



Victorian
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Stormwater
Stormwater
Action Program
Action Program
final report
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What is VSAP?



The Victorian Government launched the Victorian Stormwater Action Program (VSAP) in July 2000. Since then, under EPA Victoria's management, projects totalling about \$50 million have been undertaken across the State to improve the way we manage our urban stormwater – a significant source of pollution to our waterways and bays.

Over the ensuing six years, stormwater management in Victoria has experienced a shift in focus, increasingly moving away from a traditional gutters-and-drains approach to more innovative ways of managing stormwater.

Many no longer think about stormwater as a nuisance to be ushered quickly away along pipes into local waterways. Increasingly, we are now recognising the great value in slowing stormwater down so it can be stripped of its pollutants. And we are now starting to value the tremendous potential of rainwater and stormwater as a water resource.

This approach has all kinds of far-reaching environmental and economic benefits – it can filter pollutants out before they reach our waterways and bays; and it can provide water for reuse to take some of the pressure off our traditional water supplies.

The Government envisaged the VSAP program to be an investment in the future. VSAP encouraged applicants to be experimental, to think laterally, collaborate with colleagues and industry, and work with their communities. VSAP-funded research has delivered quantum leaps in our understanding of stormwater processes and these have been broadly communicated across the State.

I am proud to present this selection of case studies drawn from 273 projects, large and small, funded under VSAP. Together they demonstrate the many possibilities open to urban stormwater managers and the wealth of knowledge now available to councils, agencies and communities.

I hope this report serves to showcase the benefits to the Victorian community and business of this momentous program and to inspire further stormwater initiatives to protect and enhance the Victorian environment.

A handwritten signature in cursive script that reads "John Thwaites".

John Thwaites MP

Minister for Water, Environment and Climate Change

Background

VSAP's broad vision

'To improve the quality of Victoria's water environments through better environmental management of urban stormwater'.

Stormwater Management Plans

VSAP began by supporting local councils in preparing municipal Stormwater Management Plans (SWMPs), which identified the main stormwater threats to waterways in their local areas. A review of all the SWMPs found ten common themes for stormwater across the State:

1. Run-off from roads.
2. Run-off from residential land.
3. Sediment and erosion control from building and construction sites.
4. Degradation of receiving waterways.
5. Run-off from industrial and commercial sites.
6. Elevated nutrients from agricultural activities.
7. Litter.
8. Septic tank and sewer effluent.
9. Run-off from public open spaces.
10. Run-off from contaminated sites.

The SWMPs are local strategic programs integrating planning, design, source controls and structural controls. Under the SWMPs, local councils identified the priority actions they would undertake over a number of years. For many municipalities, SWMPs have initiated a continuing process of change in stormwater management.

VSAP Framework

In light of the ten common issues above, VSAP set four categories in a strategic framework under which projects would be funded:

- Building **awareness** in different audiences about the benefits of 'best practice environmental management of urban stormwater' and in doing so, promote sustainable management and behaviour.
- Developing **tools** to enable managers to be more effective in their regulation, planning and implementation of actions to achieve sustainable urban stormwater management.
- Assisting **implementation** by supporting those involved in managing urban stormwater, thus bringing about sustainable management.

- Generating the **knowledge** needed to support good policy formulation and effective implementation of environmental management practices.

Local councils applied for VSAP funding for projects that were part of their long-term SWMPs, with many neighbouring councils forming project partnerships.

The strategic framework also gave other agencies and organisations access to VSAP funds, enabling them to make a statewide contribution towards improving stormwater practices.

Results

Over six years, a number of other programs reinforced the changes that were under way, particularly the adoption of new environmental performance objectives for urban stormwater management and the publication of *Best practice environmental management guidelines for urban stormwater*.

Council participation in VSAP lifted the profile of stormwater management and water quality as a key issue for metropolitan and rural municipalities. Resources, knowledge and experience generated through VSAP and other initiatives created a wealth of information on sustainable stormwater management, only a portion of which is described in this report.

The intensity and duration of VSAP established lasting networks and consolidated improved processes as the new norm – from which there is no turning back.

About this report

The case studies showcased in the following pages reflect the wide diversity of projects that VSAP was able to support. Collectively, they illustrate the many ways in which Victorian communities are tackling the ten common themes listed above.

This report also includes case studies aimed at the wider VSAP themes: notably education and awareness projects, and research into tools, technologies and processes for application statewide.

