 Depth study

Year 11 Earth and Environmental Science

Resources

[Sewerage Treatment](https://www.sawater.com.au/community-and-environment/our-water-and-sewerage-systems/sewage-treatment) https://www.sawater.com.au/community-and-environment/our-water-and-sewerage-systems/sewage-treatment

[Seabin](https://www.theguardian.com/environment/shortcuts/2017/oct/11/the-seabin-the-debris-sucking-saviour-of-the-oceans) https://www.theguardian.com/environment/shortcuts/2017/oct/11/the-seabin-the-debris-sucking-saviour-of-the-oceans

[Innovative toilets](http://theconversation.com/the-world-needs-more-toilets-but-not-ones-that-flush-74007) http://theconversation.com/the-world-needs-more-toilets-but-not-ones-that-flush-74007

[NSW Water real-time data](http://www.water.nsw.gov.au/realtime-data) http://www.water.nsw.gov.au/realtime-data

[NSW Water urban water](http://www.water.nsw.gov.au/urban-water) http://www.water.nsw.gov.au/urban-water

[NSW water management](http://www.water.nsw.gov.au/water-management) http://www.water.nsw.gov.au/water-management

[Melbourne water teacher resources](https://www.melbournewater.com.au/community-and-education/teacher-resources) https://www.melbournewater.com.au/community-and-education/teacher-resources

[Department of the Environment and Energy: Water](http://www.environment.gov.au/water) http://www.environment.gov.au/water

[CSIRO Water Book](https://www.csiro.au/en/Research/Environment/Water/Water-Book) https://www.csiro.au/en/Research/Environment/Water/Water-Book

[ABC splash: water](http://splash.abc.net.au/home#!/topic/496766/water) http://splash.abc.net.au/home#!/topic/496766/water

Module 4: Human impacts - Water management

Inquiry question: How can water be managed for use by humans and ecosystems?

Marvellous 'Smellbourne' (Sourced from Melbourne Water)

The discovery of gold in 1851 made Melbourne one of the richest cities on earth. With a population of about half a million people by the 1880s, it had also become Australia’s biggest city.

But Melbourne was facing a big pollution problem. While it had been described by British journalists as "a city of magnificent intentions", it was also being dubbed Marvellous 'Smellbourne’ because of the city’s unsanitary waste disposal methods.

Open sewers

In those early days the majority of waste from homes – including kitchen, bathroom and laundry wastes, along with the contents of chamber pots – were emptied into open drains that flowed into street channels and on to local rivers and creeks. Waste from farms and industries also flowed into these street channels, turning Melbourne's rivers and creeks into open sewers.

Thunderboxes and chamber pots

Methods for disposing of human waste were also very basic. A toilet consisted of a bucket that was housed in a wooden structure known as a 'pan closet toilet' or 'thunderbox'.

The early solution was to cart human waste away to the outer fringes of Melbourne, where it was often used as fertiliser by market gardeners or taken to the tip. Thunderboxes were only emptied about once a week by a nightman, so called because he collected pans at night by reaching through a small door in the back of the closet. Because the waste stayed in the pan for up to a week, thunderboxes were really smelly.

Since walking to the thunderbox in the cold and dark of night was not very appealing, many people opted to use chamber pots at night instead. These were often emptied straight into street drains.

To make matters worse, as Melbourne’s population grew the system of nightmen couldn't keep up and more and more people started disposing of their wastes directly into street drains.

[Source:](https://www.melbournewater.com.au/aboutus/historyandheritage/historyofsewerage/Pages/history-of-sewerage.aspx) https://www.melbournewater.com.au/aboutus/historyandheritage/historyofsewerage/Pages/history-of-sewerage.aspx

Historical case study

Melbourne Water has played a significant role in Melbourne’s development, from creating our underground sewerage system in the 1890s to completing Thomson Reservoir, Melbourne’s largest water supply reservoir in 1984.

