possibility that wildlife will become tangled and caught in items like plastic bags and fishing line.

- **NUTRIENTS**

Such as nitrogen from detergents, fertilisers, weeds and grass clippings increase the growth of aquatic weeds and algae. This can choke waterways and reduce native species growth. Algal blooms also decrease oxygen levels in the water, causing fish and other animals to suffocate and die.

- **CHEMICALS**

Such as pesticides, oil and industrial waste can be toxic to plants and animals in the water. These chemicals can be harmful to people as well, and can persist in the environment for long periods of time.

- **SEDIMENT**

Includes soil and gravel that result from soil erosion or runoff from building sites and unsealed roads. Tiny sediment particles can clog the gills of fish, and reduce the light availability in the water, effecting plant growth and food supply.

WHO IS RESPONSIBLE?

Everyone has a part to play. Reducing the pollution depends on every person preventing harmful natural or chemical substances entering the drains.

Council is responsible for controlling and maintaining stormwater systems. However, it is everyone's responsibility to reduce the amount of rubbish and pollution that is carried into the drains. While there are pollutant traps located across the catchment, many pollutants remain in the water. It is also more cost-effective to prevent the problem at the source.

LOOK AT THE IMAGES BELOW. THEY ARE ALL TAKEN ALONG AREAS OF THE GEORGES RIVER CATCHMENT. ...SEE IF YOU CAN IDENTIFY SOME OF THE POSSIBLE POLLUTANTS THAT COULD BE ENTERING THE GEORGES RIVER, BASED ON THE TYPE OF ENVIRONMENT AND LAND USE YOU CAN SEE.



EXTENSION - Why not explore the Georges River on a simple tool like Google maps. By typing in Georges River Catchment and selecting the satellite mode you can view the Georges River and follow it through the hills, mountains, forests and suburbs of Campbelltown and beyond. You can zoom in on your school and find out which creeks run nearby and feed into the Georges River. Zoom in on different parts of the river and see all the different land use that occurs along the Georges River.

Explore with your students the pressures these different types of land use put on the health of the river.

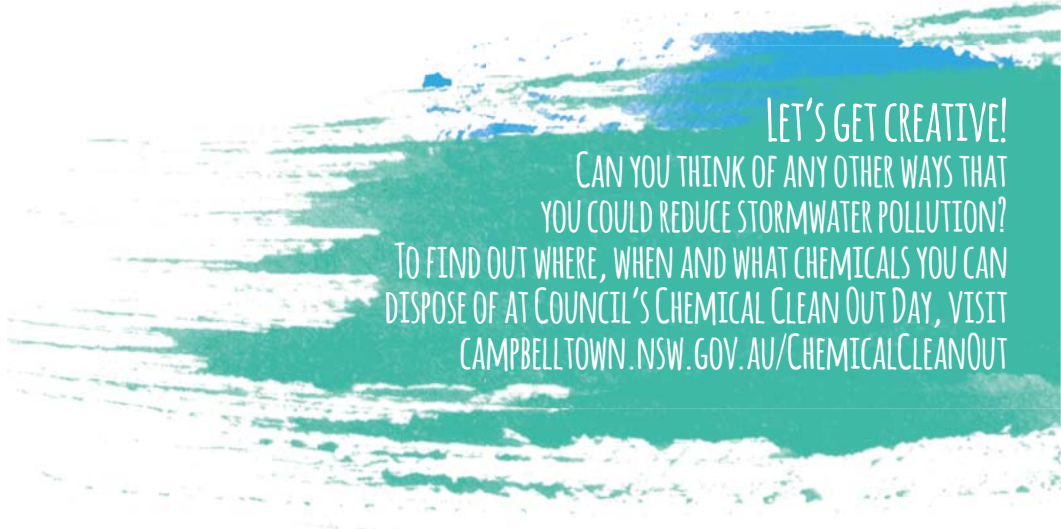


KEEPING STORMWATER CLEAN

Although stormwater is one of the worst types of pollution that can lead to poor river health, it is also one of the easiest types of pollution to treat. There are many simple actions that can be taken to reduce pollutants entering the stormwater system. It is important to remember that all our actions across the catchment have an impact on creeks and rivers, and it is important to ALWAYS be careful to make sure we are aware of any pollutants that may be entering our stormwater drains and act accordingly.

