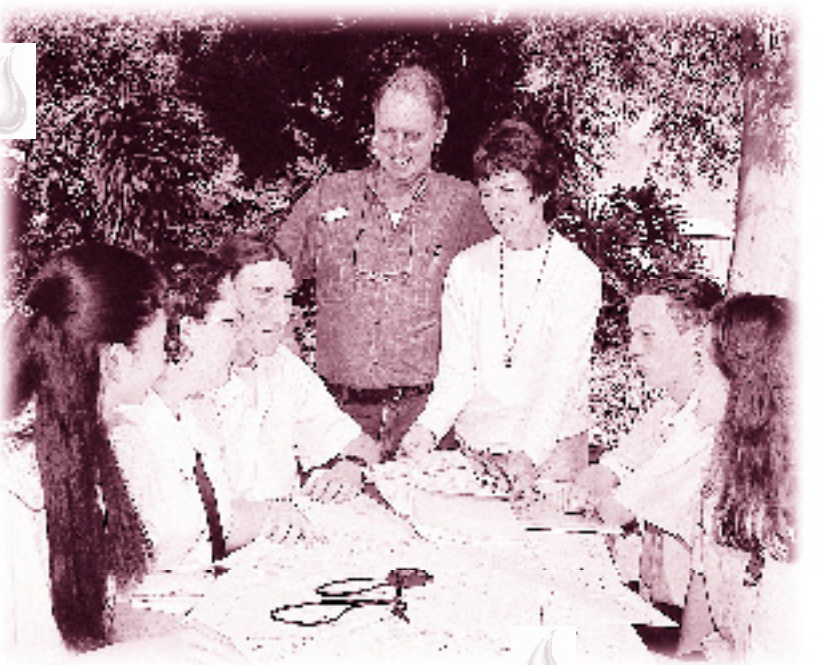
The WaterWise School

How to save water and money by involving the whole school community

A joint State and Local Government initiative

The WaterWise School

How to save water and money by involving the whole school community



by

Sally MacKinnon
BA, GradDipEd, MAppSci
Wet Paper Consultant to Gold Coast City Council (Gold Coast Water)

with the assistance of
Merrimac State High School Project Leader
Carol Black
BEd, DipPhysEd

Gold Coast City Council

BUILD

WATERWISE

NATURAL RESOURCES
Queensland Government

MERRIMAC STATE HIGH SCHOOL
PRIDE IN EXCELLENCE

Publisher
Wet Paper
Publishers and Consultants
14 Milbong Terrace
Ashmore Qld 4214

Assistant researchers
Hedley Bates, Rebecca Brown, Deborah Evans, Kerri Godden, Jessica Green, Angela Lok, Tanya Ma, Romi Moore, Matthew O'Donnell, Erin Proud, Adrian Pursey, Scott Sands, Sophia Szekeres, Andrea Tucker, Suzie Webster, Prue Wilkie, Luke Willington, and Lucy Wright from Merrimac State High School

Technical consultants
David Harrison, Bradley Clarkson, John Joyce, and Rob Hore, Queensland Department of Public Works (Q-Build); John Casey, Merrimac State High School; Jim Pickup, Tradelink Plumbing Supplies; David Wiskar, Allan Mayne, Brian Davis and Anne Woolley, Queensland Department of Natural Resources (WaterWise Queensland); Darren Hayman, Gold Coast City Council (Gold Coast Water)

Glossary
David Harrison (Q-Build)

Photography
WaterWise Queensland, Wet Paper, Sally MacKinnon, Gold Coast City Council

Editing
Rosemary Lancaster, Bookera Services

Typesetting and design
Bob Moffatt, Wet Paper

Illustrations
Trent Moffatt, Wet Paper, WaterWise Queensland

ISBN (2025 E Pub)
978-1-86283-230-5
ISBN (HARD COPY)
1-86283-045-2

First printed
Merino Lithographics, 18 Baldock St, Moorooka Qld 4105
August 1998

Disclaimer
The information contained in this document is not directive or comprehensive and may not be appropriate or relevant in every circumstance. Readers should obtain professional advice before adopting any of the procedures contained in this document. Some useful contacts are set out in the rear of the document.

The information contained in this document is provided on the basis that the Queensland Government and the Gold Coast City Council, their employees, officers and agents are not responsible for any errors or omissions contained in it or the results of any action taken in reliance on it.

To the extent legally possible, the Queensland Government and the Gold Coast City Council, their employees, officers and agents disclaim all liability (including but not limited to liability under negligence) for any loss or damage arising, directly or indirectly, from the use of or reliance on the information contained in this document.

Where specific product names or systems are used in case studies, the Queensland Government and the Gold Coast City Council in no way endorse their use over other similar products available on the market. Building owners, together with the designers and installers of water-saving equipment, are responsible for ensuring the product chosen is the one best suited for the particular application.

Contents

Figure 1 Carol Black, the teacher who played an important role in changing Merrimac State High School

Foreword

'Of all our natural resources, water has become the most precious. In an age when man has forgotten his origins and is blind even to his most essential needs for survival, water along with other resources has become the victim of his indifference.'

Rachel Carson, Silent Spring

Welcome to the experiences of a WaterWise school.

We hope, like us, you will take up the challenge to review your practices, research and measure your usage, and change.

It is simple, successful, and fun and we promise your efforts will be rewarded.

Read on for our refreshing story.

A challenge, a promise, a teacher, 18 students and a janitor with school and community support and encouragement from WaterWise Queensland, the Gold Coast City Council (Gold Coast Water), a local publisher, Q-Build, and Tradelink suppliers changed our school.

A formula for you to follow is also here.

Resources for teachers courtesy of the Department of Natural Resources are included for your use.

'Water is the elixir of life'

Be refreshed.

Carol Black
Science Teacher, Merrimac State High School
3 August 1998

Executive summary

Clean, accessible, and plentiful water is one of the most fundamental environmental and social issues facing Australia at the turn of the century. Because of this, the need for all Australian schools, businesses, industries, and households to contribute practically and effectively to water conservation programs is crucial.

The WaterWise model school project, implemented in Queensland during the first half of 1998, was initially an attempt to develop a model water-conserving school which could demonstrate the processes and benefits of water conservation at an individual school level.

Ultimately the project's aim was to assist Education Queensland, and State education systems throughout Australia, to implement water conservation policies and practices and provide a national model of institutional water conservation. A significant outcome for the local authority (Gold Coast City Council) is that, for the first time, a large public utility such as a school has demonstrated it can save water by implementing a water conservation program.

The project was also a joint venture partnership between WaterWise, Queensland Department of Natural Resources (DNR); the Gold Coast City Council (Gold Coast Water) (GCCC (Gold Coast Water)); Queensland Department of Public Works (Q-Build); Merrimac State High School; local educational consultants; Education Queensland; and Tradelink Plumbing Supplies and its associated water industry suppliers.

The project began in January 1998 at Merrimac State High School with the installation and monitoring of 36 water meters throughout the school, a full school water audit and a staff survey, in an effort to benchmark the school's water consumption.

By April 1998, after weeks of intensive data collection and analysis by Year 11 students, staff, and Q-Build officers, total water consumption and water use patterns at Merrimac State High School were identified, measured, and recorded.

During the same month, Merrimac State High School took a giant leap forward to becoming a WaterWise model school. It was completely retrofitted with water-saving equipment; and staff undertook a five-week trial of WaterWise work practices. Research into appropriate ways to reuse wastewater began at this time. Again, data was intensively collected and analysed to measure water use at the school under a water-conserving regime.

By June 1998, the results of the WaterWise school project were collated. Merrimac State High School had reduced its water use by 50 per cent, an expected annual saving of 17 047 kL (representing a expected financial saving of $13,808 in water charges).

Education Queensland became a joint venture partner in the WaterWise school project when its annual water charges across the state were identified as approximately $7.5 million. Following the indications of success from Merrimac State High School's water-conservation program, Education Queensland began investigating the impact of

Figure 2 Water is a precious resource.

Benchmark

A recognised standard, level, or basis of measurement, used primarily for comparison. For example, the average daily quantity of water consumed by Merrimac State High School was benchmarked at 63 L of water per person.

Retrofitting

To modify the design of an item by converting or replacing certain parts so that they operate differently, yet still ensuring that the item satisfies its primary functions.

Figure 3 Merrimac State High School is one of the Gold Coast's most well-established state secondary schools .

user pays water pricing on state school water charges. It also began investigating the opportunity to audit water consumption in the State's largest public schools. At the time of writing, these investigations are still underway. It is hoped that the results of this research and the Merrimac State High School program will encourage Education Queensland to be a leading education system in Australia in implementing global WaterWise policies and practices and significantly reduce its water consumption and charges. Schools use a lot of water and reducing water use through the WaterWise schools project is an effective demand management strategy.

Schools are large consumers of water, from their irrigation practices to cleaning, from their amenities blocks to their classrooms. The success of the WaterWise school program at Merrimac State High School, a school of 1200 students in south-east Queensland, clearly demonstrates the potential for individual schools, State education departments, local governments and water authorities to save significant amounts of water and money through appropriate water-conservation strategies.

Project stages

Stage 1

- Total water use obtained from Gold Coast City Council records
- A whole school water audit
- 36 meters installed throughout school and read daily
- Daily meter readings of the 36 meters
- A survey of staff work practices
- Information about water use gathered informally by Q-Build.
- School-based decision on what water saving devices to install

Stage 2

- Complete retrofit of school with most up-to-date water-saving equipment

Stage 3

- 36 meters read daily
- Water savings in non-metered areas estimated by Q-Build
- A second survey
- Information gathered about the introduction of specific WaterWise work practices for school cleaning

Why be WaterWise?

Global picture

Less than 1 per cent of the Earth's water is fresh and accessible to humans. Even this seemingly small amount of water could be sufficient for the needs of all humans if industrialised nations used considerably less water than they currently do. Although in Australia water is a resource we take for granted — most of us turn on the tap and water flows out — the World Health Organisation estimates that about 5 million people die every year across the globe because they cannot access clean, potable water.

'Much more water is used in rich countries than in poor countries. A person in an industrialised country uses between 350 and 1000 litres of water daily, whereas a person living in rural Kenya, for example, may use two to five litres of water a day'. (Suzuki, 1997, p. 72)

'In the global ecosystem, a much broader context than that of mere humanity, water performs a whole host of crucial, life-giving tasks — about which we know little and often seem to care less. If the current abuse of the world's water continues, it is not just the rest of the natural world that will suffer, but people too" (Lanz, 1995, p. 8).

It is important for many reasons then, that we conserve and protect the Earth's water, not just for human consumption but for the health of the entire planet and all its living creatures and ecosystems.

Local picture

- Australia is the driest inhabited continent in the world.
- Queensland has a rapidly increasing population because between 1000 and 1500 people move to this State every week. All these people use water. In 1996, the population of south-east Queensland was 2.2 million people. Planning for a regional population of between 3.0 and 3.2 million people by the year 2011 is underway (Queensland Department of Local Government and Planning, 1998).
- Water consumption per Queenslander has tripled since 1934.
- The Queensland Government estimates we have at least $15 billion invested in water supply and sewerage infrastructure — $15,000 for every home in Queensland, not including the system's running costs. Approximately one-third of each household's rates goes towards running the water supply and sewerage systems. As the consumption of water increases, so will the cost of maintaining and upgrading this infrastructure.
- Reducing water consumption will delay the need for additional capital works like new dams and sewerage treatment plants. In addition, we should preserve our valleys and natural ecosystems — not flood them for dams.
- Our future is bleak without water. We need to maintain clean water systems. Water is a precious resource that we must conserve and protect.

Why be WaterWise?

- Water is essential to our survival.
- Australia is the driest inhabited continent in the world.
- Less than 1 per cent of the Earth's water is fresh and accessible to humans.
- Industrialised nations use 350–1000 L of water per person per day.
- One average person in rural Kenya uses between 2–5 L of water per day.
- Water savings mean dollar savings — for individuals, businesses and schools.
- Water conservation means fewer dams and less environmental destruction.

Figure 4 In 1996 the population of south-east Queensland was 2.2 million people.

Project aims

1. Student involvement at every stage
2. Education links
3. Water and dollar savings for Merrimac State High School and recognition as a model
4. Professional development for Merrimac State High School staff
5. Data and results for the water-saving equipment industry
6. Education Queensland initiatives
7. Project stakeholder research and recognition

Figure 5 Stakeholder research

Aims of the project

Merrimac State High School is one of the Gold Coast's most well-established state secondary schools; it has been operating for almost 20 years.

It is involved in Education Queensland's school-based management program with the school community now responsible for making, budgeting, and implementing most decisions on the school's operation.

It has an enthusiastic and committed staff and a student body which is interested in environmental issues.

It was invited to participate in the WaterWise model school program for these reasons and because, at the same time, it represented a typical state high school.

It was reasoned that if Merrimac State High School could become a successful WaterWise model, almost any school could undertake effective water-conservation measures.

After discussions between the project's joint venture partners, the stakeholders took a unanimous decision to attempt to transform Merrimac State High School into a national WaterWise model.

The school did this by retrofitting a full complement of water-saving equipment during the project, as well as installing appropriate wastewater reuse technology.

The seven aims

Student involvement at every stage of the project

- Monitoring and auditing school water use
- Research
- Analysis
- Presentations
- Media interviews
- Negotiation and communication with key stakeholders

Education links

- Maximum education value with close links to curriculum areas
- Development of real life education programs in Study of Society and the Environment (SOSE) and Geography

Merrimac State High School results

- Benchmarking and analysis of water use
- Reduction in water consumption by at least 20 per cent while maintaining or increasing education services and workplace efficiency
- Reduction in the school's water charges by at least 20 percent
- Development and recognition of Merrimac as a national WaterWise model
- Development of related school-based initiatives where appropriate, for example, health and hygiene education

Professional development for Merrimac staff

- WaterWise ground staff
- WaterWise cleaners
- WaterWise teachers
- WaterWise janitor

Water-saving equipment industry benefits

- School-specific benchmarking data
- Analysis of water-saving equipment performance in a school environment
- Development of education sector marketing campaigns

Education Queensland initiatives

- Research into the impact of the introduction of user pays water pricing on schools
- Report into the implementation of school water audits across the State
- Development of statewide policies and practices in water conservation
- Statewide school water reductions
- Statewide cost savings in water use

Project stakeholder research and recognition opportunities

Gold Coast City Council (Gold Coast Water)

- Tangible water reduction results replicable for all Gold Coast schools
- Reductions in the city's total water consumption
- Unique water conservation initiative — setting national standards
- Extension of Gold Coast Water's demand management program:

WaterWise Queensland

- Education sector research and analysis in water conservation
- Collaboration with Education Queensland in implementing WaterWise policies and practices
- Research into the impact of user pays pricing on schools
- National water conservation initiatives

Q-Build

- School-based research and analysis in water conservation
- Development of an exemplary water-conserving school
- Research into wastewater reuse options in schools
- Refining of school water audit processes

Tradelink Plumbing Supplies

- Building relationships with water-efficiency industry suppliers
- Development of marketing opportunities in the education sector
- Analysis of water-saving equipment performance in a school environment

Figure 6 Stage 1 meter installation

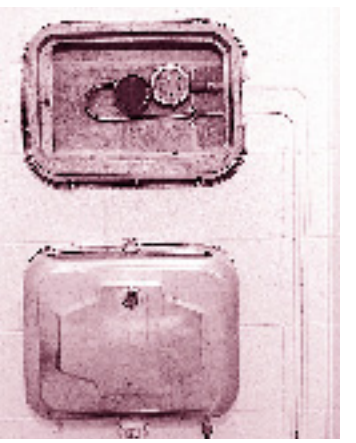


Figure 7 Meter in vandal-proof box

Figure 8 Stage 1 meter readings

Figure 9 Analysis of results prior to selection of water-saving equipment — Stage 1

Figure 10 Collecting data from all cleaning areas

Figure 11 Fitting of water-saving equipment — Stage 2

Research methodology

The difficulty in obtaining total accuracy in the research process was recognised before the project began. Because this was the first time such a comprehensive water analysis process had been undertaken by any Queensland school, problems were addressed as they arose, as efficiently and transparently as possible, and anomalies were fully documented.

To gather complete data about the school's water use and potential water savings could have taken at least one year, if not two.

The stakeholders decided to create a WaterWise model school as quickly as possible within the constraints of daily school operation.

Therefore students monitored water use for five full weeks at a time. This was completed prior to exams and school holidays in Terms 1 and 2. Although this is not an ideal situation for quantitative research, the project needed a balance between research and the realities of school life, the urgent need to conserve water and the need to maximise education value for students.

Collecting data

Stage 1 Data collection and analysis

Data was collected and analysed in six steps.

Step 1. Historical total water use and related water charges over the past three years (1997–98, 1996–97 and 1995–96) were obtained from Gold Coast City Council records.