Today, we are responsible for a rich and diverse portfolio of heritage assets which we inherited largely from our predecessor, the Melbourne and Metropolitan Board of Works (MMBW). Many of these assets were built in the formative years of Melbourne’s settlement.

But our commitment to preserving heritage goes beyond built structures. It extends to respecting the cultural heritage places of the Traditional Owners of the land, rivers and creeks that we care for today, and that we are ever-mindful of the importance they have for our indigenous communities.

| Year | Historical significance |
| --- | --- |
| 1890 | * Melbourne, was a city of half a million people, with water diverted from the Watts River, via the Maroondah aqueduct.
 |
| 1891 | * Melbourne Water’s predecessor, the Melbourne and Metropolitan Board of Works (MMBW) was formed to take responsibility for both water supply and the treatment of sewage.
* The Yarra Ranges region was closed to public for the catching, storing and filtering of rainwater.
 |
| 1892 | * Construction began on Melbourne’s sewerage system. A treatment farm was built at Werribee and a pumping station was built at Spotswood to send the city's waste to Werribee.
 |
| 1897 | * Western Treatment Plant (then known as Werribee Farm) began operations and the first Melbourne homes were connected to the sewerage system.
 |
| 1910 | * 123,227 connections to Melbourne's water supply.
* 105,993 connections to the sewerage system.
 |
| 1924 | * The Metropolitan Drainage and Rivers Act was established to solve the city's drainage requirements.
* Many wetlands were drained or filled in for development, and some creeks and rivers were altered for flood control.
 |
| 1927-1932 | * Maroondah Reservoir was completed in 1927,
* O'Shannassy Reservoir in 1928 and
* Silvan Reservoir in 1932,
* Melbourne's water storages increase from 30,000 million litres to 104,500 million litres.
 |
| 1934 | * Extreme storms caused widespread flooding, highlighting that the city required an improved drainage system.
 |
| 1937 | * Large-scale drainage works began and a new, stable and less flood-prone riverscape began to take shape.
 |
| 1946 | * Upper Yarra Reservoir and a major scheme of pipelines and tunnels brought more water to Melbourne.
 |
| 1950 | * Rapid population growth after World War II meant a new supply of water was urgently required.
 |
| 1957 | * The Upper Yarra Reservoir completed, meaning Melbourne's total water storage approximately 300,000 million litres.
 |
| 1960s | * Large scaled maintenance as parts of the water system were replaced or renewed.
 |
| 1970 | * Introduction of the Environment Protection Act in 1970 ensured a major improvement in river health.
* Industrial waste had to be treated rather than being emptied directly into rivers and creeks.
* Outer suburbs of Melbourne and rural areas were connected to the sewerage system.
 |
| 1971 | * To meet growing demand a reservoir was completed at Greenvale.
 |
| 1973 | * Construction of Cardinia Reservoir was completed.
* As part of a new Victorian Government policy fluoride was added to all public water supplies.
 |
| 1974 | * Flash flooding in the Maribyrnong River, Moonee Ponds Creek and Merri Creek caused havoc.
* In response to this disaster, the MMBW installed monitoring devices to provide an early flood warning.
 |
| 1975 | * Melbourne’s second major sewage treatment plant, the Eastern Treatment Plant opened.
 |
| 1977 | * The Drainage of Lands Act strengthened the MMBW's ability to prevent development of flood-prone land.
 |
| 1984 | * The Thomson Reservoir, the largest capacity reservoir ever built by the MMBW, was officially connected to Melbourne on 31 July, 1984.
 |
| 1992 | * The MMBW merged with a number of smaller urban water authorities to form Melbourne Water.
* Melbourne Water and the CSIRO announced an $11 million study into the health of Port Phillip Bay. The study recommended a reduction in nitrogen to the bay.
 |
| 1995 | * Melbourne Water commences operation as the wholesale water company, together with City West Water, South East Water and Yarra Valley Water as Melbourne’s retail water companies.
 |
| 1999 | * $130 million Healthy Bay Initiative, consisting of major works and environmental improvements at the Western Treatment Plant and the construction of 10 wetlands in Melbourne's south-east growth corridor, designed to improve the health of Port Phillip Bay by reducing nitrogen flows from the Western Treatment Plant and stormwater run-off.
 |
| 2004 | * The Victorian Government put in place a long-term plan for water, ‘Our Water Our Future’.
* The plan set out 110 initiatives for water conservation, aimed at every sector of the community, seeking to provide water to sustain growth over the next 50 years.
* Western Treatment Plant upgrade commenced to reduce nitrogen loads to the bay and make available a reliable supply of high quality recycled water for farms, parks, market gardens and other uses.
 |
| 2006 | * A major upgrade of the Eastern Treatment Plant to improve the quality of the treated effluent it produces was announced.
* The upgrade to tertiary treatment will reduce impact on marine environments, where treated water is discharged and make available more options to use treated water for non-drinking purposes (recycled water).
 |
| 2007 | * The next stage of the ‘Our Water Our Future’ plan to secure Melbourne's water supply, was announced.
* Planning is underway to divert water from the Goulburn River to the Sugarloaf Reservoir.
* Construct a seawater desalination plant in Wonthaggi.
* Upgrade the Eastern Treatment Plant, and
* Reconnect the Tarago Reservoir to Melbourne's water supply network.
 |
| 2009 | * Devastating bushfires in February damaged about 30% of Melbourne's water supply catchments. Most of this was in the O'Shannassy and Maroondah catchments.
 |
| 2010 to present. | * The Eastern Treatment Plant upgrade now complete. The plant is now one of the most sophisticated facilities of its kind after it was completed 2012.
* Community involvement in caring for our rivers and creeks, stronger environmental regulation, a more sustainable approach to urban development and water sensitive urban design, and major changes in rural areas (such as intensified farming practices) are all having a positive impact on water quality and river and creek health.
 |