SOME SIMPLE WAYS YOU CAN HELP TO PREVENT STORMWATER POLLUTION:

- Wash your car on the lawn. The grass and soil will soak up the detergent, preventing it from entering the drain.
- Take a plastic bag when you walk the dog and pick up its droppings.
- Never hose grass clippings down the drain.
- Rake up any leaves in the driveway and gutters to prevent them entering the stormwater.
- Put your rubbish in the bin.
- Grass or replant areas of disturbed or bare soil to prevent erosion.
- Consider using natural pesticides when ridding your house of unwanted pests. This will prevent damaging chemical pesticides washing down into our drains.
- If you have chemicals at home that need to be disposed of, you can get rid of them by taking them to Council's Chemical Clean Out Day. Never dispose of them in drains.
- Plant endemic native plants in home and school gardens to prevent the spread of weeds and promote a native habitat



LET'S GET CREATIVE!
CAN YOU THINK OF ANY OTHER WAYS THAT
YOU COULD REDUCE STORMWATER POLLUTION?
TO FIND OUT WHERE, WHEN AND WHAT CHEMICALS YOU CAN
DISPOSE OF AT COUNCIL'S CHEMICAL CLEAN OUT DAY, VISIT
CAMPBELLTOWN.NSW.GOV.AU/CHEMICALCLEANOUT



WHAT IS BEING DONE?

Campbelltown City Council promotes the use of Water Sensitive Urban Design (WSUD) in new and already existing developments. WSUD is a more natural approach to stormwater treatment and includes any development that is carefully designed, constructed and maintained so as to minimise the impacts the development would otherwise have on the urban water cycle, which includes our drinking water, sewage, and stormwater.

Council also installs both man-made and natural devices that help clean the stormwater as it moves through the Campbelltown LGA.

Gross Pollutant Traps (GPT) is a man-made device that filters stormwater pollution before it has a chance to enter waterways. Essentially, a GPT is a large grate that can catch most of the large litter before it has a chance to enter the waterway. Once these GPTs fill up, Council removes this rubbish and takes it to the tip.

However, as we previously learned, there are other types of pollution, like chemicals, that cannot be caught by a GPT and therefore different types of devices are required to remove the pollution from the water. One such device that can be both man-made and naturally occurring is wetlands. The macrophytes (plants) that live in wetlands have a unique ability to filter and convert chemicals that are found in stormwater, like heavy metals and oils, into nutrients the plants can use to grow and thrive.

Council has created stormwater wetlands in areas across Campbelltown Council to ensure that the water entering the Georges River is as clean as possible.



WHAT IS A MACROPHYTE?
MACROPHYTE SUPERSTARS THAT COUNCIL USES IN THE WETLANDS OF CAMPBELLTOWN?
VISIT CAMPBELLTOWN.NSW.GOV.AU/WETLANDS TO FIND OUT THE ANSWERS, AS WELL
AS A WHOLE LOT MORE ABOUT THE BENEFIT OF WETLANDS FOR THE ENVIRONMENT
AND FOR TREATING STORMWATER.

WATER QUALITY MONITORING PROGRAM

Council undertakes routine water quality testing at a number of sites within the Local Government Area. Council's Water Quality Monitoring Program is used to determine compliance with the relevant national and state water quality monitoring and management guidelines.

The objectives of the Water quality Monitoring Program are:

- compare the water quality results between the sampling sites across the LGA
- monitor microbial levels at popular recreational sites
- provide direction and assist in the development of stormwater management programs
- undertake long term monitoring of the waterways to assess trends in water quality over time to understand the effects of changes such as climate change and the effects of elevated nutrient and microbial levels.

The results from the water samples are compared against the National Guidelines for Fresh and Marine Water Quality, developed by the Australian and New Zealand Environment and Conservation Council (ANZECC 2000).

To view the results visit campbelltown.nsw.gov.au/WaterQuality/MonitoringProgram

EXTENSION - Extension- Stormwater wetlands are an example of Water Sensitive Urban Design (WSUD). In groups of 3-6, identify and research another form of WSUD and present it to your class, explaining what it is and why it is used.

