

(for teachers' eyes only!)

## MATHS: DOWN THE DRAIN PAGE E8

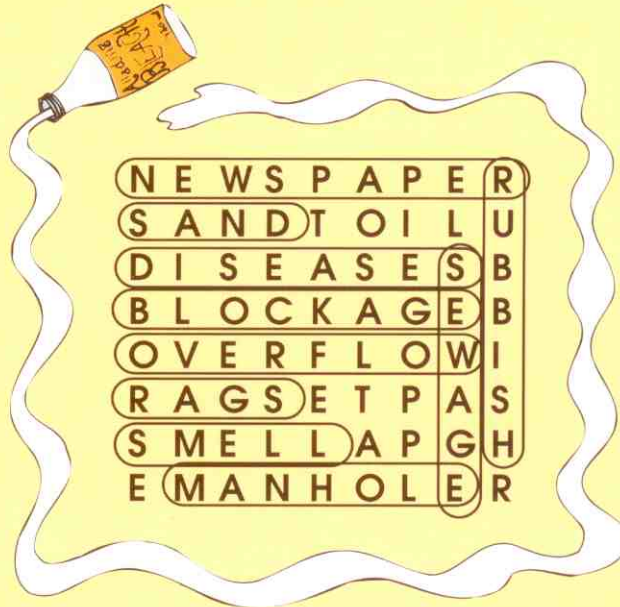
1. 1 millilitre = *ml* = 1 big raindrop  
 1 litre = *l* = 4 cups of water  
 1 kilolitre = *kl* = 5 full baths of water  
 1 megalitre = *Me* = a 25 m x 25 m school swimming pool
  
2. 1000 *ml* = 1 *l*  
 1000 *l* = 1 *kl*  
 1000 *kl* = 1 *Me*  
 1000 000 *l* = 1 *Me*  
 1000 000 000 *ml* = 1 *Me*
  
- 3.a) 1 *l* = 1000 *ml*  
 c) A teaspoon holds 5 *ml*  
 e) A *kl* equals 1000 *l*  
 g) A full bath holds 100 *l*  
 i) 100 *Me* = 100 000 *kl*  
 b) 1 *Me* = 1000 *kl*  
 d) A teacup holds 250 *ml*  
 f) A bucket holds 5 *l*  
 h) A *Me* is 1000 000 bigger than a litre
  
- 4.a) R 0,23  
 b) R 0,11
  
5. It stands for 20 *Me*
  
- 6.a) 200 *Me* per day  
 c) 40 *Me* per day  
 e) 10 *Me* per day  
 b) 60 *Me* per day  
 d) 50 *Me* per day
  
- 7.a) 200 000 *kl* per day  
 c) 40 000 *kl* per day  
 e) 10 000 *kl* per day  
 b) 60 000 *kl* per day  
 d) 50 000 *kl* per day
  
- 8.a) 200 000 000 *l* per day  
 c) 40 000 000 *l* per day  
 e) 10 000 000 *l* per day  
 b) 60 000 000 *l* per day  
 d) 50 000 000 *l* per day
  
- 9.a) R 22000,00  
 c) R 9200,00  
 e) R 2300,00  
 g) R 18 834 000,00 or 18 million 834 thousand Rand per year  
 b) R 66 00,00  
 d) R 11500,00  
 f) R 51600.00

(for teachers' eyes only!)