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Glossary of terms

bio-retention: use of vegetation (grass, plants or trees) promoting infiltration and biological treatment of stormwater. A perforated pipe collects the infiltrated water and conveys it downstream.	reticulation: division into a network. This can relate to delivery of potable water or sewerage.	3
gross pollutants: large pieces of debris (larger than 5 mm) transported through the stormwater system.	run-off: rainwater that flows across the ground, eventually entering a stormwater network.	
gross pollutant trap: a structure used to trap <i>gross pollutants</i> transported through the stormwater system.	sediment pond, sediment basin: area where water velocities are slowed and coarse sediments settle out of stormwater. Typically pools are about two metres deep.	
infiltration trench: trenches filled with a permeable material (such as gravel) and placed to intercept stormwater and direct it to permeable soil or groundwater zones.	Smart Septics: Generic name given to projects undertaken by the Municipal Association of Victoria in relation to domestic wastewater management.	
initial-flow diversion: diversion of stormwater.	soil wetting: process of infiltration and absorption of water by soil particles.	
leachate: the liquid produced when water percolates through any permeable material. It can contain dissolved or suspended material – usually both. This liquid is most commonly found in association with landfills, where the result of rain percolating through the waste and reacting with the products of decomposition, chemicals and other materials in the waste is the production of leachate.	surfactant: is a contraction of ‘surface active agent’. Surfactants are usually organic compounds that are amphipathic – meaning they contain both hydrophobic groups (their ‘tails’) and hydrophilic groups (their ‘heads’) – and are typically, as a result, sparingly soluble in both organic solvents and water.	
litter trap: see <i>gross pollutant trap</i> .	swale: a vegetated open channel, designed to intercept and convey surface <i>run-off</i> to a drainage network inlet.	
passive recreation: activities near water that do not involve direct contact with the water, such as walking.	SWMP: municipal Stormwater Management Plan.	
Ramsar: an intergovernmental treaty that provides the framework for national action and international cooperation on the conservation and wise use of wetlands and their resources.	wastewater: water diverted to sewer or on-site domestic wastewater systems.	
	WSUD: water sensitive urban design.	

Rowville Community Centre

Location: Melbourne

Waterways affected: Corhanwarrabul Creek, Dandenong Creek

Total cost: \$85,319

Project partners: LINPAC Rotational Mouldings, Rowville Community Centre, City of Knox

The Rowville Community Centre aims to demonstrate environmentally sustainable design to developers and the Knox community.

The VSAP component of this project highlighted best-practice stormwater management in action, and showed how stormwater can be a valuable resource. It also gave Knox Council the opportunity to put its new WSUD Implementation Guidelines into practice.

Structural works on the project included infiltration trenches in the new car park, an underground storage pit for on-site detention, and porous pavements. The filtration removes pollutants including phosphorus, nitrogen and heavy metals to improve the quality of stormwater before it is discharged from the site. The construction phase incorporated



best-practice site management for sediment and litter control. Three 25,000-litre rainwater tanks harvest run-off from hall roofs to store water for flushing 16 toilets, reducing the annual off-site run-off by about one million litres.

Harvesting stormwater from rooftops, Melbourne CBD

Location: Melbourne CBD

Project cost: \$118,500

Project partners: City of Melbourne and RMIT

The project aimed to establish an innovative water harvesting system on a high-rise building at RMIT University. Not only



did this improve the building, but it has become a working demonstration of stormwater reuse principles in action.

The project team investigated the logistics of installing the infrastructure into the Tivoli building to capture stormwater, direct it to a basement storage tank and pump it up to the rooftop for a water feature and header tanks for flushing toilets. The University brought a wide spectrum of academics and students into the project, who designed and commissioned the system.

Students undertook the landscape design concepts for the rooftop water feature and general amenity area for students. The final design included native plants to be watered with water captured from the roof.

Stormwater self-management system

Project agency: City of Greater Shepparton

Project cost: \$71,900

This project developed an interactive database to help local government staff ensure that their practices and activities meet stormwater best practice. The software was trialled in workshops with staff from specific council sectors and refined before public release.

The software sets up a checklist for managing data and is designed to prompt for information from all relevant departments within a local council. The software is now in use by Shepparton Council and a number of other Victorian municipalities.

Case Study: Non-structural best management practices

Total cost: \$100,000

Project partners: Co-operative Research Centre for Catchment Hydrology (CRCCH), EPA

This team carried out research into non-structural best management practices (BMPs) for improving urban stormwater quality – that is, town planning controls, strategic planning and institutional controls, pollution-prevention procedures, regulations and community education programs.