Step 2. A whole-school water audit was conducted over two days by Q-Build officers Bradley Clarkson and Rob Hore, assisted by 18 Year 11 Science and Geography students.

Step 3. 36 meters were installed throughout toilet blocks and key water-use areas. These and the main meter were read by the team of Year 11 students for five consecutive weeks.

The meters were read between 8.30–9 am every school day, with any variations to conditions or normal school routine noted. Daily temperature, rainfall, and key weather conditions were obtained from the Bureau of Meteorology.

The meter readings and results were supervised by teacher Carol Black.

Step 4. A survey of staff work practices involving water use was undertaken by Q-Build and GCCC (Gold Coast Water) 27 March–1 April 1998 with Q-Build gathering anecdotal evidence (for example, by talking to cleaners) progressively during Stage 1.

Step 5. Information about water use for school cleaning, irrigation, and activities like boat wash-downs was gathered informally by Q-Build throughout Stage 1.

Step 6. All results were analysed and the stakeholders decided what types of water-saving equipment to install in the school.

Stage 2 Retrofitting

Stage 2 involved a complete retrofit of the school during the Easter vacation and a commitment from staff to WaterWise work practices. Appendix A details the equipment used in the retrofit.

Stage 3 Data analysis and reporting

Step 1. The team of Year 11 students conducted daily readings of the 36 meters and the main meter for another five consecutive weeks, again between 8.30–9 a.m. every school day, noting any variations to conditions or normal school routine. Daily temperature, rainfall and key weather conditions were obtained from the Bureau of Meteorology.

Step 2. Q-Build calculated water savings in non-metered areas based on the school's Stage 1 water audit data, retrofit product information, anecdotal evidence from relevant staff members, and prior experience with similar organisations.

Step 3. Between 12–18 June, a second survey focusing on the introduction of WaterWise work practices among staff was undertaken.

Step 4. Information about the introduction of specific WaterWise work practices for school cleaning and irrigation was gathered informally in discussion with relevant staff.

The WaterWise retrofit and implementation of WaterWise work practices, as well as the process of water-consumption benchmarking, ensured that Merrimac State High School became an exemplar for water conservation at an individual school level.

Discussion on data collection methods

Student meter readings in the first weeks of Stages 1 and 2 were ignored because it took this time for students to learn how to accurately read and record data. Student data was periodically checked by Carol Black.

Occasional mistakes in meter reading and data recording did slip through. In these cases, when Carol Black collated the data at the end of the monitoring period, she ignored extremes.

Meters were attached to one boys and one girls toilet per toilet block. In hindsight, more accurate data may have been collected by metering each boys and each girls toilet area as well as urinals and handbasins. One meter in a boys toilet appeared to be broken throughout both monitoring periods.

Q-Build had some difficulty in estimating accurately the impact of changes in work practices and some areas of equipment retrofit because not all areas were metered. In these instances, Q-Build relied on anecdotal evidence and its previous experience and data.

Q-Build also had initial difficulty in gaining a full picture of work practice water use, for example in the irrigation and cleaning areas.

Information gatherers stressed to staff that they could be totally candid because there was no professional threat in discussing this information.

Figure 12 Calculating water use in non-metered areas

Figure 13 Students reading the main school water meter

Figure 14 Joint venturing involves state and local governments working together.

How to joint venture

1. Identify your project
2. Identify your own expertise
3. Identify the type of expertise you need
4. Identify the total budget
5. Identify your budget contributions
6. Identify the financial help and goods and services you need
7. Identify who has the dollars, expertise, goods and services you need
8. Write up your plan and budget
9. Approach potential joint venture partners with a project outline and proposal
10. Clearly identify benefits for joint venture partners
11. If potential partners become interested, review your plan with their input
12. Begin your program

The school's main meter was found to be broken during the Stage 1 water audit. The Gold Coast City Council repaired the meter within two days.

A number of problems arose after the retrofit of water-saving equipment. While 'teething problems' are to be expected, it did affect some Stage 2 results. Even greater water savings can be expected and recorded by the school now these problems are solved. For example, some dual flush valves leaked because of differences in cistern dimensions; and a communication breakdown between the supplier and plumber meant that tap washers had to be replaced when flow control devices were installed in taps. There were toilet blockages in girls dual flush toilets because some girls used toilet paper on the seats. Pipes sometimes became blocked when the half-flush flows could not flush away the large amounts of paper.

Despite these challenges, the school and project stakeholders are confident that the data collected and the results analysed during the project are accurate and paint a reliable picture of the water use and savings for Merrimac State High School during this project.

Joint venturing

Joint venturing was an integral part of the research methodology in the WaterWise model school project at Merrimac State High School. The comprehensive measuring of Merrimac's normal and water-saving water use, the development of Merrimac as a WaterWise model, the maximising of educational opportunities at the school, and the negotiation of statewide initiatives based on the Merrimac model could not have been successfully undertaken by any one organisation. Appendix B details other important information on joint venturing.

As mentioned on page 3, there were six joint venture partners in the project:

- WaterWise, Queensland Department of Natural Resources (DNR) — project coordination, State-level negotiation and initiatives, fundraising, stakeholder communication and meetings, publicity about the project to media throughout Australia, technical expertise, video production.
- Gold Coast City Council (Gold Coast Water) — Merrimac State High School liaison and coordination, publicity, presentations, report and manual writing, manual publication through Wet Paper Publishers and Consultants, a local educational consultant and facilitator.
- Q-Build — technical advice and coordination, donation of labour for installation of meters and water-saving equipment, data analysis, school water audit
- Education Queensland — funding for Merrimac State High School retrofit, statewide initiatives in WaterWise research, policy and practices.
- Tradelink and its water-saving equipment suppliers — donation and supply at cost of water-saving equipment for school retrofit, coordination of product displays for major functions

- Merrimac State High School — location, staff and student involvement, daily monitoring of water meters, data collection, media interviews and total support of project

Although it is not essential to joint venture when undertaking a WaterWise program at your school, consider the benefits and opportunities of joint venturing with local organisations.

- Your budget and WaterWise aims can be extended as more people and organisations contribute to the project.
- Levels of technical expertise in the project can be extended beyond your school.
- You can extend the involvement of your local community in your school.
- You can inspire others to become WaterWise.

The WaterWise school project has achieved success in all its aims due mainly to the synergy of the joint venture process. Each joint venture partner contributed unique expertise to the project — from plumbing installations to detailed research and high level negotiation based on research findings. Figure 16 summarises the joint venture process.

Figure 15 Student involvement

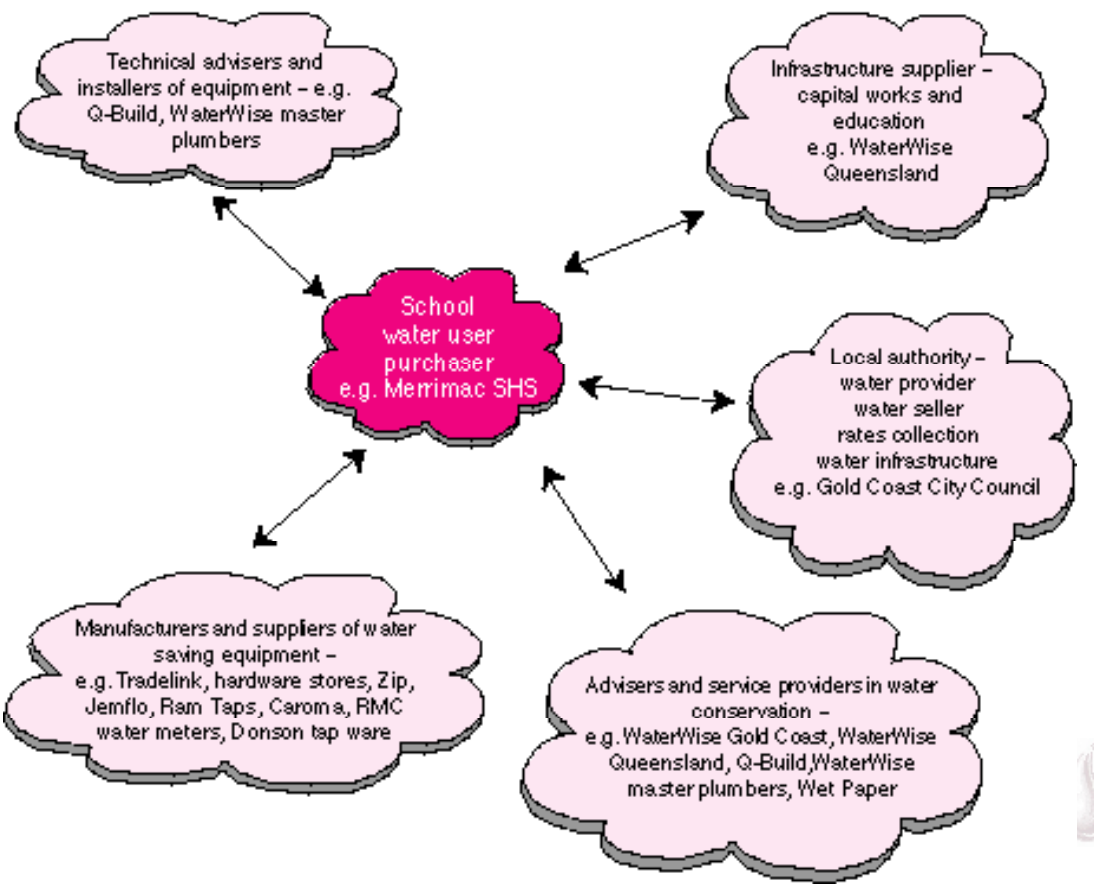


Figure 16 Summary of the joint venture process showing the venture partners and their role in water use

Results of the project

Stage 1 results

As a result of five weeks of water meter readings and calculations by Q-Build and Merrimac State High School, the school water consumption benchmarks were determined (see Figure 17).

Based on these figures, an annual water consumption of 31 647 kL was predicted by Q-Build which represented an annual water bill of $25,634 based on GCCC charges.

Figure 17 showed the school that the oval and garden irrigation, water closets, and urinals were the main water users in the school.

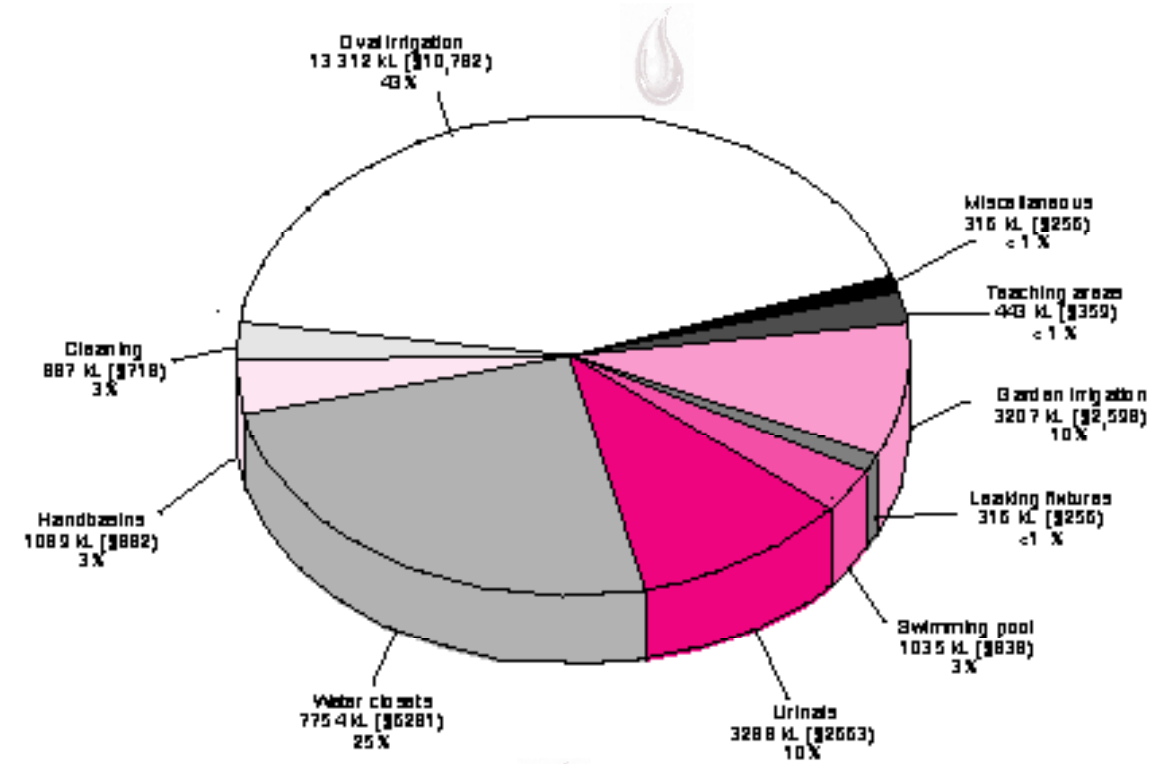


Figure 17 Stage 1 results

Stage 2 results

The projected savings to the school as a result of retrofitting water-saving equipment and changed work practices as calculated by Q-Build are shown in Figure 18.

This pie chart shows that the five key water-use areas identified in Stage 1 were dramatically affected by the changed water conservation practices. Comparisons of Figures 17 and 18 show that water use:

- On the oval dropped from 13 312 kL to 6032 kL
- In water closets dropped from 7754 kL to 4678 kL
- In urinals dropped from 3288 kL to 995 kL
- On gardens dropped from 3207 kL to 321 kL

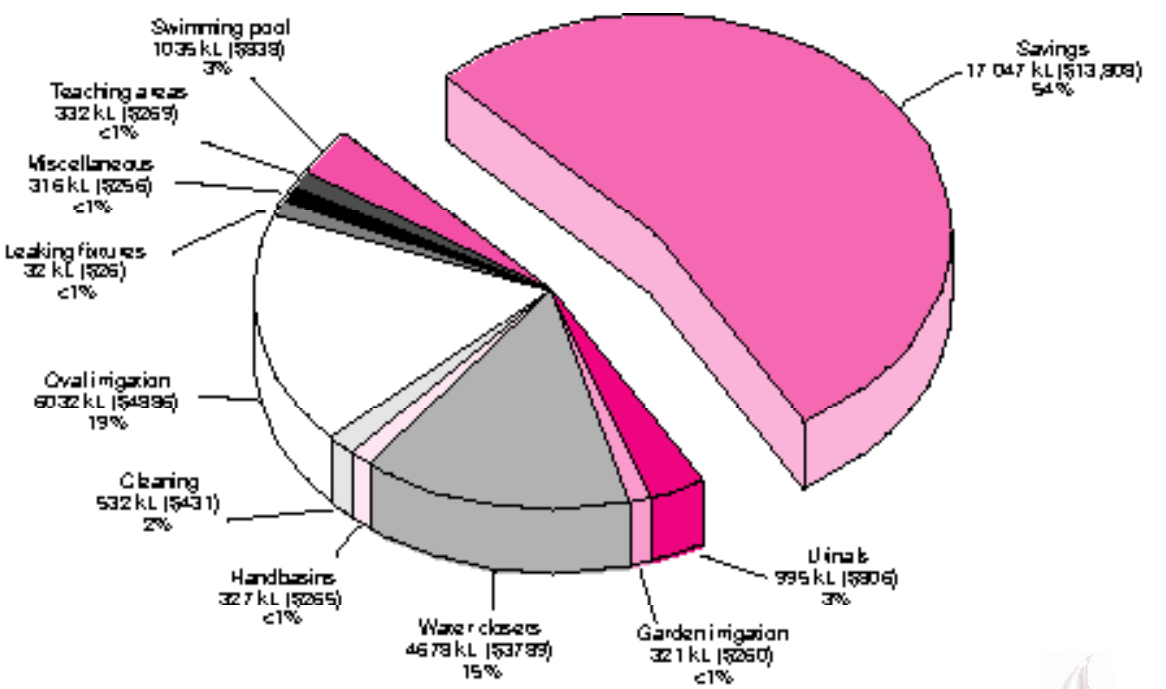


Figure 18 Stage 2 results. The separated section of the pie graph shows the saving.