[Adapted from source](https://www.melbournewater.com.au/aboutus/historyandheritage/Pages/Our-history-a-timeline.aspx): https://www.melbournewater.com.au/aboutus/historyandheritage/Pages/Our-history-a-timeline.aspx

1. Identify ONE (1) advantage and disadvantage outlined for the history of Melbourne’s water supply.
2. State which was the most important 3 decisions made with regards to the water supply of Melbourne over the past 130 years. Justify each of your choices.
3. The timeline concludes on 2010 to present, explain what you believe could be a future implication for the supply water of water in Victoria.
4. Describe how the 1999 ‘Healthy Bay Initiative’ impacted upon the ecosystem of Port Philip Bay.
5. Would you consider the $130 million spent on the ‘Healthy Bay Initiative’ a economically sound decision? Elaborate on your decision.
6. Explain the changes that occurred in society which resulted in the use of chamber pots and thunderboxes phased out.
7. Discuss the impact that open sewers might have had on local ecosystems.
8. Develop a scaled timeline for the changes that Melbourne’s water supply underwent from 1890 – 2010.

Solutions to urban water problems

Water catchments desperately need to be managed, in order, to reduce the amount of nutrients and pollutants entering a water system.

Various government focuses, scientific technologies and community programs are being developed to aid Australians in the reduction of water based problems.

| Problem | Explain why this is an issue? | Identify current solutions to reduce this problem |
| --- | --- | --- |
| Vegetation Management |       |       |
| Industrial Waste |       |       |
| Sewage Effluent |       |       |
| Urban/stormwaterrun-off |       |       |

First hand investigation: Pollutants and algal growth.

Eutrophication is referred to as a process where certain nutrients can be found in concentrated levels in a water source. Normally the addition of these two nutrients can assist in determining the level of biological productivity of a water source. This productivity is particularly evident in plant growth. A rapid increase in one or both nutrient elements, in a water source, can develop into in a sudden population explosion of algae and cyanobacteria. The presence of excess phosphorous and nitrogen can result in a ‘bloom’ or an amplified growth of microscopic organisms.

Algal growth is a naturally occurring process within a water way however a number of human activities can have a direct impact upon the levels of phosphorous and nitrogen in an ecosystem.