## THE WORD SEARCH PUZZLE - Beginners p H.4

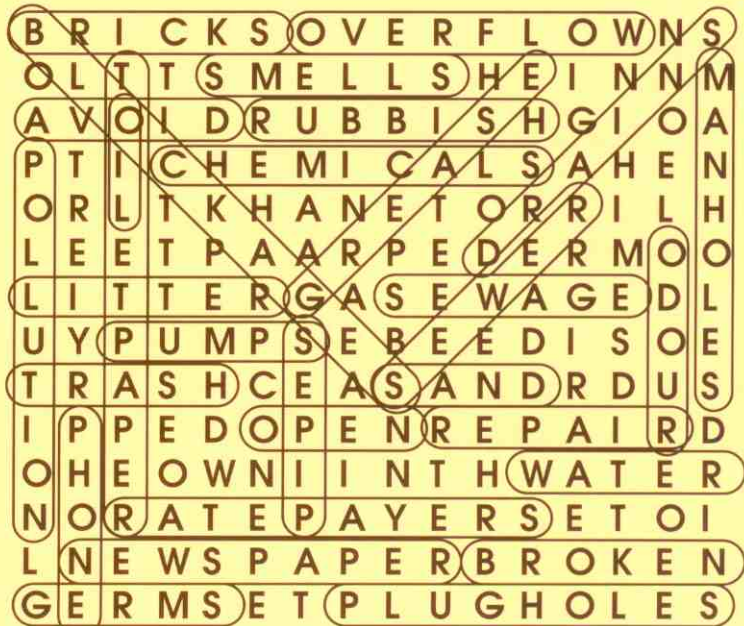
BLOCKAGE✓  
OVERFLOW✓  
SEWAGE✓  
SAND✓  
RAGS✓  
NEWSPAPER✓  
RUBBISH✓  
MANHOLE✓  
DISEASES✓  
SMELL✓

TOILET PAPER



## THE WORD SEARCH PUZZLE - Advanced p H.5

TOILETPAPER✓ LITTER✓  
BLOCKAGES✓ BRICKS✓  
SEWAGE✓ OIL✓  
SEWER✓ WATER✓  
PIPES✓ CHEMICALS✓  
PLUGHOLES✓ TRASH✓  
DRAINS✓ GERMS✓  
MANHOLES✓ PUMPS✓  
NEWSPAPER✓ AVOID✓  
OVERFLOW✓ BROKEN✓  
ODOUR✓ REPAIR✓  
POLLUTION✓ OPEN✓  
RATEPAYERS✓ PHONE✓  
GREASE✓ SMELLS✓  
RUBBISH✓ SAND✓



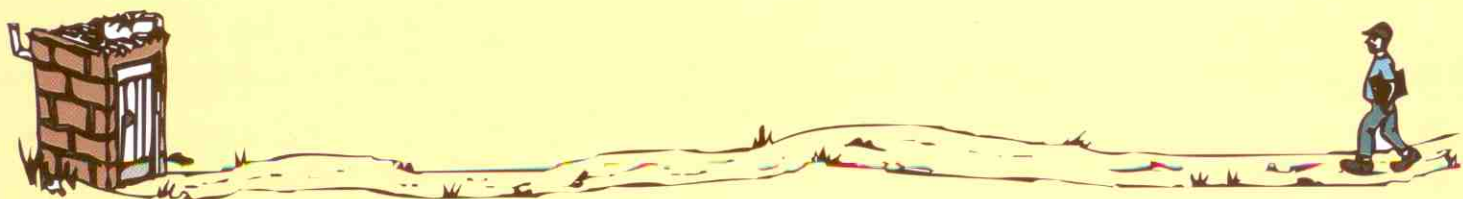
NOTHING OTHER THAN TOILET PAPER MAY BE  
DISCARDED DOWN IN THE TOILET

## CRITICAL CROSS-FIELD OUTCOMES

These outcomes are designed by the South African Qualifications Authority (SAQA) and apply to all the learning areas.

Learners should be able to successfully demonstrate their ability to:

1. Communicate effectively using visual, mathematical and / or language skills in the modes of oral and / or written presentation.
2. Identify and solve problems by using creative and critical thinking.
3. Organise and manage themselves and their activities responsibly and effectively.
4. Work effectively with others in a team, group, organisation and community.
5. Collect, analyse, organise and critically evaluate information.
6. Use science and technology effectively and critically, showing responsibility towards the environment and the health of others.
7. Understand that the world is a set of related systems. This means that problem-solving contexts do not exist in isolation.
8. Show awareness of the importance of effective learning strategies, responsible citizenship, cultural sensitivity, education and career opportunities and entrepreneurial abilities.