Figure 19 Discussing results

Figures 20 and 22 detail before and after savings in the following areas targeted for water conservation measures:

- Oval irrigation
- Garden irrigation
- Urinals
- Water closets
- Handbasins
- Cleaning
- Teaching areas
- Leaking fixtures

Before	After	Savings
Irrigation of oval		
13 312 kL/year $10,782/year	6, 032/year $4,886/year	7, 280 kL/year $5,897/year
Water closets		
7, 754 kL/year $6,281/year	4, 678 kL/year $3,789/year	3, 076 kL/year $2,491/year
Urinals		
3, 288 kL/year $2, 663/year	995 kL/year $806/year	2, 293 kL/year $1, 857/year
Garden irrigation		
3, 207 kL/year $2,598/year	321 kL/year $260/year	2, 886 kL/year $2,337/year
Handbasins		
1, 089 kL/year $882/year	327 kL/year $265/year	762 kL/year $617/year
Swimming pool		
1035 kL/year $838/year	1035 kL/year $838/year	0 kL/year $0/year
Cleaning		
887 kL/year $718/year	532 kL/year $431/year	355 kL/year $288/year
Teaching areas		
443 kL/year $359/year	332 kL/year $269/year	101 kL/year $90/year
Leaking fixtures		
316 kL/year $256/year	32 kL/year $26/year	284 kL/year $230/year
Miscellaneous		
316 kL/year $256/year	316 kL/year $256/year	0 kL/year $0/year
Total kL used		
31,647 kL/year	14, 600 kL/year	17, 047 kL/year
Total dollar savings		
$25, 634/year	$11, 826/year	$13, 808/year

Figure 20 Recorded annual savings in water consumption and water charges to school in 10 different locations

Figure 21 These results would bring a smile to any principal's face.

Figure 23 Students calculate payback

Payback period summary

If Merrimac State High School had paid the equivalent full value of labour and equipment needed to progress towards becoming a WaterWise model school its total costs would have been approximately $19,341.

With its annual water savings valued at $13,808, it would have paid back its investment, in full, in approximately 1.4 years.

Discussion of results

Overall savings and payback period

The results show that by reducing annual water use from 31 647 kL (worth $25,634 in annual water charges) to 14 600 kL ($11,826) the school saved 17 047 kL ($13,808).

This represents a more than 50 per cent reduction in water use and water charges.

Payback period

The term 'payback period' refers to how long it takes to pay off your investment in water-saving equipment you have purchased.

If Merrimac State High School had paid the full value for labour and materials in its retrofit program, the cost would have been $19,341.

Q–Build estimated that by annually saving $13,808 in water charges through investing in water-saving equipment, the payback period for $19,341 would be 1.4 years. This is summarised as follows:

Total savings summary

Before	After	Savings
31 647 kL/year	14 600 kL/year	17 047 kL/year
$25,634/year	$11,826/year	$13,808/year

Payback period summary

Cost of total retrofit	Annual saving	Payback period
$19,341	$13,808	1.4 years

Equipment

Merrimac State High School was developed as an 'instant' and comprehensive WaterWise model. Therefore, all possible water saving equipment was retrofitted into the school during a 10-day period in mid-1998. When you do this in your school, complete all your preliminary water-use research, including a school water audit, before deciding which type of water saving equipment (if any), should be installed into your school.

Merrimac State High School installed the following list of equipment:

- Anti-vandal outside taps, with keys
- Dual flush outlet valves and push/pull buttons for stainless steel cisterns
- Dual flush plastic and stainless steel cisterns
- Infra-red sensor type urinal valves
- Flow control devices for taps
- Backflow prevention devices
- Water meters

The retrofit costs for Merrimac State High School were low because all products were donated at cost or below by Zip Heaters, Caroma, Jemflo, Donson, Ram Taps and Reliance Manufacturing Company (RMC) (see pages 54–56 for contact details).

Q-Build donated the labour to install the equipment. When researching water conservation in your school, gather information about current equipment and installation costs either directly from your local supplier or through your Q-Build office. Prices on products are always changing. Many water-saving products are become less expensive as demand for them increases.

Professional development

The school janitor and ground staff were given sole control of irrigation equipment for the oval and gardens and trained in the manual operation of the equipment using WaterWise practices. The janitor was given authority to train and monitor relevant staff in WaterWise practices and equipment use including irrigation and cleaning. He also liaised closely with Q-Build plumbers on appropriate aspects of the school retrofit and with students who were doing the meter readings.

Teachers were surveyed about water use and work practices in both stages of the research. They were actively invited to give feedback on their observations and introduce WaterWise practices into their subject areas.

Staff were kept regularly informed on project progress and results by meetings and written communication. At the conclusion of the project, the janitor set up leak-detection practices through weekly water meter readings.

Water efficiency industry benefits

The WaterWise school project represented the first opportunity for industry suppliers of equipment such as infra-red urinals, dual flush toilets and flow controls to access complete school benchmarking data and audit results. They were also able to access the findings from the monitoring and analysis of water-saving equipment installed at Merrimac State High School and identify specific school-based equipment issues.

Through the Merrimac State High School results, industry members developed opportunities to develop specific education sector campaigns.

Education Queensland initiatives

Estimated conservatively, schools in Queensland annually consume the equivalent of $7.5m worth of water.

As this book was being written, Education Queensland was developing a number of statewide initiatives including a research report on the impact of user pays water pricing for Queensland's largest schools; negotiations with Q-Build to implement water conservation audits for Queensland's largest schools; and the development of statewide WaterWise policies for schools, initially focused on irrigation practices and the operation of automatic urinals.

Based on the WaterWise model school research results, it may be possible to significantly reduce that $7.5m by introducing appropriate

Figure 24 Professional development and training

Payback example

Automatic (fill and flush) urinal water use

1622 kL/year ($1,314/year)

Infra-red sensor urinal water use

123.2 kL/year ($100)

Amount of water savings by installing infra-red sensor urinal

1250 kL/year ($1012/year)

Cost of installing infra-red sensor urinal

$650

Payback period

$650/$1012 x 12 months = 7 months

WaterWise measures across the State. In fact, significant savings in water charges could be made by all Australian state education departments by implementing WaterWise policies and practices.

Student involvement

Student representatives attended a GCCC (Gold Coast Water) Water Wastewater, Beaches and Foreshores Committee meeting, key project stakeholder meetings, a staff meeting and various project functions to present information and conduct WaterWise tours through the school.

All project students were involved in media coverage, from network news programs and specialist shows such as 'Totally Wild', to photo shoots and the production of a DNR WaterWise documentary.

Finally, these students communicated with key stakeholders about ongoing water-use results and their observations about the functioning of relevant equipment.

Education links

Merrimac State High School committed itself to maximising education links within the WaterWise school project. Examples of these links include the involvement of Year 8 Art students in designing poster displays, Home Economics students catering for two major project functions, Drama and Dance students and the school band performing water-themed presentations at two major project functions, Year 12 leaders hosting and compering two major project functions, Geography and Science students visiting a water-saving trade expo at the project launch, and Year 12 Geography students carrying out water-conservation focused projects in their sustainability unit of study. Most teaching staff incorporated an ongoing focus on water conservation into a variety of subject areas during 1998.

Stakeholder rewards

Gold Coast City Council (Gold Coast Water) has developed a WaterWise marketing campaign to all schools in its area, focusing on its well-established WaterWise teacher visits. As the WaterWise school campaign is fully implemented by individual schools, GCCC (Gold Coast Water) expects tangible reductions in the City's water consumption which could help defer future water infrastructure development.

In 1998, GCCC (Gold Coast Water) received State and national recognition as a leading WaterWise council, most significantly the 1998 Banksia Environmental Foundation Award for Environmental Education and Training. WaterWise Queensland had the opportunity to analyse, in detail, education-sector water consumption on the level of individual schools and statewide, based partly on data gathered from Merrimac State High School. WaterWise Queensland also started collaborating with Q-Build and began negotiating with Education Queensland about implementing WaterWise policies and practices across the State.

Figure 25 In 1998 the Gold Coast City Council (Gold Coast Water) received State and national recognition as a leading WaterWise Council.

This work has the potential to lead to national education initiatives. WaterWise Queensland produced a report on the impact of user pays water pricing on schools and consolidated its standing as a national leader in water conservation education.

Q-Build gained extensive quantitative research results and analysis of school water consumption at an individual school level. It refined its school water audit processes and generated the opportunity to audit the largest Queensland schools through Education Queensland. It used the Merrimac State High School process and results to develop a sophisticated WaterWise schools marketing campaign. It also conducted detailed research into wastewater reuse options in schools.

Tradelink Plumbing Supplies extended its relationship with water-efficiency industry suppliers; developed marketing opportunities in the education sector; and had the opportunity to analyse in detail, the performance of water-saving equipment in a school environment, particularly urinals, flow control devices and dual flush toilets.

School savings

- The results of this project show that Merrimac State High School would annually save $17 047 kL of water and $13,808.
- The school planned to allocate these dollar savings in 1998 to computer equipment for students.
- Future savings will go wherever the school decides.

School-based management meets user pays pricing

Information about school-based management supplied by Education Queensland, July 1998.

School-based management (Government)

School-based management is an Education Queensland initiative which aims to improve student learning outcomes by giving principals, staff, and parents greater responsibility for decision making in their own schools.

The program means that most state schools will manage their total school budget. Progressively, schools will have complete control over their financial resources and will manage the full range of staff, equipment, materials, and services.

Principals involved in school-based management have the authority, responsibility, and accountability to manage these resources, including facilities, assets, and utilities.

Schools will be involved in developing and maintaining school facilities. Funds to manage utilities and minor works projects will be paid directly to each school.

The core activity of Education Queensland is teaching and learning. The aim of school-based management is to improve student learning outcomes by providing teachers, principals, support staff, and parents with greater responsibility for setting priorities, making decisions, and allocating resources. This means that resources like water, once paid for by the departmental bureaucracy, will be paid for from each school's own budget.

Each school will have the power to decide to use less water, and therefore pay for less water and redirect that financial saving to other priority needs in the school.

User pays pricing

- User pays water pricing is happening across Australia
- User pays means we will pay for each kilolitre of water we use
- Under school-based management, schools will pay for resources like water from their own budget. They will have the power to:
  - Use less water
  - Pay less for their water
  - Redirect these dollar savings to other priority needs

Figure 26 User pays allows the school community to become involved in decision making.

School-based management (independent)

Independent schools are already self managing and pay for resources like water from their own budgets. They also have the power to redirect savings made from water conservation to other areas of their schools.

User pays water pricing

Traditionally in Australia, householders, businesses, and schools have paid for their water in one of two ways.

An allowance based water metering system

Under this system, each home, business, and school pays a set fee and is allocated an amount of water. If this allowance is exceeded, an excess water rate is charged for every 1000 L of water used. For example, until 1998, Merrimac State High School paid approximately $25,000 per year for water and received an allowance of 30 800 kL per year. For every kilolitre used over 30 800 kL they paid 0.99 cents. Again, under this system, there is no incentive to use less water than the allowance because it has already been paid for.

A rates based system

Under this system, charges for water are allocated basically under a 'land tax' system. The higher the value of the property, the more the property owner pays. This system provides little or no incentive to reduce water consumption as there is no link between water use and amount of money paid.

The user pays system

During the early 1990s, the Australian water industry endorsed a series of sweeping reforms which aimed to create ecological sustainability and equity.

Under these reforms, all water authorities in Australia have (or soon will) change the way they charge for water. Under the user pays system, every consumer will pay for water in a similar way to the way they pay for electricity and telephone services. Consumers pay an access or base charge (similar to a line rental fee) and then pay for every kilolitre of water they use.

What schools can achieve

School-based management means that most schools will manage their own budgets and most will eventually do this in an environment of user pays water charges. Most schools will therefore pay from their own school budgets for every drop of water they use.

At the same time, school-based management means that schools can decide to start their own water conservation programs, budget for retrofitting water-saving equipment and educate staff and students. They can then redirect any financial savings made from water conservation measures to other priority needs in their school.

As we have seen, Merrimac State High School:

- Totally retrofitted all water outlets throughout the school including urinals, toilets, taps, and handbasins

- Educated staff and students about water conserving work practices, leading to changes in oval and garden irrigation, cleaning practices, the correct use of water-saving equipment (for example, dual flush toilets) and the introduction of water conserving practices in classes like Home Economics and Art

If your school implements water conservation programs it has the opportunity to achieve similar results to Merrimac State High School. This means extra money for other priority areas in your school.

Start a water conservation program in your school

There are six key steps to implementing a successful water conservation program in your school.

1. Preliminary research

Contact your local council or water authority and ask for the following information:

a. Previous years' water rates notices for your school. This will give you a picture of your water costs and water use over a number of years. You will be able to see if your water use is increasing, stable, or decreasing.

b. Ask how your school is charged for its water. Does the council have a main meter installed at the school which it reads annually, twice-yearly, or seasonally? Do you pay for your water on an allowance system based on your previous year's consumption? Do you pay through a user pays system where every litre of water you use costs money?

c. If your school is not charged under a user pays system now, ask if the council plans to introduce one in the next five years. Ask if schools will come under the user pays system and how this system will work.

d. If your school's water charges are based on meter readings, ask the council to visit the school to check that the meter is operating correctly. (Some councils and water authorities charge a fee to check water meters. Check if this is the case in your area).

e. If necessary, ask the council where the school gets its water from. Is it all from your town or city's main water supply or does some come from bores or other sources?

2. How is water used in your school?

In order to start a water conservation program in your school you need to know where water is used in the school and which areas use the most water.

Merrimac State High School metered all its main water use areas in the school (see map on page 59) and discovered that the oval used 43 per cent of its total water (see Figure 17, page 12). The next highest

Figure 27 Start by locating your meter and reading it each week.

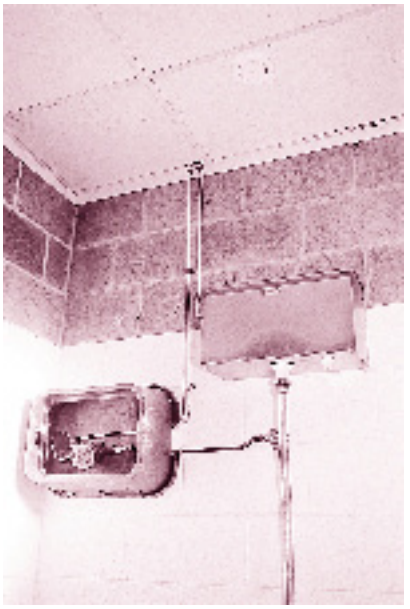


Figure 28 Urinals are key places where water audit results are important.

water use areas were the student toilet blocks where urinals, toilets, and handbasins used a combined 38 per cent. The urinals and water closets particularly were discovered to be very high water users.

To find out how water is used in your school, you can:

- Install meters in the main water use areas and monitor water use each day or each week for at least one month; or
- Do a basic water audit of the school with a local WaterWise-trained master plumber and your school janitor. This involves walking around the school together and identifying large water use areas, and the type of equipment in the school for example, the type of urinals. Also identify water-wasting work practices (for example in irrigation and cleaning); or
- Have a detailed school water audit done by technical experts like Q-Build. They can calculate total water use, specific area water use, estimated retrofit costs, and payback periods (see page 28 for more information on doing a water audit); or
- Check for leakage because regular whole school maintenance programs are essential.

3. What are your water-saving resources?

WaterWise has a three-tiered water-conservation strategy: the 'Three Rs' approach:

Figure 30 summarises the following three resource areas or strategies:

1. Review and change your water-use work practices. This strategy can reduce your water use by 10 per cent or more with no cost to the school.
2. Reduce water consumption by retrofitting water-saving equipment like infra-red sensor urinals, dual flush toilets, and flow controls. This strategy can reduce your water use by 10–30 per cent with a payback period or return on investment of 2–3 years.
3. Reuse wastewater where you can within health department and local authority regulations, for example by using treated effluent for sub-surface irrigation. This usually demands a larger capital outlay and longer return on investment, though substantial water and dollar savings can be achieved along with long-term environmental benefits (see pages 47–50 for more details).

There are many water reduction measures available to your school based on the WaterWise Three Rs program.

Having reviewed work practices, now is the time to research available water saving equipment.

You can do this by talking to your local WaterWise-trained master plumber, contacting organisations like Q-Build, Tradelink Plumbing Supplies, WaterWise Queensland or even talking directly to equipment suppliers and manufacturers (see contact list on pages 49–50).

All these people and organisations are qualified to give you information and advice about the type of water saving equipment and

How to start a water conservation program in your school: A summary

1. Do your preliminary research.
2. Find out how water is used in your school.
3. Research water-saving resources and equipment.
4. Review and document your work practices.
5. Review options and make decisions.
6. Evaluate and adjust your

initiatives available. (See page 52 for a list of water-saving equipment installed at Merrimac State High School).

4. Review and document work practices

Water use in schools can generally be reduced by 10 per cent at little or no cost, simply by reviewing and changing water-wasting work practices.

- Review your staff's work practices in teaching and ancillary areas. Ask staff to estimate how many litres of water they use in their daily work.
- Document your findings throughout the school and report back to staff so they can see how their work practices impact on the school's total water use.

Merrimac State High School discovered that Home Economics classes used 540 L of water per day, Art classes used 800 L per day, Manual Arts classes used 160 L per day and Photography classes 55 L per day, a total of 1555 L of water per day. Cleaning staff used approximately 3500 L per day.

Combine this information about your work practices with your water audit information and you can decide how best to reduce water use in your school without negatively affecting lesson or service delivery.