GEORGES RIVER COMBINED COUNCILS' COMMITTEE

Campbelltown City Council is a member of the Georges River Combined Councils Committee' (GRCCC). The GRCCC's mission is to help protect, conserve and enhance the health of the Georges River by developing programs and partnerships and by collaborating with government organisations and other stakeholders. The GRCCC represents local councils in the Georges River Catchment of NSW. Members include nine local councils: Rockdale City, Sutherland Shire, Kogarah City, Hurstville City, Bankstown City, Liverpool City, Fairfield City, Campbelltown City and Wollondilly Shire councils. The GRCCC works in partnership with State and Federal Government agencies and community representatives within the Georges River Catchment.

The GRCCC is always looking at developing stormwater education programs that can engage the wider community, as well as giving schools the opportunity to be involved.

THE GEORGES RIVER RIVERKEEPER PROGRAM

The Riverkeeper Program aims to protect the ecological health and biodiversity of the Georges River system via the collection of litter and rubbish and the regeneration of weed infested remnant bushland.

The program continues to provide positive environmental results for the Georges River through diversified labour, such as corporate groups, volunteers and the Department of Corrective Services NSW.

The program has successfully removed 70.2 tons of rubbish from the Georges River system in 2013/14 alone.

THE RIVERHEALTH MONITORING PROGRAM

The Riverhealth Monitoring program measures the water quality along the whole of the Georges River, allowing a better understanding of how chemical pollutants, agricultural, industrial and urban runoff affects the structure and function of freshwater and estuarine ecosystems.

The program is facilitated by the Georges River Combined Councils' Committee (GRCCC) in partnership with its nine member councils, the Cooks River Alliance (CRA) and its eight member councils, the Greater Sydney Local Land Services (GS LLS), Georges River Environmental Education Centre, the Streamwatch Program and the community to monitor the health of the River.

The River Health Monitoring Report Card presents the findings of 12 months of data collection across the Georges River catchment that feed into Botany Bay. You can find the report card here <http://www.georgesriver.org.au/River-Health-Monitoring-Program.html>

Schools are encouraged to get involved in the River Health Monitoring Program. It is a great way to get outdoors with one of the GRCCC's qualified educators and put into practice your knowledge of stormwater education, as well as learn new scientific skills and see some fascinating creatures that live in our waterways!

To get your school involved, contact the GRCCC at info@georgesriver.org.au or for tools and resources, visit georgesriver.org.au/Resources-for-Students-and-Teachers.html

ADDITIONAL INFORMATION

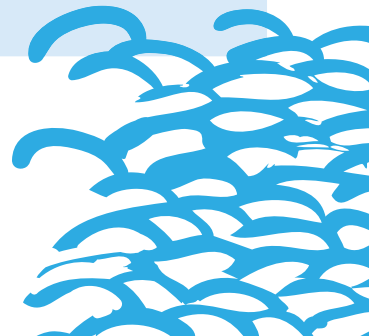
WEBSITES

Georges River Combined Councils' Committee (GRCCC) georgesriver.org.au
The Georges Riverkeeper Program georgesriver.org.au/Riverkeeper-Program
The River Health Monitoring Program georgesriver.org.au/River-Health-Monitoring-Program
Streamwatch streamwatch.org.au/cms
Hawkesbury Nepean Catchment Management Authority hn.cma.nsw.gov.au
Sydney Catchment Authority sca.nsw.gov.au/
Campbelltown City Council campbelltown.nsw.gov.au/WaterQualityMonitoringProgram

EPA Victoria Types and causes of urban stormwater pollution
epa.vic.gov.au/yourenvironment/water/stormwater/types-and-causes-of-urban-stormwater-pollution

INTERACTIVE GAMES

Catchment Detox catchmentdetox.net.au
Clean up the River cleanup.noco2.com.au



ACTIVITY 1

ACTIVITY 1 – STORMWATER EXPLORATION

DESCRIPTION

In this lesson activity, students will be introduced to catchments and stormwater by exploring their school playground and surrounding environment, discovering where the stormwater catchment drains are located in and around their school.

After the students identify the common pollutants they find in their school and surroundings, they will discuss the problems these pollutants can cause and suggest possible solutions.