Learners will be able to:

1. Understand and apply the Technological Process to solve problems and satisfy needs and wants.
2. Apply a range of technological knowledge and skills ethically and responsibly.
3. Access process, and use data for technological purposes.
4. Select and evaluate products and systems.
5. Demonstrate an understanding of how different societies create and adapt technological solutions to particular problems.
6. Demonstrate an understanding of the impact of technology.
7. Demonstrate an understanding of how technology might reflect different biases and create responsible and ethical strategies to address them.

Learners will be able to:

1. Apply knowledge, techniques and skills to create and be critically involved in arts and culture processes and products.
2. Use the creative processes of the arts and culture and develop and apply social and interactive skills.
3. Reflect on and engage critically with the arts experience and works.
4. Demonstrate an understanding of the origins, functions and dynamic nature of culture.
5. Experience and analyse the role of the mass media in popular culture and its impact on multiple forms of communication and expression in the arts.
6. Use art skills and cultural expressions to make an economic contribution to self and society.
7. Demonstrate an ability to access arts and cultural processes to develop self esteem and promote healing.
8. Acknowledge, understand and promote historically marginalised arts and cultural forms and practices.

# SPECIFIC OUTCOMES

## MATHEMATICAL LITERACY, MATHEMATICS AND MATHEMATICAL SCIENCES

## LIFE ORIENTATION

Learners will be able to:

1. Demonstrate understanding about ways of working with numbers.
2. Manipulate number patterns in different ways.
3. Demonstrate understanding of the historical development of mathematics in various social and cultural contexts.
4. Critically analyse how mathematical relationships are used in social, political and economic relations.
5. Measure with competence and confidence in a variety of contexts.
6. Use data from various contexts to make informed judgements.
7. Describe and represent experiences with shape, space, time and motion using all available senses.
8. Analyse natural forms, cultural products and processes as representations of shape, space and time.
9. Use mathematical language to communicate mathematical ideas, concepts, generalisations and thought processes.
10. Use various logical processes to formulate, test and justify conjectures.

Learners will be able to:

1. Understand and accept themselves as unique and worthwhile beings.
2. Use skills and display attitudes and values that improve relationships in family, group and community.
3. Respect the rights of people to hold personal beliefs and values.
4. Demonstrate value and respect for human rights as reflected in *Ubuntu* and other similar philosophies.
5. Practice acquired life and decision making skills.
6. Access career and other opportunities and set goals that will enable them to make the best use of their potential and talents.
7. Demonstrate the values and attitudes necessary for a healthy and balanced lifestyle.
8. Evaluate and participate in activities that demonstrate effective human movement and development.

# SPECIFIC OUTCOMES

Learners will be able to:

1. Engage in entrepreneurial activities.
2. Demonstrate personal role in economic environment.
3. Demonstrate the principles of supply and demand and the practices of production.
4. Demonstrate managerial expertise and administrative proficiency.
5. Critically analyse economic and financial data to make decisions.
6. Evaluate different economic systems from various perspectives.
7. Demonstrate actions which advance sustained economic growth, reconstruction and development in South Africa.
8. Evaluate the interrelationships between economic and other environments.

Learners will be able to :

1. Demonstrate a critical understanding of how South African society has changed and developed.
2. Demonstrate a critical understanding of patterns of social development.
3. Participate actively in promoting a just, democratic and equitable society.
4. Make sound judgements about the development, utilisation and management of resources.
5. Critically understand the role of technology in society.
6. Demonstrate an understanding of the interrelationships between society and the natural environment.
7. Address social and environment issues in order to promote development and social justice.
8. Analyse forms and processes of organisation.
9. Use a range of skills and techniques in the Human and Social Sciences context.