Figure 29 Signs designed by WaterWise Queensland

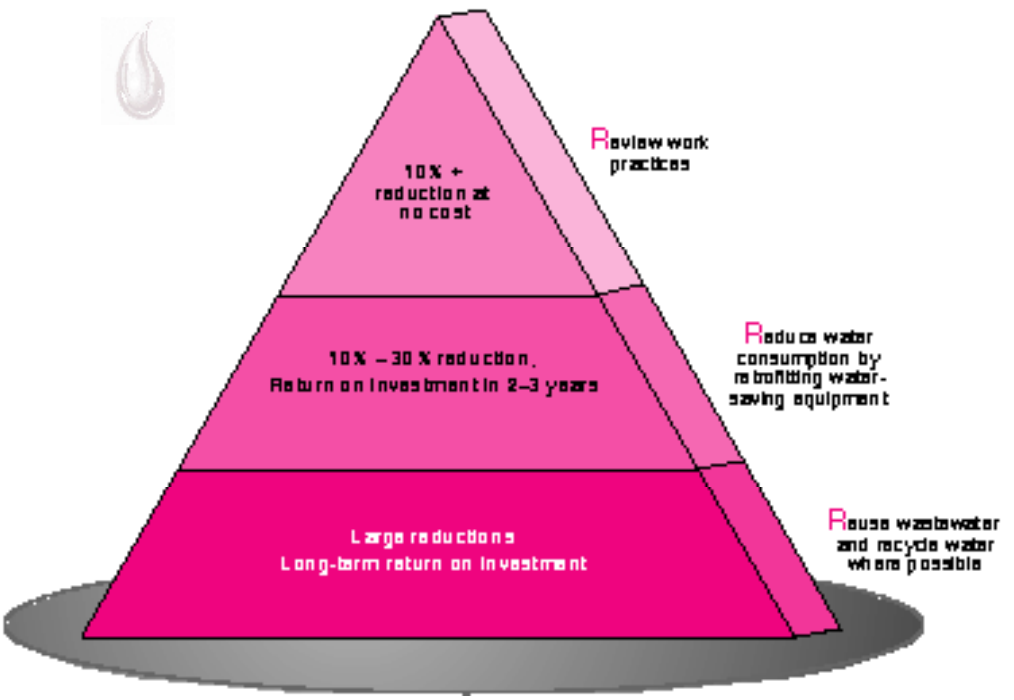


Figure 30 A summary of the Three Rs approach to water conservation strategies

Figure 31 Review of oval irrigation system work practices

5. Reviewing options and making decisions

Remember, WaterWise advocates the wise use of water and water conservation practices where health, safety, and service standards will be maintained or improved.

When deciding on equipment and work practices for your school, consider the size and design of your school; number and type of students; type of classes offered; and your particular health, hygiene, safety, and maintenance issues.

You can then make informed and appropriate decisions about how to reduce water use in your school.

6. Evaluating the project

Implementing WaterWise work practices and installing WaterWise equipment in your school can be a major step and deserves to be monitored and evaluated over time. You may like to set up a specific evaluation period for one month to closely monitor the immediate impact of water conservation in the school.

The results will tell you about water and cost savings as well as any adjustments which might be needed to ensure equipment is operating optimally for your situation.

You will also need to gain feedback from staff about the success or problems of WaterWise work practices and adjust practices where necessary.

After this, continue to monitor your water use and link that to water savings and financial savings over the long term to ensure water conservation becomes an entrenched and effective component of your school culture.

Putting it into practice

Merrimac State High School undertook a total WaterWise program but in normal circumstances they would have implemented the program with a two-part strategy like the one outlined below.

Part 1. Immediate changes

- Revise oval irrigation practices from computer operated 3 hours per day, 7 days per week to manually operated 3 hours per day, 3 days per week, with no irrigation for 1 week after rain. Visually monitor turf condition regularly. Merrimac State High School saved 7280 kL per year ($5897 per year) doing this.
- Revise garden irrigation practices from watering 7 days per week to 3 days per week, with no irrigation for 1 week after rain. Visually monitor garden condition regularly. Merrimac State High School saved 2886 kL per year ($2337 per year).
- Install vandal-proof stainless steel dual flush toilets throughout the school. Merrimac State High School saved 3076 kL per year ($2491 per year).

- Replace automatic flush urinals with infra-red sensor urinals. By doing this in one urinal, Merrimac State High School saved 1250 kL per year ($1012 per year).
- Install flow controls in all toilet handbasins. Merrimac State High School saved 762 kL per year ($617 per year).
- Develop a student education campaign around handwashing (particularly in boys toilets) to address health and hygiene issues discovered during water use metering.
- Request teachers to reduce water use in work practices for 5 weeks and give feedback and results to administration. Merrimac State High School found it could save approximately 101 kL per year ($90 per year) while involving staff in the WaterWise campaign.
- Identify and repair leaking fixtures. Merrimac State High School saved 284 kL per year ($230 per year).
- Purchase a blower for use by cleaning staff and ask them to reduce hosing of pavements from 5 times per week to 2–3 times per week. Merrimac State High School saved approximately 355 kL per year ($288 per year).

Part 2. Second priority changes

- Replace pull chains and cisternmiser urinals with infra-red sensor urinals. By doing this, Merrimac State High School solved problems with odour in the boy's toilets and degraded pipes caused by a build-up of stagnant uric acid and avoided vandalism of urinal pull chains.

  This action avoided long-term maintenance costs and saved the school 634.4 kL per year ($514 per year). This was in addition to the saving of $1012 per year from replacing one automatic urinal with an infra-red sensor urinal. The resulting total savings for the urinal retrofits was therefore $1857 per year.
- Install vandal-proof tap heads on external hose cocks to prevent unauthorised use of outside taps.
- Implement an ongoing maintenance and monitoring program by the school janitor to prevent leaking fixtures and detect underground leaking pipes.
- Install flow controls in all other taps in the schools, for example in Home Economics classrooms, school canteen, Science labs, Art classrooms.
- Research ways of reusing wastewater.
- Develop long-term WaterWise work practices with teachers and other staff.

Involve your whole school

The successful development of the WaterWise model school at Merrimac State High School was largely due to the support of the entire school community.

Figure 32 Purchase a blower for use by cleaning staff

Merrimac implementation summary

Part 1 Immediate changes

- Revised oval irrigation practices. Saved $5897/year
- Revised garden irrigation practices. Saved $2337/year
- Installed vandal-proof dual flush toilets. Saved $2491/year
- Replaced automatic urinal with infra-red urinal. Saved: $1012/year
- Installed flow controls in hand-basins. Saved $617/year
- Changed teacher work practices. Saved $90/year
- Purchased blower for cleaners. Reduction in hosing of pavements saved $288/year
- Identified and repaired leaking fixtures. Saved $230/year
- Addressed student health and hygiene issues
- Leak prevention and detection program introduced

Part 2 Second priority changes

- Installed vandal-proof tap heads on outside taps
- Installed flow controls in most taps
- Replaced pull chain and cisternmiser urinals with infra-red sensor urinals. Addressed health and maintenance issues. Saved $514/year
- Ongoing leak prevention and detection program
- Long-term WaterWise work practices introduced

Figure 33 Success happens if the whole school community is involved

Students, teachers, cleaners, the ground staff, the janitor, canteen staff and volunteers, the administration team and the P & C committee all became involved in the program and highlighted the need to involve and enthuse as many people as possible.

Parents were also informed of the project's progress and results through the monthly Merrimac State High School newsletter.

Regional Education Queensland officers were also kept up to date by reports and letters.

Here is a list of the many benefits of this high level of involvement:

- Increased real life education opportunities in all subject areas
- Increased WaterWise awareness and behaviour among staff and students
- Reduced vandalism generally and no vandalism of WaterWise equipment
- Appropriate use of WaterWise equipment
- Prompt reporting of leaks or equipment problems
- The school community took ownership of the WaterWise campaign.
- Delays in equipment installation and associated problems, like temporary water shut down, were borne with patience by staff and students.
- Other maintenance issues were addressed at the same time as the WaterWise work was going on, for example staff and student toilet blocks were painted to cover previously unpainted sections of wall behind urinal cisterns, and all tap washers were replaced.

How Merrimac State High School involved its school community

Here are some successful ideas that Merrimac implemented as part of its WaterWise program.

- The school janitor, deputy principal, and coordinating Science teacher were involved in the planning and implementation from the beginning of the project.
- Eighteen Year 11 students volunteered to form the core group of researchers and media spokespeople.
- Regular communication and support was provided by GCCC (Gold Coast Water), WaterWise Queensland officers, and Merrimac's deputy principal including face-to-face meetings, written contact, public recognition, non-contact time, and links with technical expertise and information.
- The core group of WaterWise students kept up to date on progress and were publicly recognised for their efforts throughout the project. They received a special reward at the end of the project.
- Teaching staff were consulted and kept up to date by means of surveys, contact with the coordinating teacher, and staff meetings.
- A whole-school assembly launched the project with student performances, presentations, and special guests including the then Minister for Education. There was a high level of involvement from other staff and students including the school band, Year 12 drama students, school leaders, and Home Economics students who catered for morning tea. As well, a mini expo of water-saving equipment was held during the same day for Science and Geography students.
- A WaterWise display was set up in the office reception area for the week of the launch.
- A Year 8 class created a WaterWise art display in the school office.
- Posters presenting WaterWise facts, a campaign overview, and the new WaterWise equipment were put up in all student toilet blocks.
- Regular project updates and results were published in the school's monthly newsletter.
- Ongoing media coverage of the project was organised. Interviews took place with students and the coordinating teacher.
- Individual staff members who made special contributions to the project received written thanks.
- Merrimac State High School hosted two important project meetings on school premises, one for joint venture partners and the other for a GCCC (Gold Coast Water) committee meeting.
- Progress reports and a summary of results were sent to joint venture partners and interested people including key Education Queensland directors and managers.
- A WaterWise Queensland video was made to promote the project to other schools and a celebratory function was held at the end of the project.

Figure 34 Use music or drama presentations …

… to launch your program to students.

Figure 35 Visit to school by local Councillor and WaterWise motivational character

Figure 36 Collaborate and consult with a qualified advisory service.

Advisory service

Q-Build employs advisory and technical staff (both in-house and from external consultancies) who are experts in water conservation planning. Why not contact your regional Q-Build office and enquire about their water audit service for your school. (See page 49 for contact information.)

Water audit options

To plan and implement a truly effective WaterWise program in your school, you must find out how much water your school uses in total, which are the biggest water use areas in the school, how much water these areas actually use, and what reductions in consumption are possible. This process is called a water audit and is briefly discussed on page 22 as part of the six steps to running a water conservation program in your school.

Two types of water audits are discussed in more detail here to help you decide how to go about measuring water use in your school.

The information you get from this audit will form the foundation of your WaterWise planning because it will enable you to prioritise the areas of the school to focus on and decide how to work with these areas — whether through WaterWise work practices, and/or equipment retrofits.

Equipment retrofits can involve a significant financial investment. By completing a whole school water audit you can estimate the time frame for your return on investment, the payback period.

According to Q-Build, different levels of water audits can be undertaken at your school. The two main types of audits are an initial investigatory audit or a full water conservation audit and report.

The decision about which level of auditing to take will depend on your school's water charges and how your local authority charges you for water, as well as other factors such as the size, age, and location of your school.

Q-Build say a water audit generally should at least:

- Identify the sources of water at your school
- Identify areas of consumption and quantities of water used
- Identify potential areas for improvement
- Predict reductions in water consumption
- Predict related cost savings for example, reductions in electricity costs for water heating

Advisory service

Q-Build employs advisory and technical staff (both in-house and from external consultancies) who are experts in water conservation planning. Why not contact your regional Q-Build office and enquire about their water audit service for your school. (See page 49 for contact information.)

Water conservation audit reports

Whatever type of audit you choose, the result should be a water conservation audit report. Q-Build recommends you select one of the following water conservation reports, or a mix of the two.

Level 1 report

A level 1 report is a low-cost, relatively simple, qualitative report which provides broad advice about water use and conservation in your school.

It is primarily based on observations made during a brief walk-through audit and a review of historical costs from past rates notices, as well as initiating preliminary discussions with your local government water supply authority about their charging methods for water consumption.

The level 1 audit report identifies all locations and activities where water is used in your school and comments on the current usage practices and possible water-saving options. Expected percentage reductions in consumption would be provided using industry benchmarks if available.

The report could include some approximate costs of retrofitting some simple appliances. Improved water saving work practices would be discussed with key school personnel such as ground staff, the janitor, and teachers. Any problems with current water supplies, for example inadequate pressure or unpleasant taste, would also be recorded.

Level 2 report

A level 2 report is a more technical and detailed quantitative report than level 1. It provides specific advice for your school. The report would be comprehensive enough to justify decisions made in relation to most water-saving strategies.

The report would contain a cost–benefit analysis as well as estimates of payback periods for recommended water-saving measures. Areas requiring further design work would be identified and your school could then decide if such additional work was required.

Use the services of trained and accredited professionals, such as Q-Build staff, to obtain appropriate and accurate water use information about your school.

WaterWise best practice guidelines for schools

A water conservation audit at your school should focus on the key areas of water consumption where real opportunities exist to reduce water use. The recommended strategies for each area should consider any potentially adverse impacts water conservation could have on operations in that area.

In a school environment, the following areas should be audited:

- Urinals
- Toilets (water closets)
- Handbasins
- Cleaning
- External hose cocks

Figure 37 A group of 18 Year 11 students volunteered to form the core group of researchers and media spokespeople.

Figure 38 All areas of the school were included in the project.

Figure 39 Mulching is a good way to save water.

- Sinks
- Oval irrigation systems
- Garden irrigation systems
- Showers
- Teaching areas
- Swimming pool (if applicable)
- Leakage (fixtures and underground pipes)
- Miscellaneous areas including drinking fountains, canteen, staff rooms, etc.

Urinals

Generally there are four types of urinal systems currently operating within schools:

- Automatic (older style fill and flush)
- Manual pullchain
- Cisternmiser (These units rely on a drop in pressure within the water supply pipe-work in order to flush, for example washing hands at a basin will create the drop in pressure to activate the urinal.)
- Infra-red sensor urinal

Many urinals in schools are the automatic fill and flush types. They operate on a continuous cycle where the urinal cistern slowly fills to a pre-set volume. Once the volume is reached, the cistern flushes. After this, the cistern refills and the cycle repeats itself, 24 hours a day, 7 days a week, 365 days a year. These urinals are inefficient and waste significant amounts of water. The automatic urinal at Merrimac State High School used 1622 kL per year at an annual cost of $1314. It was literally money down the drain.

The main options available when considering retrofitting urinals to become more water efficient are pull chain types, cisternmiser types, and infra-red sensor types.

Pullchain urinals, if used properly, are probably the most water efficient because they only flush when actually used. However, vandalism of this urinal can render pullchains dangerous or too high to use. Health and hygiene issues must also be considered. Often the pull chain is not used to flush at all and long-term maintenance issues can arise, for example the potential deterioration of pipe-work and odour problems.

Although popular some years ago, cisternmiser urinals raise concerns about health, hygiene, and maintenance. If a user doesn't wash his hands in the sink, the urinal doesn't flush, which leads to similar maintenance problems as pullchain urinals.

Therefore the infra-red sensor urinal is probably the most water-saving and appropriate urinal for schools. This type of urinal will only flush when the presence of a person is detected at the urinal, thus reducing water consumption without causing potential health, hygiene, safety, and maintenance problems.

Where feasible, schools should replace all urinal systems with water-saving infra-red sensor urinal systems. In the short term, if your school has automatic fill and flush type urinals, turn them off at night, over weekends and during holidays to stop them flushing when the school is unoccupied.

In circumstances where pull-chain urinals are not being vandalised, replace only automatic and cisternmiser urinals immediately with infra-red sensor urinals and review and replace the pull-chain urinals later if necessary. If your short-term budget is constrained, urinals can be progressively retrofitted.

Figure 40 Installation of a Zip infra-red sensor urinal

Toilets

Toilets usually consist of two sections, the cistern and the pan (or bowl). (See Appendix D, Glossary of terms). Most pans are the same fundamental design. Cisterns, however, often vary in design. Although most modern cisterns are water efficient, many of the older style cisterns waste water, particularly compared to current standards.

A number of different types of cistern can be found in schools, depending on when the school was constructed as well as the design and physical location of the toilets. Toilets will either have a single flush, using 12 L per flush, or a dual flush with options of 9/4.5 L or 6/3 L per flush.

Dual flush cisterns are water efficient and do not usually require further attention in a WaterWise campaign. Most single flush cisterns however, should be replaced with dual flush cisterns wherever possible to be cost effective. In some instances, converting a single to a dual flush cistern may mean replacing the pan, depending on its style.