Some key human based impacts which can increase these nutrients include;

* Agriculture practices as animal manure, excess crop fertilisation and soil erosion.
* Urban stormwater runoff as rain in cities often runs across hard surfaces collecting pollutants which are inevitably relocated into local waterways.
* Wastewater systems as sewer and septic systems treat large quantities of waste before discharging into waterways.
* Household activities which involve garden fertilisation, pet waste, cleaning products soaps and detergents can all contribute to increased nutrient levels when not properly used or disposed of.

Aim:

* To test the effects of different pollutants on algal growth.

Materials:

* Sample of algae (Collected from an outside water source)
* Soluble fertiliser (Nitrogen pollutant)
* Detergent (phosphorous pollutant)
* Distilled water
* Glass beaker 200ml
* Stirring rod

Method:

1. Collect 10 beakers each 200ml
2. In 5 separate beakers, using water and detergent make up 5 concentrations at 0%, 25%, 50%, 75% and 100%.
3. In 5 separate beakers, using water and Soluble fertiliser make up 5 concentrations at 0%, 25%, 50%, 75% and 100%.
4. Place the beakers in a lightened area of the laboratory and leave for a period of one week.
5. After a period of one week record all observations into results table, for each beaker.

Results:

Table 1. Detergent: Phosphorous based pollution

| Beaker | Phosphorous Concentration | Detergent (ml) | Distilled water (ml) | Observation after 1 week |
| --- | --- | --- | --- | --- |
| 1 | 100% | 100 | 0% |       |
| 2 | 75% | 75 | 25 |       |
| 3 | 50% | 50 | 50 |       |
| 4 | 25% | 25 | 75 |       |
| 5 | 0% | 0 | 100 |       |

Table 2. Soluble Fertiliser: Nitrogen based pollution

| Beaker | Phosphorous Concentration | Detergent (ml) | Distilled water (ml) | Observation after 1 week |
| --- | --- | --- | --- | --- |
| 1 | 100% | 100 | 0% |       |
| 2 | 75% | 75 | 25 |       |
| 3 | 50% | 50 | 50 |       |
| 4 | 25% | 25 | 75 |       |
| 5 | 0% | 0 | 100 |       |

Discussion questions:

1. State a hypothesis developed by your group.
2. Explain the idea behind this hypothesis.
3. Identify your controls in this set of experiments.
4. Explain how levels of phosphorous and nitrogen could have a beneficial effect upon an environment.
5. Describe what the effect of detergent was on the growth of algae.
6. Describe what the effect of soluble fertiliser was on the growth of algae.
7. Explain the reason for increasing the concentration levels of the pollutant.
8. Compare the results obtained for detergent to the results obtained for soluble fertiliser.
9. Identify a risk factor to this experiment.
10. Describe how you maintained a valid experiment over the observational period.

Wastewater treatment plants in NSW

In NSW, there are currently 16 waste treatment plants which are currently processing over 1.3 billion litres of wastewater from over 1.8 million homes and businesses every day.

Students are encouraged to investigate a range of sources to complete the information in the following table, about key waste treatment plants from around Sydney and its surrounding suburbs.

| Treatment plant | Population serviced | Daily dry discharge amount | Discharge location |
| --- | --- | --- | --- |
| Bondi |       |       |       |
| Camden West |       |       |       |
| Cronulla |       |       |       |
| Hornsby Heights |       |       |       |
| Malabar |       |       |       |
| North Head |       |       |       |
| Picton |       |       |       |
| Shellharbour |       |       |       |
| Warriewood |       |       |       |
| West Hornsby |       |       |       |
| Winmalee |       |       |       |

Analysing wastewater overflows data

NSW’s wastewater network is designed to protect public health through efficient and safe removal of private and industrial wastes. On occasions, in the event of heavy rain, pipe blockages or breakages, wastewater has been known to overflow into the environment, through septic systems, manholes, drains and specifically engineered overflow points. These methods of overflow are designed to release pressure on the network rather than backing-up in pipes and flowing onto streets or into businesses or even your home.