# SPECIFIC OUTCOMES

## LANGUAGES, LITERACY AND COMMUNICATION

Learners will be able to:

1. Make and negotiate meaning and understanding.
2. Show critical awareness of language usage.
3. Respond to the aesthetic, affective, cultural and social values in texts.
4. Access, process and use information from a variety of sources and situations.
5. Understand, know and apply language structures and conventions in context.
6. Use language for learning.
7. Use appropriate communication strategies for specific purposes and situations.

## NATURAL SCIENCES

Learners will be able to:

1. Use process skills to investigate phenomena related to the Natural Sciences.
2. Demonstrate an understanding of concepts and principles, and acquire knowledge in the Natural Sciences.
3. Apply scientific knowledge and skills to problems in innovative ways.
4. Demonstrate an understanding of how scientific knowledge and skills contribute to the management, development and utilisation of natural and other resources.
5. Use scientific knowledge and skills to support responsible decision making.
6. Demonstrate knowledge and understanding of the relationship between science and culture.
7. Demonstrate an understanding of the changing and contested nature of knowledge in the Natural Sciences.
8. Demonstrate an understanding of ethical issues, bias and inequities related to the Natural Sciences.
9. Demonstrate an understanding of the interaction between the Natural Sciences and socio-economic development.

# SPECIFIC OUTCOMES

**Metro Wastewater Management  
Department  
Education and Public Liason Division  
PO Box 1038  
Durban  
4000**

**Tel. 031 - 3024667 311 1111**

Services offered include:

- Educational Programmes for schools
- Resource Guide for Teachers (Outcome Based)
- Education & Awareness Campaign for Communities
- Video
- Leaflets and Posters
- Working Model showing the difference between Stormwater & Sewerage systems
- Organised visits to the Sewage Treatment Works
- Technical Library - Reference Material for Teachers Only

**Natal Parks Board  
PO Box 662  
Pietermaritzburg  
3200  
Tel. 0331 - 471961**

**SWAP  
EEPUS: Faculty of Education  
University of Stellenbosch  
Private Bag X 1  
Matieland  
7602  
Tel. 021 - 8082292**

The Schools Water Awareness Project is supported by EEPUS, with a number of satellites countrywide. Although primarily school-based, SWAP endeavours to develop strong community links.

**Umgeni Water  
External Educational Services  
PO Box 9  
Pietermaritzburg  
3200  
Tel. 0331 - 3411111**

Umgeni Water is responsible for supplying water to all people living in the Umgeni and other catchments. The External Educational Services of Umgeni Water is dedicated to education about water and related issues. Services offered include:

- A range of resources for teaching and learning about water. If you would like a catalogue of these materials, write to or telephone Umgeni Water.
- A twice-yearly newsletter called 'On Stream'. This is available at no charge. To receive this newsletter, write to Umgeni Water.
- 'Tailor-made' workshops for teachers in the Pietermaritzburg / Durban area. The workshops can be linked to the curriculum, and include guidance on how to use simple water test kits, and health education.

**Share-Net  
PO Box 394  
Howick  
3290  
Tel. 0332 - 303931**

Share-Net produce a range of low-cost resource materials for teaching and learning about the environment. Materials include simple field-guides, teacher's guides, picture-building games and information sheets. Contact them for a free copy of their Resources Guide which describes all the materials.

**KwaZulu-Natal Dep. of  
Education and Culture  
Durban Environmental Education Centre  
49 Lambert Rd.  
Morningside  
Durban  
4001  
Tel. 031 - 234029**

Supports Environmental Education in the greater Durban Area.

**Shell Educational Services**  
**PO Box 2231**  
**Cape Town**  
**8000**  
**Tel. 021 - 4084112**

Shell education services produce a range of resource materials for teaching many subjects, e.g. science, geography and maths. Write off for their free colour catalogue.