Cisterns are constructed from a variety of materials. When retrofitting single flush cisterns with dual flush cisterns in your school select materials which suit your operating environment. For example, Merrimac State High School installed stainless steel cisterns in student toilet blocks to prevent potential damage and vandalism. Plastic cisterns were installed in staff toilets.

Note: If you choose to retain any existing single flush toilet pans and only replace the cistern, install 9/4.5 L dual flush cisterns not 6/3 L cisterns. Older style pans require a minimum of 4.5 L per flush to function effectively.

Where large amounts of toilet paper are used, for example in female student toilet blocks, paper can build-up over time if flush volumes are too low, resulting in pipe blockages. In these circumstances, either disconnect the low flush option of the dual flush cistern before installation or keep the cistern as a single flush type. A single flush of 9 L is normally quite satisfactory in these circumstances and still saves water. However, if problems continue, you may need to keep one older style single flush (12 L) toilet at the end of the line of toilets to ensure a full flush occurs regularly.

Replacing the entire toilet cistern is not always necessary. A possible alternative for some brands of plastic and stainless steel full flush cisterns is to modify the cistern by inserting a push-button dual flush

Figure 41 Stainless dual flush toilets were installed for students.

Figure 42 The installation of water-saving equipment was supported by the development of a health and hygiene program.

outlet valve assembly inside the cistern. Check which, if any, of the cisterns at your school are suitable for this option because this removes the necessity and cost of replacing entire cisterns.

Achieving water savings by replacing or modifying toilet cisterns will depend on whether the dual flush facility is correctly used. Consider developing an accompanying education program for staff and students. At Merrimac State High School, laminated information posters were put up in all student toilet blocks (see Figure 42) and staff were informed of the changes by letter. Merrimac's water consumption costs for their toilets dropped from $6261 per year to $3789 per year as a result of modifying their toilets.

Handbasins

Handbasins are mostly located in the toilet blocks of schools and their taps are capable of flow rates up to 20 L per minute. These rates are completely unnecessary for hand washing and can be reduced without any loss of effectiveness by installing flow controllers in the taps.

A number of different brands of flow controllers are on the market. Some are simply fixed restrictors which depend on a constant and adequate mains pressure while others are modulating restrictors which attempt to keep water flow constant, irrespective of the mains water pressure.

If water pressure is a problem at your school, particularly when a number of fixtures are used simultaneously, you may need to trial the use of these controllers building by building to ensure adequate water flow can be maintained at all times.

Controllers are relatively inexpensive, however there is an installation labour cost. To maximise cost effectiveness, install flow controllers at the same time in a series of basins, rather than dealing with one basin at a time.

Most handbasins at schools are fitted with cold water taps only. However, for basins fitted with hot and cold taps, the benefits of reducing water consumption are two-fold. Not only is water use reduced but also water heating (electricity or gas) costs.

Installing water-saving equipment in handbasins can reduce water consumption by 70 per cent. Merrimac State High School reduced its costs from $882 per year to $265 per year.

Figure 43 Install flow control devices in taps such as Jemflo

External hose cocks

External hose cocks (outside taps) at schools can be a source of significant water waste, particularly if the hose cocks are prone to vandalism or unauthorised use.

Vandal proofing the handles of hose cocks prevents indiscriminate or uncontrolled use.

The simplest means of vandal proofing hose cocks is to fit handles that require a special tool to operate the tap. Ground staff and janitors should then be the only people authorised to carry such tools. Merrimac State High School did install vandal-proof hose cocks.

While it is impossible to estimate how much water and money this installation saved, the unauthorised use of outside taps by students and neighbouring boat owners no longer occurs.

Note: Do not allow students to use these hose cocks as drinking points. Make sure that there are adequate designated safe drinking points for students, irrespective of where they are on the school property. Often sports fields and ovals do not have adequate drinking facilities for students.

Showers

Substantial water and financial savings are possible by reducing the flow rate of showers within schools. This is particularly relevant in schools which have boarding houses or large sporting facilities, both of which require high numbers of showers.

Retrofitting showers by installing water-saving shower roses or flow controllers in the water supply lines will reduce flow rates. Hand-held shower roses can often be modified with trigger control outlets which allow water to flow only while a button on the shower rose is held .

Before retrofitting any showers, run a trial to assess whether the reduction in water flow will reduce the effectiveness of the shower. In addition, lowered flow rates can sometimes affect how well thermostatic mixing valves work (the valves which control the final temperature of the water at the shower head.). Carry out a trial retrofit and analyse the results if there is any doubt.

Installing water-saving equipment to reduce flow rates in showers which have both hot and cold water supplies, will result in dual savings: a reduction in water consumption costs and a reduction in water heating (electricity or gas) costs.

At the time of writing, Merrimac State High School did not have any showers in the school. However the school plans to install a small number of water saving models in the swimming pool amenities block late in 1998.

Industry example

In 1996 the Hyatt Regency Sanctuary Cove calculated that replacing their 27 L per minute showers with 9 L per minute showers in guestrooms would save the hotel $15,400 per year in water costs alone (not including heating costs). Although this example focuses on a large number of showers, it does highlight the savings possible by reducing the flow rates of showers.

Sinks

The success rate of reducing water consumption by modifying sinks depends largely on how the sinks are used. While the flow rate at sink taps can be reduced using flow controllers, this has little impact, for example, when the sinks have to be filled to wash dishes. Benefits are mostly gained in situations where sinks are used for rinsing and hand washing — that is, where the water goes directly down the drain.

Figure 44 Plastic dual flush toilets were installed for staff.

Figure 45 Wash up with the plug in the sink.

Figure 46 Avoid watering the path.

High flow rates at most sinks are usually unnecessary and can be reduced without any loss of effectiveness by installing flow controllers in taps. A number of different brands of flow controllers available on the market suit sink taps. As for handbasin taps, some are simple fixed restrictors and depend on a constant and adequate mains pressure. Others are modulating restrictors which keep water flow constant irrespective of the mains water pressure. If water pressure is a problem at your school, particularly when a number of fixtures are used simultaneously, trial the controllers on a building by building basis.

Flow controllers are relatively inexpensive, however there is an installation labour cost. For maximum cost effectiveness, install flow controllers in a series of sinks at the same time rather than dealing with sinks individually. Water consumption in sinks can be reduced by up to 70 per cent.

Many sinks at schools, for example science laboratory sinks, are fitted with cold water taps only. However, the benefits of reducing water consumption in sinks that are fitted with both hot and cold taps are two-fold. Not only is water consumption reduced, so are water heating (electricity and gas) costs.

Note: Flow controllers, when used with aerator nozzle fittings, help prevent water splashing (particularly hot water) in a sink when water is first turned on. Make sure that the main restriction is in the tap, not at the end of the sink spout. Excessive pressure build-up in a spout may cause leaks through seals in the base of the spout if it is an adjustable spout.

Irrigation

Irrigation commonly consumes the most water in schools. Irrigation typically takes two forms: major irrigation of ovals, fields, and large grassed areas; and minor irrigation of gardens, vegetated plots, and minor grassed areas.

In some cases, irrigation is responsible for over half of a school's total water consumption. At Merrimac State High School for example, oval and garden irrigation accounted for more than 53 per cent of the school's total water consumption.

A number of options are available to schools to reduce irrigation's water consumption and costs: altered work practices, wastewater reuse, and even changing the water source from town-supplied water to bore or creek water. Do note however that some water authorities charge for water from a bore or creek. In addition, although changing the source of water to a creek, for example, may reduce the cost for water at a school, it is not considered a true water conservation strategy unless the change is carried out in conjunction with some pro-active effort to reduce consumption.

Figure 47 Avoid watering the oval in the middle of the day or on windy days.

Oval irrigation

Irrigating ovals, fields, and large grassed areas consumes enormous amounts of water. This type of irrigation is normally required for both aesthetic as well as functional purposes. Schools, of course, depend on their sporting fields and ovals being kept in good condition and

this maintenance can require large amounts of water. However, significant quantities of water are often wasted through inefficient irrigation procedures and practices. For example, an oval with a sandy soil base may often be overwatered, with the result that much of the water runs off below the surface to a neighbouring property, water course, or drain. This wastes water unnecessarily.

There has never been a better time for schools to irrigate as efficiently and effectively as possible. There are many ways ground staff can minimise the amount of water required to irrigate ovals and sporting fields.

Listed below are a number of short and longer-term solutions to minimising water consumption during major irrigation. Merrimac State High School implemented the first two solutions and this action contributed to financial savings of $5897 per year.

- Reduce irrigation periods gradually over time and visually monitor the impacts to ensure the health of the irrigated area is maintained.
- During and after rain and in cooler seasons, manually intervene in or override the programmed cycle of existing automatic irrigation systems.
- Seek professional horticultural or agricultural advice to find out the optimum amount of water required to irrigate your oval and grounds, taking into account soil and turf type.
- Install a computerised control for the irrigation system which has variable irrigation programming and easy manual override
- Irrigate only in the evening or early morning, not during the heat of the day, and not during windy conditions
- Investigate the use of tertiary-treated effluent —sourced either from on-site treatment plants or the local government water authority — to replace or supplement irrigation water supplies.

Note: The issue of wastewater reuse is currently being re-evaluated by Queensland Government departments. Because of the changing situation and the challenges involved in the correct and safe use of this resource Appendix C contains a detailed discussion of this topic.

Garden irrigation

Irrigating gardens, vegetated plots, and minor grassed areas can also consume large quantities of water. Much of this consumption may be unnecessary, particularly if irrigation practices are inefficient or ineffective.

- Seek professional advice to ensure you are using the minimum required amount of water. At Merrimac State High School, reducing watering time reduced the school's annual minor irrigation costs from $2598 to $260 without affecting the gardens' health.
- Most small irrigation systems in schools are domestic-style systems connected to a hose cock. Do not leave them on unnecessarily and unsupervised for extended periods of time.
- The most popular types of small systems in schools have been microsprays. This form of irrigation can be wasteful if microspray

Figure 48 Use drip irrigation systems or soaker hoses.

Figure 49 Use a broom to sweep paths.

heads are not positioned properly, or if they are used during inappropriate conditions.

Irrigate only in the evening or early morning, not during the heat of the day, and not during windy conditions.

- Change from a microspray irrigation system to a dripper type system incorporating a timer control to reduce water consumption significantly.

  The water flow rate through a dripper system is approximately 5 per cent of that through an equivalent microspray system.

  However, you must extend the watering period to make sure enough water reaches vegetation.
- Dripper systems are either above-ground or sub-surface types. Use sub-surface drippers where possible because they can efficiently deliver the minimal amount of water required without it evaporating.
- Mulch all garden beds to reduce water evaporation and improve the soil.
- Plant native and endemic plant species which tolerate drought and can therefore survive with minimal watering.

Cleaning

Some cleaning activities at schools require significant quantities of water. In most cases though, changing some cleaning practices will reduce the quantity of water consumed.

For example, the practice of hosing down walkways daily could be changed by using hand-held blowers, sweeping with a broom and hosing every second day.

These changes should be balanced against any health or safety concerns which may arise as a result of less hosing. Merrimac State High School bought one blower and trained its cleaners to do less hosing. The school's estimated annual water costs for cleaning dropped from $718 to $431.

Some schools use fire service supplies — fire hydrants and hose reels — for cleaning purposes. This practice contravenes the Sewerage and Water Supply Act and penalties can be imposed under the Act. Fire services' water supplies should not be used for any purpose other than the testing and operation of fire fighting fixtures and services.

In addition, when a school has previously used fire service supplies for cleaning, the increase in water costs will be considerable when the same cleaning activities carried using the metered water supply for the school.

Figure 50 Spring-loaded drinking taps save water.

Drinking fountains

Make drinking fountains in schools as water efficient as possible. Many schools still use hose cocks as an acceptable drinking point for students. This practice should be discouraged. Hose cocks are not designed to be used as drinking taps.

In addition, they can be left on and waste significant amounts of water, particularly when running continuously and unnoticed by ground staff.

Where hose cocks are used for students to clean up in subjects like Art or Marine Studies, fit spring-loaded taps to ensure they operate only when required and cannot be left on. There are a number of brands on the market of both spring-loaded bubblers and taps.

WaterWise work practices in your school

Q-Build estimates that schools can, on average, reduce their water use by up to 10 per cent at little or no cost (see page 23 for details) by introducing WaterWise work practices for staff and students.

Merrimac State High School made massive water savings at no cost by altering oval and garden irrigation practices.

The computer-operated irrigation system was switched to manual operation and the groundskeeper was given sole responsibility for its operation (and the only key to access the equipment).

The oval watering routine was changed from an equivalent of 3 hours, 7 days a week, to an equivalent of 3 hours, 3 times a week with no watering for 1 week after rain.

The garden watering was also significantly reduced.

Using the new WaterWise irrigation routines, Merrimac State High School saved a total of 9121 kL and $7388 per year without any outlay. This is equivalent to almost one-third of the school's water use!

Remember, teaching WaterWise practices at school means staff and students are likely to be WaterWise at home too, extending the water conservation message beyond the school gates.

WaterWise practices are relatively easy to introduce at school. On page 27 you will find lots of ideas to involve your school community in your WaterWise campaign.

Here are some specific training ideas for individual school staff members and students.

Cleaning staff

- Sweep paths, don't hose them. Many cleaners use fire hoses to clean paths — this is illegal under local government laws and many local authorities are starting to actively police this practice
- If you do hose paths, reduce the number of days that this happens, for example from 5 days per week to 2 or 3, and then only in areas which present health and hygiene risks.
- Use a blower on difficult-to-clear areas.
- Use a bucket, mop, and other appropriate equipment to clean toilet blocks rather than just hosing them out.
- Report any leaks to the janitor immediately so that a decision can be made about what water to turn off until the leak is fixed.

Figure 51 Never hose down paths with the fire hose. Apart from being illegal, it wastes a huge amount of water.

Merrimac State High School WaterWise work practices

- Cleaning staff use brooms and blowers to clean paths and only hose when absolutely necessary.
- All leaks are reported directly to the janitor.
- Marine Studies classes use minimal water to hose boats after use while meeting necessary maintenance standards.
- Home Economics students plug sinks to wash their hands prior to beginning the lesson. Students use as little running water as possible when rinsing dishes and cleaning up, and they use plugs wherever possible.
- Staff and students use the dual flush toilets correctly.

Figure 52 Never wash brushes out in stormwater drains. Reuse the water on the garden.

Ground staff

- Train and empower ground staff in manual WaterWise irrigation practices. Give them sole responsibility for this task, including monitoring and adjustment.
- Give ground staff access to professional development in WaterWise garden practices including mulching, native plants, and microspray and drip irrigation systems. Contact organisations like your local ground staff association, Greening Australia, and Nursery Industry Association

Janitor

- Train maintenance staff in basic leak detection in fixtures and underground pipes.
- Provide access to professional development in WaterWise practices and equipment (through your local Master Plumbers Association, local authority or water authority, or WaterWise Queensland).
- Develop a regular maintenance program to prevent leaks in fixtures and keep WaterWise equipment operating at maximum efficiency
- Give your janitor responsibility for overseeing ground staff and cleaners and support their WaterWise practices and innovations.
- If your school has a swimming pool, ensure the janitor has the responsibility and equipment to cover it when not in use to reduce evaporation from sun and wind

Registrar/bursar

- Provide access to professional development in WaterWise work practices.
- Empower administrators to ensure WaterWise work practices are implemented and maintained by ancillary staff.
- Make sure they understand the financial benefits of WaterWise work practices.

Teachers

- Get teachers to monitor their normal water use and estimate amounts used.
- Ask for their ideas about WaterWise work practices.
- Trial, monitor, and review these ideas.
- Implement ideas appropriate to teachers' subject areas, for example ensure Home Economics classes put plugs in sinks when they wash up or rinse food.
- Teachers in all subject areas should model WaterWise practices so students can see water conservation is an important issue.

Canteen supervisors and volunteers

Below is a list of WaterWise activities that canteen staff may find useful.

- Ensure the plug is in the sink when washing up or rinsing food.
- Run the tap only when necessary.
- Defrost food in the refrigerator, not under a running tap.
- Use a bucket and mop to clean floors (don't hose).
- Use only the necessary amount of water to clean the canteen area.

Students

Below is a list of WaterWise guidelines for students.

- Avoid water fights.
- Turn off taps after use.
- Don't use outside taps without authorisation.
- Use WaterWise equipment appropriately, for example dual flush toilets.
- Prevent vandalism of WaterWise equipment and signs.
- Use WaterWise practices in all subject areas particularly high water-use ones like Home Economics, Art, and Science.
- Encourage discussion about water conservation among students.
- Behave responsibly in the swimming pool (if your school has one) to minimise losing water through excessive splashing.

All staff and students should report leaks to the janitor or designated staff member immediately.

Figure 53 Wash brushes out in a bucket. Then use the wastewater on the garden.