PREPARATION

Before the lesson, walk around the school grounds to find stormwater drains and identify common pollutant sources. These may include litter in the playground, leaves from the garden, detergent and cleaners used for washing windows, or exposed soil. If possible, it is ideal to walk around the perimeter of the school to identify road gutters and drains and discuss pollutants that may be found around houses such as detergent from car washing, garden pesticides and dog droppings.

EQUIPMENT

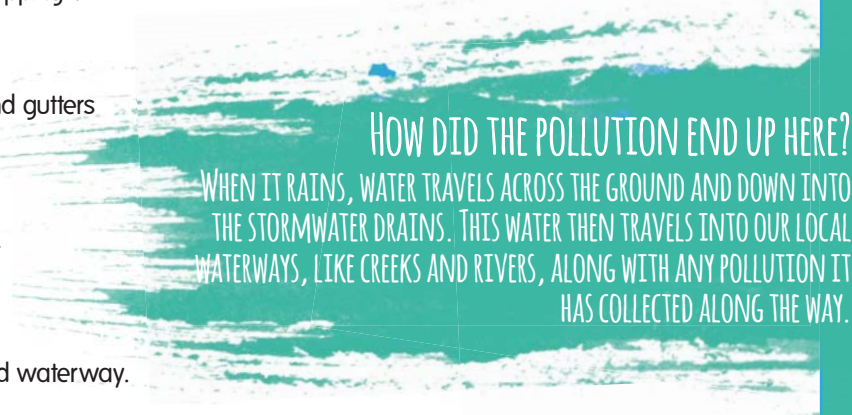
- Images of polluted creek, drains and gutters
- Map of the school
- Clipboard (two per group)
- Pencils
- Stormwater Exploration' worksheet

ACTIVITY DESCRIPTION

1. Show students an image of a polluted waterway.
2. If available, look up the school location on Google Earth. Have students identify the school location, zoom out and look for the Georges River and any waterways that lead away from your school.

The main catchment for Campbelltown LGA is the Georges River catchment, with a very small percentage belonging to the Nepean River Catchment. This means the majority of the stormwater that collects in Campbelltown flows into the Georges River and eventually into Botany Bay.

However, as we have already discovered, catchments can range greatly in size, and our entire planet acts as catchment.



ACTIVITY 1

3.
 - A) divide students into small groups.
 - B) give each group a map of the school and assist them in orientating themselves on the map, identify stand out features they can use as benchmarks.
 - C) move outside and outline all necessary safety rules.
 - D) provide each group with a 'Stormwater Exploration' worksheet, clipboards and pencils.
 - E) assign group tasks to each member of the group. These may include map drawer, scribe, safety officer and time keeper (to keep students on task).
4. Move to a stormwater drain closest to the classroom. The map drawer marks this on the school map. Have students identify some surrounding features that may impact on the water going down the drain. On the map, use arrows to identify the slope of the surrounding ground. Identify a possible pollutant nearby and fill in the 'location' and 'pollutant' columns on the 'Stormwater Exploration' worksheet.
5. Continue to move around the school identifying stormwater drains. You may also like to stop at the following locations to identify pollutant sources:
 - Eating area or playground (litter)
 - Garden (leaf litter, weeds)
 - Patch of bare soil near the oval (sediment)
 - Windows, toilets (detergent, cleaners).
6. Return to the classroom. If available, combine map and worksheet results on a large class map. Discuss the effects the pollutants that have been found in and around your school potentially have on the health of our catchment and have students work in their groups to complete the 'problem' and 'solution' columns of the 'Stormwater Exploration' worksheet. This is where students can offer ideas and solutions to help rid the school and its surroundings of the different types of pollution they identified.

HAVE STUDENTS IDENTIFY BENEFITS OF HEALTHY WATERWAYS AND COMMON ACTIVITIES THEY ENJOY PARTICIPATING IN SUCH AS FISHING, SWIMMING, BOATING.

HOW WILL POLLUTED WATERWAYS IMPACT THE WAY PEOPLE USE THE RIVER?
BY LOOKING AT THE MAP OF YOUR SCHOOL, CAN YOU IDENTIFY WHERE THE WATER WOULD FLOW AFTER IT RAINS?
TIP - THINK ABOUT THE STORMWATER DRAINS AROUND YOUR SCHOOL AND WHAT THE CLOSEST CREEK IS TO YOUR SCHOOL.