**Global Rivers Environmental Education Network (GREEN)**  
**National Coordinator: Dr D Schreuder**  
**EEPUS: Faculty of Education**  
**Private Bag X 1**  
**Matieland**  
**7602**  
**Tel. 021 - 8082292**

GREEN is an international network for sharing water quality monitoring information ideas.

**Department of Water Affairs and Forestry**  
**Communications Division**  
**Private Bag X 313**  
**Pretoria**  
**0001**  
**Tel. 012 - 3387500**

This department organises Water Day, Water Week and River Day. They also produce free resources such as posters and booklets which follow the theme chosen for Water Week.

**Department of Environmental Affairs and Tourism**  
**Communications Division**  
**Private Bag X 447**  
**Pretoria**  
**0001**  
**Tel. 012 - 31039111**

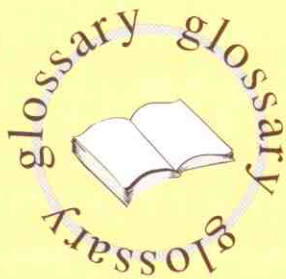
**EnviroTeach**  
**The Communications Group**  
**PO Box 7870**  
**Johannesburg**  
**2000**  
**Tel. 011 - 8352221**

**The Wildlife Society of Southern Africa**  
**Environmental Clubs Programme**  
**PO Box 394**  
**Howick**  
**3290**

**Tel. 0332 - 303931 or 011 - 4863294/5**  
 The Wildlife Society's Environmental Clubs have many benefits for their members, including two full colour educational magazines *African Wildlife* (for older children and adults) and *Toktokkie* (for younger children). Both of these magazines are full of interesting information to help you in your teaching. If you would like to know more about the benefits of being a member of the Wildlife Society's Environmental Clubs, write or telephone for more information.

**The National Parks Board**  
**Custos**  
**PO Box 787**  
**Pretoria**  
**0001**  
**Tel. 012 - 3439770**

This organisation is in charge of all our National Parks, e.g. Kruger National Park, Addo National Park and Karoo National Park. They produce two free magazines, *Custos* and *Young Custos*. Write off and have your name added to their mailing list. Like *Skipper* and *Conserva*, the magazines deal with many issues, including water, that will be of interest to you as a teacher.



**AERATION:** The mixing or agitation of liquid sewage in order to add in just the right amount of oxygen or air. This helps the 'good' bacteria to break down the pathogens (bacteria that are harmful to humans) more effectively.

**AEROBIC SLUDGE DIGESTION:** The breakdown of suspended and dissolved matter in the presence of oxygen.

**ALGAL BLOOM:** The growth of many tiny water plants (algae) in a river or sea, increasingly as a result of unnatural fertilisation of the water by phosphorus and nitrogen. This can lead to the death of plants and animals when the bloom uses up most of the available oxygen.

**ANAEROBIC SLUDGE DIGESTION:** The breakdown of organic matter brought about by micro-organisms in the absence of oxygen.

**AQUATIC:** An aquatic plant or animal is one that grows or lives in or near water.

**AUDIT:** An investigation of an issue using a choice of criteria. These could include financial criteria, environmental criteria or a combination of various criteria.

**BACTERIA:** Organisms, each of which are made up of a single cell. They can only be seen with a microscope. Many bacteria are essential for human life, but a small percentage (about 2%) are harmful to us. *E. coli*, found in human faeces, is an example of a harmful disease-causing or pathogenic bacteria.

**BIODEGRADABLE MATTER:** That which can be broken down by natural processes, usually involving bacteria and fungi. Examples include faeces and toilet paper.

**BIOLOGICAL PROCESSES:** These occur where living organisms perform natural activities. An example is the breakdown of organic solids found in sewage by micro-organisms.

**CHOLERA:** A serious disease caused by a certain bacterium. It often leads to death. Cholera epidemics arise when people come into contact with water or food contaminated by the faeces of infected people. The supply of enough purified water and the hygienic disposal of sewage help to prevent cholera outbreaks.