Working with the media

We all know how important it is to tell people about environmental and educational initiatives at our schools.

One effective way to spread the good news is through local print and electronic media. These outlets can help in your search for joint venture partners, provide recognition of joint venture partners, help market your school to the local community, inspire other schools and similar organisations to undertake water conservation programs, and spread the word about water conservation through practical, good news stories.

How to work with local media

- Find out who your local journalists, editors, and chiefs of staff are at newspapers, radio stations, and television stations.
- Contact them by telephone to summarise and regularly update the project. Try to keep in touch with the same journalist if possible so they will understand the project fully.
- Follow up your calls with a media release or progress report stating the most important and newsworthy points.
- Newsworthy items may include:
  - Why your school is undertaking the project (including interesting local and global environmental facts and potential water and dollar savings)

Figure 54 Rehearse your answers with the media before you do the interview.

- Who is involved
- What is involved in completing the project
- When these things will happen
- Highlight the involvement of staff and students if appropriate
- Results of the project — water and dollar savings

- For television and newspaper journalists, make sure you have interesting visuals for them to record or photograph, for example, students reading meters and checking equipment, drama group presentations and songs.
- Plan media coverage for each project milestone:
  - Project launch
  - Results of benchmarking
  - Installation of equipment and change of work practices
  - Final results
- Always try to involve a high profile community member to attract media coverage, for example the local mayor or councillor, well known sporting identity, etc.

Preventing media problems

The following points may be useful when dealing with the media.

- If the media are visiting your school to report on your water conservation work, ensure there is no evidence of water wastage.

  Check no taps are leaking and that the sprinklers are not watering during the day.
- Thank the media for coming to cover your story.

  Be polite and courteous to them and be ready and organised to record interviews and visuals.
- Have some facts and figures on hand, for example current consumption, costs, new consumption, potential savings.
- When key staff and students are involved in doing media interviews, brief them fully beforehand and ensure a senior member of staff is with them at all times during interviews.
- School community members being interviewed should be prepared to answer questions succinctly and enthusiastically.
- Before an interview begins, make sure the interviewee asks the journalist what sort of questions they will ask.

  They can then mentally prepare their answers.

Figure 55 Staff and student involvement is crucial to the success of the project.

Success factors of the model school project

A number of factors helped Merrimac State High School achieve its outstanding water saving results. Many of them are detailed on page 27 in the section about involving and enthusing the whole school

community in a water conservation program. Here is a summary of what worked for Merrimac State High School.

- The school delegated project coordination to a committed teacher who was given enough time, resources, and support by the school's administration team to ensure successful completion of the project.
- The school had a committed WaterWise janitor who involved and empowered ancillary staff. He ensured that WaterWise work practices were understood and used by these staff for the long term. He was an excellent communicator who liaised with plumbers, staff, and students while equipment was installed and effectively dealt with any disruptions caused by installation or teething problems with new equipment.
- A deputy principal took responsibility for organising project logistics from an administration perspective. She ensured time, resources, and support were made available to the coordinating teacher and janitor as needed.
- A core group of Year 11 students was involved for data collection, ideas, media interviews and whole school student leadership.
- Staff and student support for the WaterWise campaign was vital. It included teachers who incorporated water conservation issues into their lessons and activities, and teacher support for special student activities in important project functions, from drama and music to catering.
- Real life education was integrated into related subject areas.

While these factors are specific to Merrimac State High School, they are relevant to the development of a successful WaterWise campaign in any school in Australia. For example, even though it is not vital to set up a joint venture partnership to run a water conservation project, it is recommended you do link up with an accredited organisation like Q-Build that can assist you with technical advice on issues like water audits and water conservation planning.

Although the Merrimac project required significant funding for completion — almost $20,000 — this amount of money is not necessary to carry out an effective WaterWise program in your school. The cost of a WaterWise program depends on how much water your school uses now, how it is charged for this water, your school population and location, and water use habits. Remember, Merrimac State High School saved at least 10,166 kL and $8234 per year for no cost just by changing their irrigation practices.

The cost of a WaterWise program

The Merrimac project required significant funding for completion — almost $20,000. This amount of money is not necessary to carry out an effective WaterWise program in your school.

The cost of a WaterWise program depends on how much water your school uses now, how it is charged for this water, your school population and location, and water use habits.

Remember, Merrimac State High School saved at least 10,166 kL and $8234 per year for no cost just by changing their irrigation practices.

Figure 56 All equipment installation must be carried out by a licensed plumber

Troubleshooting

Although the 'WaterWising' of Merrimac State High School was successfully completed, it was not without its challenges and hiccups. Here are some ideas to help your school prevent problems and deal effectively with others if they occur.

- All equipment installation must be carried out by a licensed plumber, preferably a WaterWise-trained master plumber. This

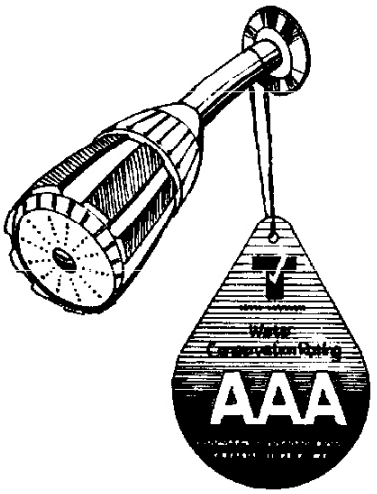


Figure 57 Any water-saving equipment installed in your school should be AAA rated and/or licensed under Australian Standards.

includes the installation of most water-saving equipment such as shower roses and flow control devices. Licences and laws like the Workplace Health and Safety Act exist for good reason, to protect your staff and students. Never put any of these people in situations where damage or injury could occur.

- Any water-saving equipment installed in your school should be AAA rated and/or licensed under Australian Standards. Never be tempted by cheaper unregistered products.
- Ensure that plumbers installing water-saving equipment are trained in WaterWise equipment installation procedures. Some items like flow control devices and sensor urinals require specific knowledge.
- Teething problems with new equipment can occur. Just in case they do, designate a staff member (probably someone like the school janitor) as key contact point for the reporting of problems such as leaks or blockages. Give that person the support to follow up problems with suppliers or manufacturers as quickly as possible.

  Merrimac State High School experienced some difficulties after flow control devices were installed in taps (for example leaks in Home Economics classrooms) and the devices had to be refitted. This problem was rectified quickly because the school janitor immediately gathered details of the problem and reported it to the project coordinator who contacted the supplier. The supplier visited the school as soon as possible, confirmed the problem, then solved it.

  Similarly, some dual flush girls toilets blocked. A swift investigation by the janitor disclosed that some female students were using large amounts of toilet paper to cover seats.

  This amount of paper, coupled with the reduction of water in half flush toilets caused the blockages. The school put up signs in girls toilets asking them to use less toilet paper and explaining why.
- Ensure you have suppliers' or manufacturers' contact details in an accessible place to enable quick contact about any installation information or problems.
- Work to get the whole school community informed and involved in your WaterWise program. This helps prevent or minimise vandalism and helps staff and students be patient during difficult times like equipment installations when water may need to be disconnected. The Merrimac State High School community was involved with their WaterWise program from the beginning and embraced its purpose and aims. Because of this involvement, no equipment was vandalised, new water-saving equipment was used correctly, and disruptions to the water supply during equipment installation were borne with good humour.
- Design clear communication channels between school personnel and joint venture partners. Key school personnel for your WaterWise program will probably include the registrar or bursar, janitor, ground staff, cleaners, administration team, and project coordinator. At Merrimac State High School the key personnel

janitor John Casey, Science teacher Carol Black, deputy principal Jo McDonald, and the school's groundsman and cleaners.

- Trial WaterWise work practices for approximately one month and then review them to ensure their effectiveness and efficiency. Areas such as manual irrigation practices need to be continuously monitored to ensure turf and garden health are being maintained with minimal water and that effects of climatic conditions all year round can be taken into account.

WaterWise at a school design stage

Historically, Queensland schools have been designed and constructed by the Department of Public Works on behalf of Education Queensland.

Schools have been constructed using a range of standardised designs, developed by Department of Public Works in conjunction with Education Queensland. These designs were in line with latest technology and community trends, for example, school buildings are designed for enhanced natural ventilation. Where this is not possible due to local climate conditions, thermal comfort controls have been introduced.

Most modern schools are constructed from environmentally friendly and safe building materials and, are designed to be energy efficient. The standard designs and specifications developed by the Department of Public Works in conjunction with Education Queensland include a range of water saving strategies for incorporation in new schools including:

- Dual flush toilets (6/3 L)
- Occupancy triggered urinals (for example, infra-red sensor urinals)
- Flow controls on basin, sink, and shower outlets
- Removal of internal cistern overflows
- Use of rainwater in lieu of reticulated town water
- Improved, water-saving landscaping designs

Even though new school design work is outsourced to both the Department of Public Works and the private sector, Education Queensland ensures that its design briefs contain explicit detail demanding cost effective, water efficient designs.

Water conservation is not a mandatory requirement in the community, nor is designing water-saving buildings. Some local authorities are currently in the process of including provisions in their local laws demanding flow controllers be installed in all bathroom and kitchen outlets.

In summary, the inclusion of water-saving strategies into the design of new schools is being pursued by Education Queensland and their chosen design consultant.

Figure 58 Working with new equipment

Figure 59 WaterWise landscaping recommendations include organic mulch

Case study of a new school

Located in the hinterland of the Gold Coast, Beechmont, like many rural communities in south-east Queensland, has a fast-growing population. A new state primary school premises is currently being built to replace the existing crowded building. Beechmont does not have access to reticulated town water. All its residents and businesses (including the school) get their water from either rainwater, bores, or creeks.

The new Beechmont State School is an excellent model of a WaterWise school under construction; it has the following fixtures built into its construction specifications:

- Dual flush toilets (6/3 L)
- Occupancy triggered urinals (infra-red sensor)
- Flow controls on basin, sink, and shower outlets
- Vandal-proof outside taps
- Vandal-proof spring-loaded drinking fountain and bubblers
- Rainwater-tank water supply
- On-site aerobic sewage treatment plant in which effluent will be ultraviolet treated
- WaterWise landscaping recommendations including organic mulch

Because most of the students and staff at Beechmont State School live in the local area and rely mainly on rainwater tanks to meet all their water needs, the level of WaterWise awareness and work practices at the school is very high.

Educational outcomes for Merrimac State High School

When developing and implementing a WaterWise program in your school, it is up to you how broadly you encourage related educational outcomes.

Given that the prime aim of schools is learning and teaching and that many benefits can come from involving the school community in your WaterWise program, it is a good idea to aim to maximise educational outcomes through your water conservation program.

At Merrimac State High School, the aim was to maximise educational opportunities for students and teachers and, where possible, link the program to the curriculum.

Below are just some of the educational outcomes that emerged from Merrimac State High School WaterWise project.

- For the Year 11 students involved closely with most aspects of the program, their educational outcomes focused on real life education including research skills, presenting at meetings, media interviews, attending major functions, developing related water-saving ideas and recommendations for equipment and work practices, and liaising with key staff members and joint venture partners.

- Year 12 Geography classes undertook an overview and analysis of the program through their 'Small is Beautiful' unit of work.
- Science and Geography classes from lower grades attended a water-saving mini expo held by suppliers and GCCC (Gold Coast Water) at the school. Many teachers followed this experience up by further integrating water issues into their classes.
- A Year 8 Art class produced a WaterWise poster display for the school's administration office area. The art teacher who initiated the display also developed a WaterWise board game.
- Year 12 Drama students created presentations for two major WaterWise school functions and were recorded for television news and special interest programs.
- Home Economics classes catered for and served at two major WaterWise school functions. The first became a class assessment task and the second an opportunity for work experience at a five-star resort recognised for its WaterWise work practices and equipment.
- A Computer and Science teacher generated a number of graphs for reports and presentations during the program.
- WaterWise work practices were introduced into a variety of high water-use subject areas including Home Economics, Art, Marine Studies and Science.
- Parents, staff and the student body were educated in WaterWise practices, equipment and project results through the school newsletter, whole school assemblies, staff meetings, and mini expos.
- The school band performed a selection of water themed songs at official project functions.
- Senior dance students developed and performed a water themed presentation at the final project celebration.
- The Science Department nominated the project students for an environmental education award.
- Ongoing contact with GCCC (Gold Coast Water), WaterWise Queensland and water-efficiency industry suppliers provided WaterWise staff education and professional development, particularly for the school janitor, groundsman and cleaners.

Remember that GCCC (Gold Coast Water) and WaterWise Queensland offer free WaterWise classes to schools. These are conducted by trained teachers and are mainly for primary schools though secondary and TAFE level classes can be organised individually.

WaterWise classes are a free service for all schools. When you plan your WaterWise campaign, include WaterWise classes for your whole school through these organisations to reinforce your water conservation program.

The GCCC (Gold Coast Water) education program operates only across Gold Coast City and WaterWise Queensland organises school visits across the rest of Queensland and beyond.

Figure 60 WaterWise lessons are run by many local water authorities.

How to use this book as a classroom resource

Teachers who want to incorporate WaterWise ideas into the curriculum can use these ideas.

Primary school

Primary teachers are limited in how they can use the program described in this book because their students would not be able to be involved in financial decisions about retrofitting or understand the technical aspects of water conservation.

However, primary students have excellent skills in changing adults' attitudes to water use. They could play a big role in changing work practices in schools and homes.

Whole of school activities

Here are some activities in which the whole primary school could take part.

- **Tidiness.** Students could keep concrete areas clean and so help cleaners reduce the need to hose down play and study areas.
- **Environmental clubs** could participate in creating native gardens and help with mulching programs.
- **Compost and mulch.** The school could start worm farming and composting to improve soil texture in gardens and so reduce the need for irrigation. Composting will also encourage students to manage their scraps which would also reduce the need to hose down concrete areas.
- **Fundraising.** Students could raise money for a water system that turned sprinklers on at night on the oval or for infra-red urinals in the boys toilets.
- **Ribbon tracking.** Students could be set an activity to find every place in the school where drinking water is located and tie a blue ribbon to it. Ribbons can be made in Art classes and Mathematics classes could calculate the number of ribbons around the school.
- **WaterWise song competition**. Obtain copies of the GCCC WaterWise songs and teach them in music lessons. Have a singing competition in which the winning class gets to sing on parade.
- **Weekly water use**. Locate your school water meter and have Art students paint a water use board on which to record weekly water meter readings. Use the water meter readings in Mathematics lessons.
- **WaterWise lessons.** Invite WaterWise teachers to your school to run special lessons on water conservation. For information about lessons in your area, contact WaterWise Queensland or your local water authority.

Figure 61 Composting programs in primary schools can help save water.

Years 1 and 2

Students complete the activities from the resource booklets. Small children can do simple things at home such as using the correct button

in the dual flush toilet and turning off the tap when they brush their teeth.

Years 3

Introduce ideas about the water cycle and how water gets to our homes. Students at this age will know why it is important to save water from the Whizzy stories produced by WaterWise Queensland. In this way they will learn to value water as a resource.

Year 4

Students should now be able to describe the water cycle in full and be able to find where the water meter is at home. Year 4s could learn about household water appliances such as washing machines, showers, and sprinkling systems and how they can be used to save water.

Years 5

An excursion to the dam and water treatment plant is a possible activity for Year 5. Students could learn about the catchment and how water gets to their taps.

Year 6

Students are now able to understand percentages and can be involved in water meter readings at home and at school.

By reading their water meter, students will be able to calculate their home water bill for their parents and make some suggestions for saving money.

Reading the water meter also gives parents an idea of patterns of water use which allows them to manage the water bill.

School measurements of daily usage/estimates could be used for annual calculations and then compared to the real annual water bill.

Year 7

Students could take an excursion to the sewage treatment plant to see how the water cycle is completed. Students should be able to design a water conservation program for their home and explain why water is such an important resource.

Secondary School

Years 8–10

The whole of Year 8 could take part in a cross-curricular teaching unit, especially if the school decided to do something about reducing its water bill. Use the ideas listed below.

- Science classes could look at flow control and water-restricting devices in showers as a means to save water.
- Mathematics classes could conduct a total school water audit, calculate the water bill for the school, look at compound interest in loan repayments on the purchase of water-saving equipment and calculate the payback period and saving to the school.
- Manual Arts classes could look at how water-saving equipment is installed, the ways taps work and leak, how to change a washer and install a water saving shower rose, and general plumbing in the home.

- English classes could discuss or debate a topic such as Water conservation — whose problem is it?

  Use different genres in describing the role water plays in their lives or the lives of others.
- Media students could design story boards and television and radio advertisements for National Water Week Competitions.
- History classes could study different ways water was used in the local area in the past, for example, when were tanks used and when did the sewerage system come in? Students could interview senior citizens, record ways they used water and compare these with volumes of water used by people today.
- Study of Society and Environment students could study water conservation attitudes among different community members.
  - Do young people conserve more water than middle-aged people?
  - Do some communities conserve more water than others?