The four published reports give local governments a wealth of stormwater management information based on experiences in Australia and overseas. The reports contain funding profiles from projects by leading authorities for use as benchmarks, and a shortlist of the non-structural BMPs deemed to be the most effective, efficient, practical and acceptable, with potential for future use.

The reports include Australian and overseas evaluations on the

effectiveness, efficiency and practicality of 41 non-structural BMPs, and offer a new framework for analysing non-structural BMPs that aim to improve urban stormwater quality.

These publications were disseminated to councils across Victoria as part of the Clearwater workshops which provided technical training about using these guidelines.



Case Study: Water Sensitive Urban Design Technical Manual

Project cost: \$250,000

Project agency: Melbourne Water

The manual produced by this project has become the most-used reference for techniques, examples and engineering drawings for creating water sensitive urban design elements. It has detailed design methods for use by developers, local government, consultants and other relevant authorities.

The WSUD Manual covers a wide range of topics, including hydrology, hydraulics, maintenance and construction. It also contains practical checklists and case studies.

Two groups oversaw the Manual's preparation: a group representing users – local government, industry, Melbourne Water and EPA – and a technical review group of experts. The project also reviewed techniques being used across Australia and overseas.

The level of detail in this seminal work provided the know-how to underpin a broad gamut of projects under VSAP funding. It gave councils and agencies confidence in applying WSUD principles to their projects and continues to provide the bedrock for those striving to overhaul stormwater management practices.

Case Study: Stormwater reuse project, Bayside settlements

Location: Bayside settlements

Waterways affected: Port Phillip Bay

Total cost: \$250,000

Project partners: City of Greater Geelong, CSIRO Urban Water, Indented Head Community Association, Corrangamite Catchment Authority, Barwon Water, Indented Heads Drainage Working Group, Steering Committee of the Stormwater Reuse Project

This pioneering study investigated ways to treat and reuse stormwater as an alternative to discharging run-off into Port Phillip Bay, as part of total water cycle management.



This was the first study to establish the technical principles for stormwater reuse – until then, no-one had developed or applied the principles of initial-flow diversion and treatment to drainage system discharges.

It then applied the principles to a pilot project in the beachside settlement of Indented Head, with ambitions to extend the project across the municipality, regionally and nationally.

The team also assessed the stormwater management alternatives in terms of infrastructure life-cycle costs, water quantity and quality,

social acceptance, externalities, total resource costs and current regulations.



Cremorne Street upgrade, Richmond

Location: Inner Melbourne
Waterways affected: lower reaches of Yarra River
Total cost: \$385,000
Total catchment size: 12,000 m² of road and carparks
Project agency: Yarra City Council
Cremorne Street runs through one of the oldest subdivisions in Richmond, serving small offices and industries, showrooms, and a TAFE College. Piped stormwater from this narrow street runs straight into the Yarra River.

With a number of large redevelopments planned and Cremorne Street scheduled for an infrastructure upgrade, Yarra Council was able to test and demonstrate WSUD principles in existing high-density areas.

This project was the first of its kind in Victoria for a constrained inner-city environment. The streetscape was rebuilt with new roads, drains and footpaths, lights and landscaping. Long kerb extensions were created as mini linear wetlands, planted with more than three thousand wetland plants and thirty street trees. These form a bio-retention system which waters the street trees,



slows and filters run-off, and traps sediments and pollutants. These principles are now part of Council's development applications process. Council is continuing to work with local businesses and residents to reduce run-off from their sites. The system is treating ninety per cent of daily run-off and over the next two decades will substantially reduce sediments and pollution entering the Yarra.

Wells Road reconstruction, Patterson Gardens

Wells Road reconstruction
Location: Outer suburban Melbourne
Waterways affected: Patterson River, running into Port Phillip Bay
Total cost: \$2.5 million
Total catchment size: 10 hectares
Other size indicators: 67 abutting residences and a number of commercial properties.
Project agency: Kingston City Council

This project demonstrates how the construction of main roads, their easements and verges can filter and treat road run-off, thereby reducing pollution in local waterways.

The new roadside swales and bio-retention inlets along Wells Road combine vegetation and gravel filters to remove sediment, litter, nutrients, petroleum products and heavy metals from the road's run-off.

Kingston Council disseminates technical information about this project by conducting seminars and field days, and in journals, newsletters and on the internet. The project gave Kingston the impetus to embed WSUD practices throughout its municipal management.



Local communities were consulted during the design process and public understanding of stormwater quality issues has increased. The Council worked specifically with small business operators to improve on-site stormwater management.