**COCKTAILS:** A mixture of liquids.

**CONTAMINATED:** Polluted or infected by filth or germs.

**DECOMPOSE:** To rot or break down into smaller elements.

**DEHYDRATE:** Too much fluid lost from the body due to fever, vomiting and diarrhoea, etc. This can lead to the failure of normal body functions.

**DIARRHOEA:** Diarrhoea refers to a 'runny tummy', or the frequent passing of very liquid stools (faeces). Large amounts of water are lost when a person has diarrhoea. This can lead to dehydration which is particularly dangerous in young children.

**DIFFUSERS:** The short chimney-like structures under the sea through which sewage effluent is discharged. The diffusers are positioned to ensure that the effluent is well spread.

**DISCHARGE:** The process of releasing the 'cleaned up' or treated sewage also known as sewage effluent, into a river or sea.

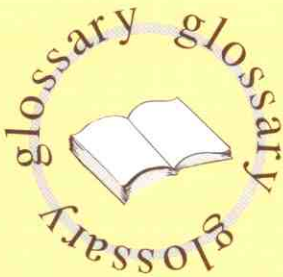
**DOMESTIC:** Originating out of the home or household.

**ELBOW GREASE:** A way of saying that a job needs to be done with a good deal of hard work.

**FAECES:** Human waste from the bowels. Also known as stools.

**FERTILISERS:** Substances that help plants to grow.

**FIELD- GUIDE:** A 'hands-on' booklet developed to provide learners with locally relevant information on a specific subject area. Field guides are very useful 'out of doors' during educational excursions.



**GASTROENTIRITIS:** This is the inflammation of the lining of the stomach which can have many different causes including viral or bacterial infection. Persistent vomiting and diarrhoea may result in severe dehydration, which, in babies and young children, can easily lead to death. Admission to hospital is essential.

**HAZARDOUS:** Dangerous. Hazardous waste is of risk to people and their environment.

**HEAVY METALS:** For example mercury and lead. Any metal heavier than water, e.g. mercury and lead. Even small quantities of heavy metals can lead to poisoning.

**HYGIENE:** The principles and practices necessary for good health.

**INCINERATION:** The process of destroying solids through burning at very high temperatures.

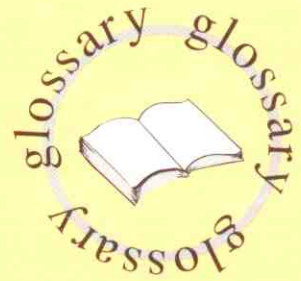
**INDUSTRIAL REVOLUTION:** During the late 18<sup>th</sup> and early 19<sup>th</sup> Century, there was a sudden increase in mechanical inventions. This led to a rapid increase in the numbers of industries, attracting many people to the cities. Industrialisation and urbanisation resulted in large increases in the amount of sewage discharged into the sewers and rivers.

**INSOLUBLE:** Matter that will not dissolve in water, for example cooking oil.

**MECHANICAL PROCESSES:** These involve the use of machinery. For example, the screening of sewage at a treatment works is a mechanical process.

**METROPOLITAN:** The areas falling under the control of a single local authority. It is usually associated with larger cities, eg. Greater Durban Metropolitan Area.

**MICRO-ORGANISMS:** Microscopic plants or animals, invisible or barely visible to the naked eye. Examples are some algae, bacteria, fungi, protozoa and viruses.



**MONITOR:** Checkup to ensure that required standards are being maintained.

**MUTATION:** A change in the genetic material of an organism. This often leads to harmful side effects such as incomplete foetal development.

**NIGHT SOIL:** A term describing human faeces deposited in toilets using the bucket system.

**NON-BIODEGRADABLE:** Materials that cannot be broken down by natural processes, e.g. hard plastics.

**NON-RENEWABLE:** Resources that, once used, cannot be renewed, e.g. petrol.

**NUTRIENTS:** Substances that are necessary for growth and life. Nutrients in sewage refer mostly to nitrogen and phosphorus.