EXTENSION - Students can research the effects of pollutants on plants and animals. In small groups, students will pick one type of pollutant Eg. (dog droppings or emissions/oils from cars) and research the effect this pollutant has on our waterways and/or the broader environment. They will then report back to the class as 'experts' on this topic.

EXTENSION - Get your students to create an Action List that details a list of actions the school and students can take to help get rid of litter and potential stormwater pollution in your school and present it to the school assembly.

ACTIVITY 2

ACTIVITY 2 – 'WATERWISE WATERWAYS' DRAIN ARTWORK DESIGN

DESCRIPTION

In this lesson activity, students will design a waterwise drain artwork that could be placed around the stormwater drains of your school and the local area to encourage people not to litter and to take care of their waterways, such as the creeks and rivers.

Students will discuss elements of design in the classroom in relation to public artworks intended to educate the community.

The teacher will choose several of the artworks created by the students that most clearly display the ideals of stormwater education. The artworks chosen will then be sent to the Design team of Council.

The Design team will combine the ideas of all the artworks chosen to create one design that will represent the stormwater education message your school wants to deliver. This final design will be printed onto a material called Asphalt Art, an extremely durable material that can be easily pressed into the concrete of the stormwater drains.

Together, the students, teacher and Environmental Education Officer of Council will apply these artworks onto the stormwater drains that surround the school. This will allow the surrounding community to see and learn about stormwater education, all through the work of the school students.

NOTE: If there are concerns for students' safety along the roadside, the Environmental Education Officer can install the stickers on the drains on behalf of the school. The results of the project can then be demonstrated to students through photos, as well as students seeing it themselves as they leave and arrive to school.



ACTIVITY 2

PREPARATION

Before the lesson, gather required materials. The students may use any two-dimensional art medium to create their design. Students may also create a digital image. The design must be no larger than 60cm (width) x 25cm (height).

Some helpful hints:

- Any colours can be used.
- Large, solid images are ideal to create maximum impact when placed on the kerb.
- A short slogan along with images will help to convey the message.
- Use the entire design space of 60cm x 25cm.

NOTE: prepare your images on an A3 piece of paper and Council will transpose this onto the design space template

EQUIPMENT

- Art materials or access to computer.
- Drain artwork design worksheet (found over the page).
- Sample images of drain artwork (see images in this booklet or you can easily find some examples if you google 'Stormwater drain stickers').
- A3 paper.

ACTIVITY DESCRIPTION

1. Review information learnt in previous activity. Ask key questions such as:
 - Where does the rainwater that flows down our stormwater drains end up?
 - What are some of the types of pollution that can end up in our waterways?
 - What catchment or sub-catchment does the stormwater from our school flow into?
 - What effect does the pollution in our stormwater have on the environment?
 - Why is it important to keep our stormwater clean?
2. Students will be designing drain artwork to be placed onto the stormwater drains that surround your school.
 - Show images of previous examples of drain artwork to your students to help get them started as well as providing some inspiration.
 - Discuss the design features the images have in common.
 - Identify features that are important in designing a large image. This might include using large solid images that can be seen from a distance and making the image eye catching.
3. Provide students with the design worksheet. It is important that students complete the worksheet first, as this will help them structure and create their design.
4. Once students have finished their design worksheet, they can begin designing their artwork. It is as simple as drawing it on a piece of A3 paper and writing their name, class and school in the corner of the page or on the other side of the paper.

Although not all students' artwork may be chosen, it is important to let the students know that it is a group idea and project and no individual names will be placed on the artwork, just the class and the school.



DESIGN WORKSHEET

TASK: Design a drain artwork to be placed around stormwater drains in your local community. Your artwork needs to encourage others to do the right thing and stop pollutants ending up in the water.

Answer the questions below to help you with your design

1. What effect does pollution have on plants and animals in creeks and rivers?

2. What type of pollution did you see in your school and local area?

3. Write a slogan to encourage others to take care of the creeks and rivers



READY. SET. GO.
USE AN A3 PIECE OF PAPER TO DESIGN
YOUR DRAIN ARTWORK!