Incidence of wastewater overflows occur primarily in wet weather but can also occur in dry weather because of blockages

Overflows in wet weather

During heavy rainfall, the wastewater system can become affected by large amounts of stormwater. Wet weather overflows can occur during heavy periods of rain when the volume of stormwater exceeds the capacity of our wastewater pipes, pump stations and treatment plants. If a lot of stormwater enters a wastewater system, the system could become overloaded, resulting in wet weather overflow and the release of untreated raw sewage.

Overflows in dry weather

This form of overflow is often caused by blockages in wastewater pipes. Most wastewater pipes are only 100mm in diameter and are not designed to carry anything other than wastewater and bio-degradable products.

Wastewater that enters systems consists predominantly of water, human waste, food scraps, fats, debris and trade wastes. Over time, fats, oils and grease build ups in pipes, eventually causing blockages. Blockages can also be caused by natural events such as ground movement, but more commonly tree roots. It is important to note that a dry overflow is not caused by excess amounts of liquid in the system.

In 2014-15, Sydney Water experienced 17,663 blockages across all its wastewater networks (Sydney Water 2015a). The total number of overflows that resulted from these blockages was 720 (about 4%). Of these, 291 resulted in wastewater overflow to water (approximately 1.6%). The primary cause of blockages was tree roots (64%). Other causes of blockages were debris, soft choke and fat.

The following data represents the previous 8 years of suspended solids loads (tonnes/year) from an ocean treatment plant (Bondi).

Use the data to complete the think and analyse questions.

Sewage Plant

| Weather | 2007 - 2008 | 2008 - 2009 | 2009 - 2010 | 2010 - 2011 | 2011 - 2012 | 2012 - 2013 | 2013 - 2014 | 2014 - 2015 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dry | 1,195.0 | 1,128.3 | 1,241.0 | 1,129.4 | 1,149.7 | 1,304.1 | 1,405.9 | 1420.0 |
| Wet | 328.5 | 335.6 | 216.2 | 309.7 | 400.8 | 229.1 | 191.9 | 353.0 |
| Yearly Total |       |       |       |       |       |       |       |       |

Think and analyse questions

* Calculate total
* Calculate the % change last 1 year, % change last 8 years for the total (11%)
* Looking the map where does Bondi receive most of its waste from
* Explain why there is such a variety between wet totals
* What environmental issues might occur from overflow?
* You want to plant a tree however…. provide an educated answer.
* Provide a reason why there is more dry than wet at Bondi.

Evaluating government information sites

Visit TWO (2) different state government websites evaluating the information provided to the public with regards to wastewater sewage and its disposal.

The following criteria is to be considered when evaluating a website.

* Author/Authority
* Purpose
* Currency
* Design
* Objectivity

Site Number 1: URL -

| Author/Publisher credentials: | Tick |
| --- | --- |
| Known expert | [ ]  |
| Creator has other reliable publications | [ ]  |
| Unknown (such as newspaper, magazine, TV network) | [ ]  |

| Website Domain: | Tick |
| --- | --- |
| .com | [ ]  |
| .org | [ ]  |
| .net | [ ]  |
| .edu | [ ]  |
| .gov | [ ]  |

| Authority | Yes | No |
| --- | --- | --- |
| Is it clear who the Author of the website is? | [ ]  | [ ]  |
| Has contact information (name, email, phone number or address) been provided? | [ ]  | [ ]  |
| If there is no personal author, is an institution provided along with contact information? | [ ]  | [ ]  |
| Does the website list any or qualifications, or credentials. | [ ]  | [ ]  |

Justify your views on the validity of this website.

| Purpose | Yes | No |
| --- | --- | --- |
| Does the website avoid trying to persuade your understand? | [ ]  | [ ]  |
| Is the information on the site relevant to your needs? | [ ]  | [ ]  |
| Based on the reading you have already done on sewage in NSW, does the information on this site seem accurate? | [ ]  | [ ]  |
| Is the data and facts information referenced? | [ ]  | [ ]  |
| Are there any textual mistakes such as grammar/spelling? | [ ]  | [ ]  |
| If there are links to other pages, do they lead to reliable sources? | [ ]  | [ ]  |