**ORGANIC:** Matter which comes from or off living organisms.

**OUTFALL PIPES:** Sewage disposal pipes through which 'cleaned up' or treated sewage is discharged into rivers and seas.

**PATHOGENIC BACTERIA:** Any bacteria that cause disease. Also see bacteria in glossary.

**PESTICIDES:** Poisonous chemicals produced to kill off pests, including a wide range of insects and other vermin such as rats and mice.

**PHOSPHORUS:** A chemical element that occurs naturally in human waste and is present in some detergents and fertilizers. Phosphorus is a nutrient that should be controlled in effluent discharge so that algal blooms (eutrophication) can be prevented.

**PHYSICAL PROCESSES:** These use the principles of physics. For example, gravity is largely responsible for the settling of heavy organic solids in the settling tanks at the sewage treatment works.



**POLLUTER-PAYS PRINCIPLE:** The system of charging users, especially industry, for both the quantity and quality of sewage discharged into the sewerage system.

**POLLUTION:** Damage caused to the environment by substances released into it. These substances are known as pollutants.

**RECYCLING:** Method of removing and re-using certain types of materials.

**REGULATIONS:** Rules or laws laid down by local, provincial and national authorities.

**REHYDRATE:** The process of reintroducing fluid into the body after it has been dehydrated.

**RENEWABLE:** Resources which, if used wisely, can be used again. Water that is well managed is a renewable resource.

**SEDIMENTS:** Matter that settles to the bottom of a liquid.

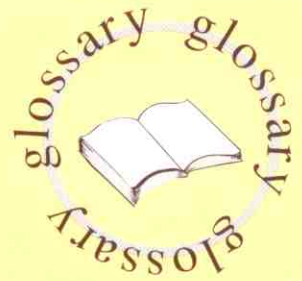
**SEWAGE:** Waste products and water that are flushed down the drain, toilet or sink. Sewage includes domestic and industrial waste. Because it often contains human waste (faeces and urine), sewage contains many disease-causing organisms. In very populated places, such as towns and cities, it is essential that sewage gets treated before it is discharged into nature.

**SEWAGE EFFLUENT:** The 'cleaned up' sewage, or final liquid by-product of the sewage treatment process which flows out of a sewage works into a river or sea.

**SEWAGE TREATMENT WORKS:** A man made centre to where all waterborne sewage is piped for treatment. Here the dirty, contaminated water is 'cleaned-up' before being released back into nature.

**SEWERAGE:** The system of pipes (usually underground), pumps and treatment works used for effective disposal and cleansing of sewage.

**SURVEY:** Gaining information through investigation and the asking of questions.



**SLUDGE:** The solids - heavy organic matter - resulting from the sewage treatment process. This material is separated from the liquid effluent, treated separately and disposed of.

**SOLUBLE:** Matter that will dissolve in water, e.g. salt.

**SOLVENT:** A solvent is a substance, usually liquid, in which other substances are able to dissolve. For example, when sugar is added to tea, the water is the solvent.

**TOXIC:** Poisonous. Toxic chemicals are a source of water pollution.

**URINE:** The fluid people pass when going to the toilet. It contains waste products that the body no longer needs.

**WATERBORNE:** Carried in water.

**WETLAND:** Marshes, bogs, swamps, vleis and sponges are examples of wetlands. Wetlands are difficult to define because of their great variation in size and location. The most important features of wetlands are: waterlogged soils covered with a shallow layer of water, unique soil types and plants that are especially adapted to waterlogged soils.

**TYPHOID:** A bacterial infection from food or water contaminated with human faeces. The bacteria responsible are also found in dairy products and undercooked meat. Prevention of typhoid depends on good sanitation and proper hygiene among food handlers.