  Students could design posters in a competition, the winners to be part of the school water conservation program.

  Students could compare daily water usage in developed and developing countries by discussing how they can act on the following statement made by Suzuki in their daily lives.

  'Much more water is used in rich countries than in poor countries. A person in an industrialised country uses between 350 and 1000 litres of water daily, whereas a person living in rural Kenya, for example, may use two to five litres of water a day'.
- All subject departments could complete a water audit for their building, including their water use habits, and develop water use best practices.

Years 11–12

The success of Merrimac State High School's program was due to the enthusiasm of a small group of senior students and their coordinating teacher. Reading water meters seemed at first to be a mundane and uninteresting activity, however it proved to be the cornerstone of success of the WaterWise school project.

In your school, the collection of accurate and reliable data by students could form the basis of either Science, Geography, Manual Arts, Business Management, or Mathematics classes. The recording and analysis of data is fundamental to any report writing activity in these subjects.

A water conservation project also extends students into real-life learning experiences because it involves them in communicating with the wider school community. Students could find themselves communicating with school cleaners, ground staff, local authority officers, parents and citizens representatives, other subject department heads and local plumbing suppliers as part of the project. Finally they will take the knowledge of water conservation into their home life and young adult years, a factor which many parents would gratefully acknowledge.

Figure 62 Year 11 and 12 Beenleigh High students survey residents attitudes to water conservation

Contacts

Addresses and numbers current 31 August 1998.

Q-Build Head Office

Ron Rankin: Assistant General Manager
David Harrison: Product Development Manager
John Joyce: Senior Plumbing Officer
Bradley Clarkeson: Plumbing Officer
GPO Box 2937
Brisbane Qld 4001
Telephone: (07) 3224 6077
Fax: (07) 3224 5007

WaterWise Queensland

David Wiskar: Manager
Allan Mayne: Senior Officer
Queensland Department of Natural Resources
GPO Box 2454
Brisbane Qld 4001
Telephone: (07) 3224 2716
Fax: (07) 3225 2131

Merrimac State High School

Carol Black: Science Department and School Project Leader
John Casey: Janitor
Bill Wilcox: Principal
Jo McDonald: Deputy Principal
Dunlop Court
Merrimac Qld 4226
Telephone: (07) 5572 2700
Fax: (07) 5572 8450

Wet Paper Publishers and Consultants

Bob and Paula Moffatt: Managers
Sally MacKinnon: Consultant to the Gold Coast City Council (Gold Coast Water)
Trent Moffatt: Graphics and designs
Mark Moffatt: WaterWise Gold Coast schools bookings
14 Milbong Terrace
Ashmore Qld 4214
Telephone: (07) 5597 2806
Fax: (07) 5539 4187

Education Queensland
Central Office

Richard Williams: Director, Facilities and Services
Ken Hobday: Assistant Director, Facilities and Services
Ken Jordan: Manager, Asset Management
PO Box 33
Brisbane Albert Street Qld 4002
Telephone: (07) 3237 0941
Fax: (07) 3235 4367

Education Queensland
South-East Queensland Facilities Services Centre

Val Brown: Senior Facilities Services Officer
Telephone: (07) 3237 9966
Fax: (07) 3239 0817

Gold Coast City Council

Councillor Daphne McDonald: Chairperson Water, Wastewater, Beaches and Foreshores Committee
Shaun Cox: Director, GCCC (Gold Coast Water)
Karen Barnes: Manager, Consumer Services
Dick Went: Manager, Water Treatment Services
Darren Hayman: Coordinator, Water Revenue
David Zinn: Coordinator, Trade Waste
PO Box 5042
Gold Coast Mail Centre Qld 9729
Telephone: (07) 5581 6000
Fax: (07) 5581 6796

Q-Build
South Coast Region Office

Bob Pickard: Manager
Gary Rollinson: Client Services Manager
Rob Hore: Client Services Officer
Glenn Stead: Client Services Officer
PO Box 3156
Robina Post Shop
Robina Town Centre Qld 4230
Telephone: (07) 5583 1915
Fax: (07) 5583 1943

Tradelink Plumbing Supplies

Jim Pickup: Product Development Manager, WaterWise Program
1051 Nudgee Road
Banyo Qld 4014
Telephone: (07) 3260 9752
Fax: (07) 3260 9701
Mobile: 0412 765 227

Master Plumbers Association

PO Box 408
Fortitude Valley Qld 4006
Telephone: (07) 3252 1266
Fax: (07) 3257 1910

Front Load Washers Association

Ken Evans
17 Smugglers Place
Runaway Bay Qld 4216
Telephone: (07) 5529 2881
Fax: (07) 5529 2850

Zip Heaters

Infra-red urinals

Ken Peuker
3/43 Links Avenue North
Eagle Farm Qld 4009
Telephone: (07) 3268 3301
Fax: (07) 3268 3302

Jemflo

Water and energy saving systems

Don Arms and Brett Holt
PO Box 2084
Logan City Qld 4114
Telephone: (07) 3290 3171
Fax: (07) 3808 5962

Caroma

Pans and cisterns

George Moulos
PO Box 1191
Eagle Farm Qld 4007
Telephone: (07) 3260 1977
Fax: (07) 3260 1277

Ram Taps

Vandal-proof tap ware

Colin Hill
PO Box 4007
Eagle Farm Qld 4009
Telephone: (07) 3260 1843
Fax: (07) 3260 1220

Donson

Tap ware

Gordon Spreadborough
PO Box 992
Archerfield Qld 4108
Telephone: (07) 3274 3971
Fax: (07) 3274 2851

Reliance Manufacturing Company (RMC)

Water meters and flow restrictors

Paul Watkins
4042 Ross Street
Newstead Qld 4006
Telephone: (07) 3252 1396

Con-Serv Corporation

Shower roses and flow restrictors

Bryan Nothling and Ian Carmody
5 Noble Street
Wilston Qld 4051
Telephone: (07) 3856 4411
Fax: (07) 3856 4433

Saxon Water Heaters

Hot water services

Peter Sachs
PO Box 82
Virginia Qld 4014
Telephone: (07) 3265 5133
Fax: (07) 3265 5781

Delrana

Shower roses

Dennis Bailey
PO Box 4
Nerang Qld 421
Telephone: (07) 5596 0155
Fax: (07)5596 6533

Flexispray

Shower roses and flow restrictors

Kevin Post
Unit 5, 30 McCotter Street
Acacia Ridge Qld 4110
Telephone: (07) 3273 8811
Fax: (07) 3273 8787

Cuno Pacific

Water filters

Michael Limerick
76 Zillmere Road
Boondall Qld 4034
Telephone: (07) 3865 1955
Fax: (07) 3865 3404

References

Lanz K., *The Greenpeace Book of Water,* Cameron Books, Scotland, 1995

MacKinnon S., *WaterWise information guide: Water conservation in caravan parks,* Wet Paper Publishers and Consultants, Ashmore, Qld, 1997

McGregor P. *Australian Study Topic: Managing Water*, Centre for Economic Education, Melbourne, 1997

Moffatt B. *WaterWise: Water resource management and conservation*, teacher resource book and student manual, Department of Primary Industries, Water Resources Commission, Queensland, 1993

Q-Build, *Water Conservation in Queensland Schools*, discussion paper, June 1998

Queensland Department of Local Government and Planning, Regional Coordination Committee *South East Queensland Regional Framework for Growth Management*, 1998

Suzuki D. *The Sacred Balance: Rediscovering our place in nature*, Greystone Books, British Columbia, 1997

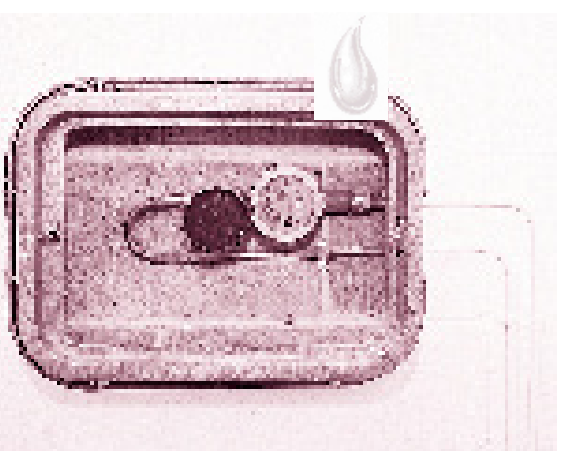


Figure 63 Reliance Manufacturing Company (RMC) meter used for data collection

Appendix A Equipment specifications

Note that labour worth approximately $8000 was supplied by Q-Build.

Vandal-proof hose cocks

Ram Taps

Supplied: 15 mL Asylum Vacuum Breaker Hose Cocks (AHHCVBB)

Infra-red urinals

Zip Heaters

Supplied: Flushmaster infra-red urinal flush valves WS003 recessed

Note: Optional WS002 wall mounted

Flow controls

Jemflo Water and Energy Saving Systems

Supplied: Jemflo flow control valves (W09/2) for basins and (W09/5) for sinks

Stainless steel toilet cisterns

Donson/Email/Clark Dorf

Supplied: Clark stainless steel 6/3 dual flush cisterns. Model no: Y7163

Note: also available in 9/4.5

Meters

Reliance Manufacturing Company (RMC)

Supplied: Multijet wet dial meters in 15 mL to 50 mL

Note: available in 15 mL to 250 mL for hot or cold water

Plastic toilet cisterns

Caroma

Supplied: Fowler Tasman Mk II 6/3 dual flush cisterns (plastic)

Appendix B

Joint venturing

Joint venturing was an integral part of the WaterWise model school project at Merrimac State High School. Here are some ideas to help you get started.

Local organisations who might be interested in joint ventures

- Local council or water authority
- Q-Build or public works department regional office
- Education Queensland facilities service centre
- Tradelink outlet
- Hardware store
- WaterWise master plumbers
- Environment groups
- Other schools in your area
- University or TAFE college
- Plant nurseries
- Greening Australia office
- Landcare group

How do you initiate a joint venture WaterWise project?

1. Identify the type of project you would like to undertake.
2. Identify your own expertise within this project and the type of expertise you need which you don't have at your school.
3. Identify the total budget needed to complete the whole project and your budget contributions.
4. Identify the financial and in-kind goods and services you need to complete the project.
5. Identify who has the dollars, expertise, goods, and services you need.
6. Write up your plan clearly and comprehensively, including a budget.
7. Approach potential joint venture partners with a project outline and a proposal inviting their involvement, either individually or at a meeting of all potential partners.
8. Clearly identify to potential partners, the benefits likely to accrue to them from their involvement.
9. If they are interested in your proposal, review your project plan with their input.
10. Begin your program.

What if you can't find joint venture partners?

If you are unable to find any joint venture partners for your project, don't give up.

You can go it alone and plan your school WaterWise program over a number of years to fit in with your ongoing budget and maintenance programs. Then when you have finished, you can take all the benefits and glory yourself!

If Merrimac State High School had proceeded on its own to be a complete and 'instant' WaterWise school, its total costs would have been valued at $19,341. With its annual water savings valued at $13,705, it would have paid back its investment in full, in approximately 1.4 years.

Another option is to set up a stage 1 pilot program, and target a suspected high water user such as an automatic urinal or the oval irrigation.

Gather the water consumption data, make the necessary and appropriate WaterWise equipment and/or work practice changes, measure again, analyse the before and after data and dollar savings, then go back to potential joint venture partners with your evidence. Show them your success and encourage their involvement from stage 2 onwards.

Issues in joint venturing

While joint venturing has undeniable benefits to school programs like WaterWise, it also has its challenges. Here are some ideas to prevent joint venture problems:

- Be clear from the start about who is contributing what to the project. This includes dollars, expertise, goods and services, co-ordination skills, etc.
- Communication is crucial. Aim to minimise misunderstandings and crossed communication by organising informal and formal lines of communication and stick to them. For example, in the Merrimac State High School project WaterWise Queensland was made the central communication point and undertook State level and overall project decisions. Other parties communicated directly with WaterWise Queensland most of the time and, where necessary, directly with each other
- Have occasional meetings between all joint venture partners to update, exchange information, reinforce project purpose, and iron out any problems
- Correspond regularly between partners, for example circulate meeting minutes, project updates, progress reports, timelines, media coverage, etc.
- Publicly recognise project partners whenever possible, especially at formal or media events for your project. Ensure banners, logos and posters highlighting partners are highly visible, and acknowledge their involvement in written reports with logos and summaries of their contributions.
- Be prepared to clarify and renegotiate partners' needs as the project progresses.

Figure 64 A WaterWise project is a great team-building exercise for a school.

Appendix C Wastewater reuse in schools

Warning

Before considering either on-site treatment of wastewater, or reuse of treated wastewater at schools, you must seek the appropriate technical expertise and approvals from the relevant statutory authorities, for example:

- Local water supply authority
- Your local state departments of health, environment, education and public works

Approvals must also be obtained from Education Queensland Central Office so that legal issues can be closely examined.

According to DNR, schools proceeding with the use of treated wastewater will need to develop documented management plans which cover operation and maintenance of the wastewater reuse system and which clearly delegate responsibility for the various component activities.

Schools considering the use of treated wastewater should refer to DNR's *Interim Guidelines for Reuse or Disposal of Reclaimed Wastewater* (April 1996) for guidance on both microbiological water quality for various uses, general water quality, general assessment of suitability for irrigation, and the management of wastewater reuse systems.

Wastewater

Wastewater can be defined as waterborne wastes from human or household, or commercial and institutional activity.

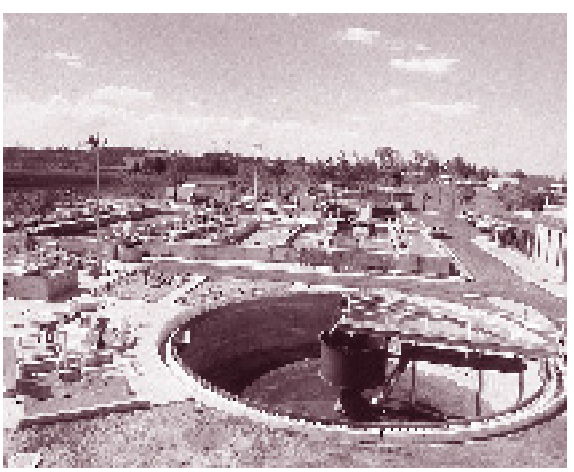


Figure 65 Waste water is treated by local authorities at waster water treatment plants

Wastewater produced from most buildings can be comprised of either greywater and/or blackwater. These two types of wastewater can be disposed of separately or together, depending on the design of the wastewater-piping layout at the school.

Blackwater refers to human body waste, discharged either direct to a vault toilet or through a water closet (flush toilet) and/or urinal.

Greywater refers to household sullage wastes, that is, all wastewater from kitchen, laundry, bathrooms, etc. other than water closet wastes.

Note, it is illegal to reuse greywater for irrigation or any other purpose, in a sewered area (*Standard Sewerage Law 1998*). All domestic wastewater, both grey and black must be discharged to sewer.

If greywater is of a high enough quality to be used for irrigation or any other purposes in unsewered areas, sub-surface irrigation methods should be used. Details can be found in *Model Guidelines for Domestic Greywater Reuse for Australia* (Urban Water Research Association of Australia, Research Report no. 17, March 1996).

Wastewater (commonly referred to as sewage if it contains blackwater), is usually disposed of from schools by at least one of the following methods:

- Discharged directly into a local authority sewerage system
- Stored in a holding tank until it is transported from the property (on a regular basis)
- Treated on-site by a septic treatment system, and the effluent disposed of through absorption and/or transpiration trenches within the school property, or transported away
- Treated on-site by systems other than septic tanks, for example on-site aerobic systems. The effluent from these systems is disposed of by irrigation (preferably sub-surface for health reasons).

Some schools may be able to reduce the cost of wastewater disposal, and even reduce the total quantity of water needed by the school, by treating some or all of the wastewater on-site and reusing it.

Treated wastewater is often referred to as effluent. The final composition of this effluent will depend on the level of treatment applied to the wastewater.

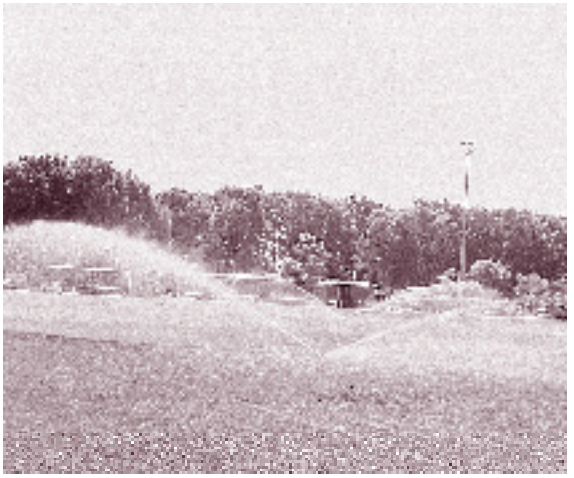


Figure 66 Effluent from wastewater treatment plants has for 20 years been used on the Gold Coast parks and gardens

The most suitable application for effluent is irrigation. This can range from watering garden beds through to irrigation of major sporting ovals. Another possible use for effluent is flushing toilet systems, in lieu of using town water.