Explain the purpose of this website.

| Currency | Yes | No |
| --- | --- | --- |
| Is the date the site was created provided? | [ ]  | [ ]  |
| Is there a date that shows when the site has last been updated? | [ ]  | [ ]  |
| Does the site contain “broken” links? | [ ]  | [ ]  |

| Design | Yes | No |
| --- | --- | --- |
| Is the information presented in a clear and organized fashion? | [ ]  | [ ]  |
| Do any graphics, video or audio add to the content or distract? | [ ]  | [ ]  |
| Do ads interfere with the content? | [ ]  | [ ]  |

Provide judgement on the overall design of this website.

| Objectivity | Yes | No |
| --- | --- | --- |
| Does the content give only one side of an issue? | [ ]  | [ ]  |
| If so, do they hide their bias? | [ ]  | [ ]  |

Evaluate if the websites bias impacts the usefulness of the information?

Site Number 2: URL -

| Author/Publisher credentials: | Tick |
| --- | --- |
| Known expert | [ ]  |
| Creator has other reliable publications | [ ]  |
| Unknown (such as newspaper, magazine, TV network) | [ ]  |

| Website Domain: | Tick |
| --- | --- |
| .com | [ ]  |
| .org | [ ]  |
| .net | [ ]  |
| .edu | [ ]  |
| .gov | [ ]  |

| Authority | Yes | No |
| --- | --- | --- |
| Is it clear who the Author of the website is? | [ ]  | [ ]  |
| Has contact information (name, email, phone number or address) been provided? | [ ]  | [ ]  |
| If there is no personal author, is an institution provided along with contact information? | [ ]  | [ ]  |
| Does the website list any or qualifications, or credentials. | [ ]  | [ ]  |

Justify your views on the validity of this website.

| Purpose | Yes | No |
| --- | --- | --- |
| Does the website avoid trying to persuade your understand? | [ ]  | [ ]  |
| Is the information on the site relevant to your needs? | [ ]  | [ ]  |
| Based on the reading you have already done on sewage in NSW, does the information on this site seem accurate? | [ ]  | [ ]  |
| Is the data and facts information referenced? | [ ]  | [ ]  |
| Are there any textual mistakes such as grammar/spelling? | [ ]  | [ ]  |
| If there are links to other pages, do they lead to reliable sources? | [ ]  | [ ]  |

Explain the purpose of this website.

| Currency | Yes | No |
| --- | --- | --- |
| Is the date the site was created provided? | [ ]  | [ ]  |
| Is there a date that shows when the site has last been updated? | [ ]  | [ ]  |
| Does the site contain “broken” links? | [ ]  | [ ]  |

| Design | Yes | No |
| --- | --- | --- |
| Is the information presented in a clear and organized fashion? | [ ]  | [ ]  |
| Do any graphics, video or audio add to the content or distract? | [ ]  | [ ]  |
| Do ads interfere with the content? | [ ]  | [ ]  |

Provide judgement on the overall design of this website.

| Objectivity | Yes | No |
| --- | --- | --- |
| Does the content give only one side of an issue? | [ ]  | [ ]  |
| If so, do they hide their bias? | [ ]  | [ ]  |

Evaluate if the websites bias impacts the usefulness of the information?

Overcoming your 'yuk factor'

Australian towns and cities have relied upon the use of wastewater for the watering of recreational facilities such as parks and golf courses along with agricultural and private irrigation.

However, a recent proposal for one drought-stricken Australian community to recycle sewage and use it to top up drinking supplies has been met with mixed feelings.

Residents of Toowoomba in Queensland recently rejected a scheme to recycle sewage to top up drinking supplies, with 62% of residents opposing the scheme. Whilst the issue was addressed by a small community it has highlighted a major issue facing many Australian cities. A drying climate due to global warming and a consistently growing population is resulting in a need for innovative and more sustainable methods when it comes to water supply.

