Resource 5 – The sewage factory: from sewage to clean water

In this activity you will explore how water is extracted from sewage and recycled.

What you will need

- The Eastern Treatment Plant virtual tour.
- The information sheet: Ammonia Reduction Project (attached).
- One of the videos: *Big City small land* or *Making it fresh*. (The videos can be viewed by clicking the two movie icons in the bottom navigation bar of the Eastern Treatment Plant Explorer.)

Background

What is in sewage?

Technically, sewage is the wastes from human settlement. If not handled properly, sewage can spread disease throughout a community.

However, sewage is also an untapped resource: It might carry bacteria and diseases but it also contains a range of valuable materials that can be separated and reused. The Eastern Treatment Plant is an interesting account of how engineers used basic scientific principles, not only to solve the problems associated with sewage, but also to use the resources in the sewage itself. This is a story about how a problem turned into a solution.

What to do

Before starting the virtual tour, watch one of the videos that describe the Eastern Treatment Plant. Jot down notes about the different processes described in the video.

The Eastern Treatment Plant virtual tour allows you to explore these processes in more detail. In this activity, your task is to follow the water in 'The sewage factory' on the virtual tour and concentrate on how water is extracted from the sewage. On your tour, you may want to collect photos and text to help you.

Questions

1. Make a list of all the physical, chemical and biological processes used to purify the water.
2. Draw a flow diagram showing how water is extracted from the sewage. Break the diagram into three parts: Primary, Secondary and Tertiary treatments. (Read the information sheet on the Ammonia Reduction Project)

3. How can this water be used? Is it drinkable?
4. Make a list of the possible benefits and costs associated with extracting water from sewage. How do you and your classmates feel about using this water?

Information sheet: Ammonia Reduction Project

Melbourne Water has begun a $47 million project to reduce ammonia levels in effluent treated at the Eastern Treatment Plant at Bangholme by more than 75 per cent. This will significantly improve the quality of water released into Bass Strait on the Mornington Peninsula.

A major two-year CSIRO study commissioned by Melbourne Water studied the effect of effluent on the marine environment, and found that ammonia was affecting the marine ecology. The study concluded that treatment improvements to reduce ammonia would result in a reduction of far-field impacts and may allow some recovery at the rocky platforms south-east of Boags Rocks, where effluent is discharged.

The ammonia reduction project has been approved after a successful $5 million six-month pilot project in one of the Eastern Treatment Plant's six aeration tanks.

The project involves incorporation of a treatment process, called nitrification-denitrification, into the existing system.

The trial tank was fitted with barriers and upgraded aeration to create alternating aerobic and anoxic (low oxygen) zones. The additional aeration improves conditions for the aerobic bacteria, and ensures greater mixing of the waste, leading to more thorough treatment.

In the aerobic zones, bacteria are encouraged to convert ammonia to nitrate, and in the anoxic zones the nitrate is reduced to nitrogen gas, which makes up about 80 per cent of air.

This project, which will take about four years to complete, is a major step in improving the marine environment.