As discussed above, many health and safety related issues need to be comprehensively addressed before any form of effluent can be considered for use in a school environment. The particular application for effluent, and the level of treatment the wastewater receives, will determine the precautions that have to be taken to ensure health and safety standards are maintained.

Some local water supply authorities can supply secondary-treated effluent to users (sometimes free of charge) who are in the vicinity of the effluent main. This main conveys effluent that has been treated in a treatment works or plant to a point of discharge such as the ocean. This effluent will be treated to a standard to comply with the Local Government's licence requirements. However, this quality may not be suitable for the intended re-use purposes.

Further treatment to meet the DNR recommendations for water quality for various uses would then be the responsibility of the school which purchased the wastewater.

Using this type of effluent is common among private sector facilities such as hotels, resorts, and golf clubs, as well as council-operated parks and recreational areas. Although the effluent is supplied to a specified standard, certain precautions are still necessary to manage any risks to health and safety. For example, golf clubs must not irrigate within 4 hours of players being permitted onto the irrigated area of the golf course.

Nevertheless, the benefits of using this effluent can be significant, particularly if using wastewater can totally replace your school's dependence on town water for irrigating large areas. Education Queensland has developed an asset management guideline for schools considering using this resource, *Interim Guidelines — Use of Effluent to Irrigate School Grounds*.

In summary, some schools can possibly make savings over time in reduced consumption costs and/or wastewater disposal costs by reusing treated wastewater from either the school or another source, but these options must be thoroughly investigated at all levels with key authorities.

Trade waste

Local authorities provide sewerage systems for the transport and treatment of domestic sewage. Schools discharge materials which do not fit the definition of domestic waste, such as those generated by science laboratories, art and paint workshops, machinery repair shops, pool backwash, and canteen kitchens.

All of these areas may generate liquid waste that is of greater chemical strength and volume than domestic sewage. This waste discharge is described as trade waste. Trade waste which is discharged into the sewer may damage the sewerage system or pose an environmental hazard.

As in water pricing policy, trade waste charges are also moving to user pays systems based on the quality and quantity of the trade waste discharged. Like user pays water charges, such trade waste charges will be payable by individual schools as generators of trade waste. So it makes sense to conserve water in school areas which generate trade waste in an effort to lower trade waste charges. Remember, the amount of water coming into a school determines the amount of water going out of a school, both of which can incur user pays charges.

When wastewater is treated by on-site systems, the effect of trade waste on the quality of effluent and its suitability for reuse will need to be considered.

Appendix D

Glossary of terms

Glossary definitions are from Q-Build and have been developed specifically for the WaterWise school project.

AAA

The Australian Standards Water Conservation and Labelling System. It identifies quality products and 'rates' them according to water efficiency. The more As a product receives, the more water efficient the product is. For example, AAA — an excellent rating (highest); AA — a high rating; A — an acceptable level of water efficiency. **Note**: Products which are part of this rating system have also been through a rigid quality assurance program.

Audit

A qualitative and/or quantitative assessment of a product or service that aims to provide enough technical or other detail to allow informed decisions to be made.

Australian Standards

A document, published by Standards Australia, which sets out technical specifications on criteria necessary to ensure that a material or method will consistently do the job intended.

Automatic urinal

A urinal that uses a fill and flush type of cistern to store water which is then used to flush the urinal on a cyclic basis. These urinals operate on a continuous cycle (average 5 minutes), in which the cistern slowly fills to a pre-set volume and then flushes. The cistern then refills and the cycle repeats itself. **Note**: Schools with automatic urinals can quickly reduce water consumption in these fixtures by ensuring they are turned off anytime the school is unoccupied: overnight, on weekends and over school holidays.

Backwash

Of a pool's filtration system, sometimes referred to as 'backflush' water. Backwash is the wastewater produced during the regular cleaning of a pool's filter. It is created when the water flow through the filter is reversed, thus backflushing the filter. The wastewater from this process is redirected to waste or a holding tank. Backwash is chlorinated water which contains human hair, skin, sunscreens as well as a high concentration of pathogens.

Benchmark (noun)

A recognised standard, level or basis of measurement, used primarily for comparison purposes. For example, the average daily quantity of water consumed by Merrimac State High School is 63 L water per person. This amount can be used as the point of comparison for future measurement to see if the school water-saving performance is improving or otherwise.

Benchmark (verb)

To apply a standard, level or basis of measurement so that comparisons can be made. For example, the water efficiency of schools can be compared by 'benchmarking' or measuring the ratio of water consumed to the number of students at the school.

Cistern

One of the two main parts of a toilet (or water closet or WC). The cistern houses the flow control mechanism as well as storing the water to be used for flushing.

Cisternmiser urinal

Older style urinals which are activated by a drop in pressure in the water supply piping. Normally these urinals operate when the handbasin taps are turned on. They operate on the principle that after people use the urinal or adjacent toilets they will wash their hands and thus activate the flush.

Demand management

The process of managing the demand for water by controlling consumption and water usage patterns of consumers. **Note:** This can include intervention to eliminate or modify activities that are known to unnecessarily waste large quantities of water.

Dual flush toilet

A modern, water-saving style of toilet cistern which offers two flush modes: the full flush and half flush option. There are two types available: 6/3 L and 9/4.5 L options.

This means full flush = 9 L, half flush = 4.5 L. **Note**: In a school environment the 9/4.5 L is the preferred type, with enough flush volume to prevent pipe blockages in high use areas. The 6/3 L type is more suitable for domestic and residential use.

Effluent

Outflowing liquid and/or wastewater discharged from a small septic tank, sullage tank, blackwater holding tank, aerated or other treatment system, or an industrial process.

Fixtures

A receptacle, including ancillary attachments, designed for a specific purpose, whose use or operation results in a discharge into the sanitary, plumbing, or drainage installation, for example a tap, toilet cistern, or urinal.

Flow control

To reduce the flow of water through a fixture, for example a tap or shower rose, by introducing a restriction into the flow path. The restriction can be a fixed type (flow depends directly on mains pressure) or a modulating type (flow stays at a pre-set constant rate, irrespective of mains pressure because the restriction varies). Flow controllers can take the form of a wide range of devices, for example, disc inserts for taps, modulating valve arrangements in taps, aerator fittings, etc.

Flow rate

The quantity of water to pass through a given point over a predetermined time period. For example: 1000 L in 60 seconds = 16.67 L per second or 1000 L per minute or 1 kL per minute.

Greywater

Domestic wastewater discharged from the bathroom and laundry, including floor wastes from these sources. The term excludes sanitary wastes.

Note, it is illegal to reuse greywater for irrigation in a sewered area (*Standard Sewerage Law 1998*). All domestic wastewater, both greywater and blackwater, must be discharged to the sewer. In unsewered areas the quality of greywater is such that if used for watering gardens, sub-surface irrigation methods should be used. Details can be found in *Model Guidelines for Domestic Greywater Reuse for Australia*, Urban Water Research Association of Australia, Research Report no 107, March 1996.

Holding tank

A storage tank intended to temporarily store water (or wastewater) prior to disposal. Holding tanks are often used to store swimming pool backwash water and sometimes sewage.

Hose cock

A tap or similar fitting, to which a hose fitting can be readily connected.

Infra-red sensor urinal

An occupancy triggered urinal with a flushing action that is activated after a preset time period, following detection of use of the urinal.

The presence of a user is detected by interference to an infra-red beam which spreads over the urinal steps. After a preset period following the detection, the urinal flushes.

Infrastructure

Built or constructed assets, normally required to maintain and support the delivery of fundamental services like water, to the community. Examples include dams, water treatment plants, pumping stations, and sewerage systems.

Kilolitre

One thousand litres. A commonly used measure of volume of water (or any other liquid). 1 kilolitre (kL) of water = 1000 litres (L) = 1 cubic metre (m^2 i.e. a cube 1 m x 1 m x 1 m in size).

Megalitre

One million litres, or one thousand kilolitres. A commonly used measure of large volumes of water (often used by local governments and water supply authorities). 1 megalitre (ML) of water = 1 000 000 L= 1000 kL = 1000 cubic metres (m^3 i.e. a cube 10 m x10 mx 10 m in size).

Meter

A device used to measure the quantity of water passing through a given point. The difference between two meter readings taken at different times is the quantity of water to have passed through that meter during the time interval between readings.

Pan

One of the two main parts of a toilet (or water closet or WC). The pan (or pedestal or bowl) is the depository for human waste products. The pan provides physical support for people, as well as ensuring there is a liquid seal (i.e. the 'S-bend') so that odours and fumes from the sewerage system cannot enter the room via the toilet.

Per capita

Calculated on a per person basis. In a school, per capita would typically refer to the school's population that is on a per student basis.

Pull chain urinal

A urinal with a flushing action engaged by pulling a chain located on the urinal cistern.

Q-Build

A commercial business unit of the Department of Public Works, responsible in the context of this book for the maintenance of school buildings and infrastructure.

Restrictor

A device placed in the path of water flow within a fixture e.g. a tap, with an intention to impede or restrict flow. There are two types of restrictors: fixed and modulating. The fixed type is much simpler in construction and is less expensive to purchase than the modulating type. They do however, depend on adequate mains pressure at the outlet at all times and cannot provide a constant maximum flow if the supply pressure varies. Supply pressure at outlets can drop in periods of high water usage elsewhere, e.g. during breaks, lunchtime, etc.

Retrofit

To modify the design of an item by converting or replacing certain parts so they operate differently, yet still ensure the item satisfies its primary functional requirements.

Sewage

The wastewater from the community including all faecal matter and urine, greywater, household and commercial trade wastes and other polluted water.

Sewerage

The network of collection and drainage pipes carrying sewage away from a premises or property. The sewerage system includes the pipes, pumps, structures and machinery used to receive, store, transport, or treat sewage.

Sustainability

Ability to sustain or endure without harm or damage. In an environmental context, ecologically sustainable development is development which improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

Trade waste

Waterborne waste from any business, trade or manufacturing premises other than domestic sewage, stormwater, or unpolluted water.

Valve

A component of a screw-down tap. Also commonly (and incorrectly) referred to as a tap washer. The primary function of the valve is to form a watertight seal against the seat face of the tap body, when the tap is turned off. A secondary function of some specially designed valves is to regulate water flow through the tap. These valves are commonly called flow controllers or flow control devices.

Washer

A component of a tap valve. The washer is the flexible (usually nylon) face of the valve that makes direct contact with the tap body to form a watertight seal. It is held fixed to the body of the tap valve.

Wastewater

Waterborne wastes from domestic, commercial, or institutional activity. Wastewater is the used water from the community containing dissolved and suspended matter.

Water audit

An on-site assessment of those activities and areas where water is used. An audit should at least provide information on the following: sources of water used, areas of consumption and the quantity used, areas to improve efficiency, potential reductions in water consumption and resulting cost savings.

Water pumping

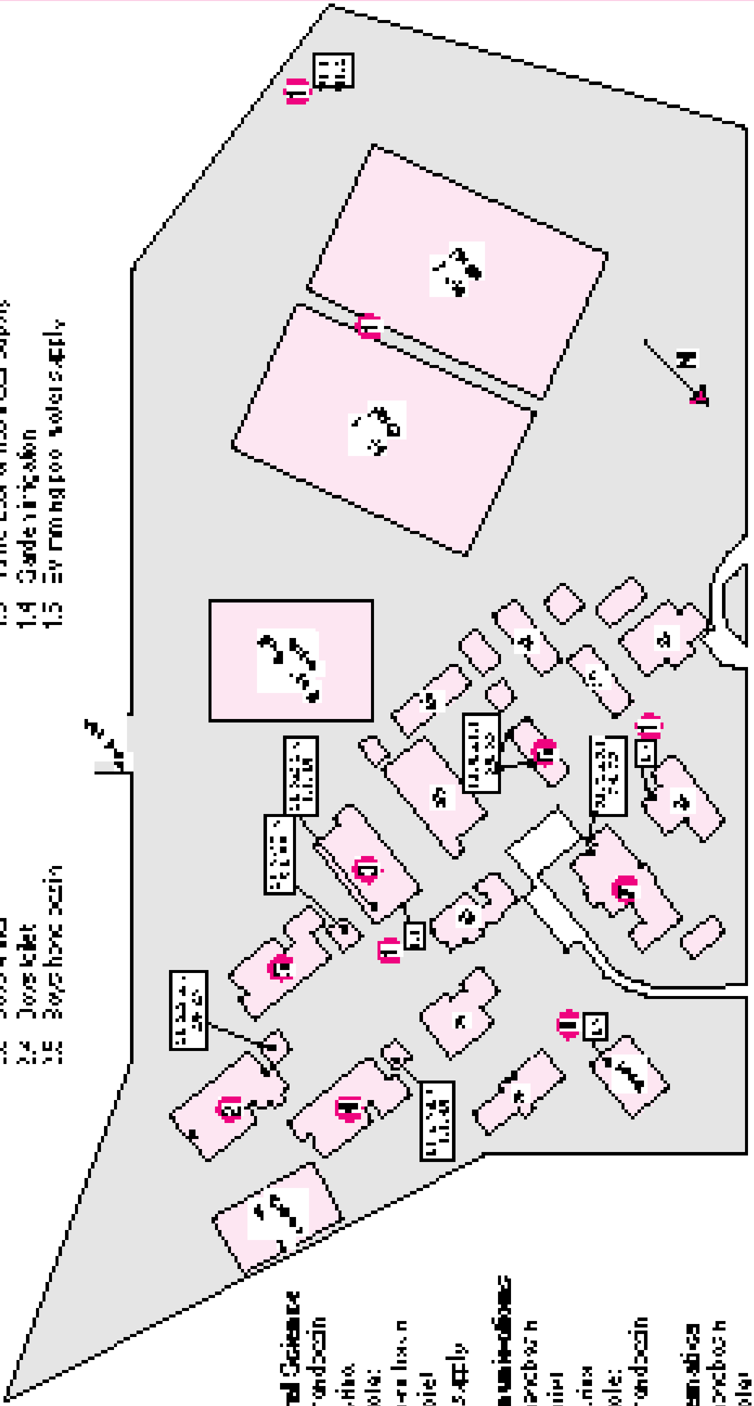
The transportation or movement of water by the use of pumps. Pumps can be used to raise the pressure of water, or to increase the available flow rate of water supplies. Pumps are often used when the town mains pressure is inadequate to deliver the necessary water quantities to all required places within the school boundary.

Water treatment

Removal, oxidisation or stabilisation of colloidal and dissolved organic material by biochemical, chemical, and mechanical processes. There are normally three levels of wastewater treatment: primary, secondary, and tertiary. Water treatment of potable water also occurs to ensure it meets all health requirements.

Appendix E Map of Merrimac School

This map shows the location of school activities and the 38 meters installed to monitor water use



1 Outside irrigation and supply points
- 1.1 Main water supply
- 1.2 Oval irrigation
- 1.3 Home Economics water supply
- 1.4 Garden irrigation
- 1.5 Swimming pool water supply

2 Social Science
- 2.1 Girls handbasin
- 2.2 Girls toilet
- 2.3 Boys urinal
- 2.4 Boys toilet
- 2.5 Boys hand basin

3 Natural Science
- 3.1 Boys handbasin
- 3.2 Boys urinal
- 3.3 Boys toilet
- 3.4 Girls hand basin
- 3.5 Girls toilet
- 3.6 Water supply

4 Communications
- 4.1 Girls handbasin
- 4.2 Girls toilet
- 4.3 Boys urinal
- 4.4 Boys toilet
- 4.5 Boys handbasin

5 Mathematics
- 5.1 Girls handbasin
- 5.2 Girls toilet
- 5.3 Boys hand basin
- 5.4 Boys toilet
- 5.5 Boys urinal

6 Main amenities and canteen
- 6.1 Girls handbasin
- 6.2 Girls toilet
- 6.3 Boys hand basin
- 6.4 Boys urinal
- 6.5 Boys toilet

7 Year 7 Centre
- 7.1 Girls handbasin
- 7.2 Girls toilet
- 7.3 Boys hand basin
- 7.4 Boys toilet
- 7.5 Boys urinal

- 8 Performing Arts
- 9 Library
- 10 Administration
- 11 Arts and Craft
- 12 Manual Arts
- 13 Commercial
- 14 Music
- 15 Student Activity Centre
- 16 Home Economics

Index

T

U

V

W

Z