Researchers and water authorities in Australia currently are stressing the evidence saying there's no scientific or health reason that recycled wastewater shouldn’t be incorporated into our drinking water supplies providing it is treated properly.

Overseas, it's not unusual for treated wastewater to be part of drinking supplies. The city of London is located downstream from numerous wastewater recycling plants that discharge into the Thames river. Also recycled wastewater is successfully used to top up drinking water supplies in Namibia, the United States and Singapore. Many informal 'taste and tell' surveys reveal that most people can't tell the difference between tap water, bottled water and recycled water.

Decisions are ultimately coming down to people’s psychological mindset. It's called the 'yuk factor' - based on the thinking that the water in the glass in your hand might have started off in someone's toilet bowl. ‘Surely we have to accept we have to drink our own excrement’, was how Chris Harris, a Sydney City councillor and a member of the NSW Greens, phrased it at a council meeting convened to discuss Sydney's water shortage

Future directions

The Goulburn proposal - which is still being considered - involves building a new wastewater plant as part of a $32 million project to recycle effluent and return it to the Sooley Dam catchment.

How to make wastewater drinkable

There are several ways in which to purify water around the world, with such methods including distillation, freezing, UV sterilisation, reverse osmosis, desalination, electro dialysis or ion exchange. Each method has obvious advantages and disadvantages associated with them. Treating wastewater to make it suitable to add to drinking supplies often involves the reverse osmosis process, along with other levels purification treatments.

The big picture

Residents of Toowoomba have voted against their wastewater scheme, but the issue is now being looked at on a much wider scale. The publicity of the scheme has driven the spotlight towards other Australia-wide initiatives when it comes to water.

A growing demand from the agriculture industry and a growing population, have exacerbated the problem. One example comes from the Australian Bureau of Statistics, highlighting that the Murray Darling Basin accounted for 57% of the nation's total water used for irrigation in 2015-16. Agricultural businesses in the Murray Darling Basin region used 4.9 million mega litres of water to irrigate 1.2 million hectares of crops and pastures during 2015-16. The area irrigated in the Murray Darling Basin account for 58% of the nation's total area watered. Although there are differing views, researchers and health authorities say it's possible to recycle water to the relevant standard for whatever use the water is required, be it irrigation, horticulture, agriculture, household use – or even drinking water.

Complete the following activities

Activity 1

Text based question – Identify the reasons why implementing sewerage based drinking water is a viable answer to water shortage.

| Reasons for | Reasons against |
| --- | --- |
|       |       |

Activity 2

Having read the text and applying your knowledge about water treatment formulate an exposition which outlines your views based on this specific social decision.

Complete the exposition into the following scaffold

| Section | Purpose | Your response |
| --- | --- | --- |
| Introduction | The introduction sets the tone for the essay and helps to engage the reader by outlining the topic, the writer’s position on a topic or issue, and the main arguments to be presented.The introductory paragraph has a very important role. It tells the reader what to expect in the rest of the essay: how the writer will demonstrate their opinion and how they will back up their opinion by using relevant examples from the text(s).Quick tip:The introduction is where the writer says what they are going to say. |       |
| Body | The body of an essay is where the student expands on the points outlined in the introduction.The body is where the student tries to convince the reader of their point of view and effectively ‘answers’ the essay question. The body includes a number of linked paragraphs with references to the text(s) to back up the writer’s point of view.Quick tipThe body of an essay is where the writer says what they have to say |       |
| Conclusion | The conclusion to an essay is generally one paragraph long and answers the main points and questions outlined in the essay introduction.It provides the writer with the chance to restate their position and persuade the reader with reference to the main points and evidence in the body of the essay. Quick tipThe conclusion is where the writer says what they have said. |       |

Activity 3

In groups of three collaboratively research the use of reclaimed sewage water for drinking in Australia to present a Current Affair News styled report which should be 2 minutes in length.