The project has reduced the cost of drain flushing, increased biodiversity and improved local amenity. It is expected to be effective for the next two to three decades.

Unsealed roads, south-east Melbourne

Total cost: \$150,000
Project partners: City of Casey, Cardinia Shire Council, Mornington Peninsula Shire Council.



An unsealed road can produce 100 times more sediment in run-off than a sealed road, releasing typically fine sediments which take a long time to settle, are carried long distances and 'muddy' waterway environments. This reduces light to plants, smothers aquatic life and clogs fish gills.

After extensive field trials, the project created a CD-ROM, an instructional handbook and a best-practice field guide for Council staff. Rather than focusing on road surfacing techniques, these explain more effective methods, such as improving roadside drainage structures and treating drainage water before it flows into waterways, giving priority to high-risks sites such as the sections of road near stream crossings.

Canadian Creek, Ballarat

Location: City of Ballarat

Waterways affected: Canadian Creek flows into the Yarrowee River, tributary of the Barwon River

Catchment size: 1384 ha

Project cost: \$2,835,902

Estimated benefits: 50+ years

Project partners: RoadCon Developments, Corangamite Catchment Management Authority, Department of Natural Resources and Environment, and City of Ballarat

Canadian Creek, on the fringes of urban Ballarat, suffered from poor quality water, flow-induced erosion and flooding problems. With housing estates planned for its catchment, the increased impermeability would have significant ramifications for the waterway.

Developers and agencies in the region were uncertain about WSUD principles, how to apply them or whether they would be relevant to local situations.

This project is a pioneer in the region, demonstrating how WSUD principles can create sustainable urban communities without increasing the impact of stormwater on local waterways.

Along most streets in the estate, swale bio-retention systems filter and treat about 80 per cent of the stormwater. This layout prevents litter being washed into the waterway – instead it

remains in the landscaped swales, a highly visible reminder to residents.

A few small residential areas drain directly to a grass buffer or the new wetland, where stormwater is slowed and treated before it reaches Canadian Creek. A flow-control basin was also constructed along the creek to trap sediments.

Pollutant loads are expected to reduce by 55–96 per cent (depending on pollutant), which will greatly improve habitats in and along the creek and create passive recreation opportunities.

The added bonus is that the project's WSUD guidelines have begun a process of continuing education for developers and now form the basis of all development approvals in the region.



Kialla Lakes, Shepparton

Location: Shepparton, country Victoria

Waterways affected: Goulburn, Broken and Murray rivers

Catchment size: 737 hectares

Project cost: \$1,140,000

Project Partners: City of Greater Shepparton, Goulburn Broken Catchment Management Authority, Kavant Nominees (developers), Fisher Stewart (consultants).

The Goulburn is one of Victoria's designated 'heritage rivers', supporting native fish and platypus. It is also a favourite recreation destination and the source of Shepparton's domestic and industrial water.



The construction of new housing estates in Kialla Lakes could potentially release 1225 tonnes of sediments each year into the Broken, Goulburn and Murray rivers. This area also generates run-off from residential, commercial and industrial lands, which flows through the drainage system untreated before running into the rivers.

The team embarked on three pilot projects to demonstrate new concepts in stormwater management to residents, other agencies and industry groups in the region. These projects focused on reducing stormwater sediment and pollutant loads by 80 per cent using WSUD principles.

The first project constructed two wetlands below the Broken River drainage pipe outfall, diverting run-off from urban, industrial and agricultural areas. Stormwater is treated by capturing and retaining nutrients, sediments and gross pollutants.

The aim of the second project was to include a wetland and other WSUD features in the new Kialla residential area to minimise the volume of pollutants leaving the estate.

The third pilot project involved developing and publicising best practices to reduce sediments being washed off construction sites. Council amended its planning and building permits to include erosion-control measures.

Each project incorporated an extensive and continuing program to encourage industry and public involvement in managing stormwater.

Case study Association of Bayside Municipalities toolkit

Waterways affected: Port Phillip Bay

Project cost: \$130,000

The ABM monitors trends and projections for further bayside development from the perspective of its impact on the Bay, and tries to balance the often competing pressures for urban development, protection of the environment and management of urban water resources.

This project produced a WSUD toolkit which contains a range of options that can be applied to a variety of sites and development proposals. The kit is scalable to suit local areas, precincts and regions.

It is essentially a software package planners can use when assessing development applications for their implications on stormwater quality and compliance with regulations. The toolkit is now used by all bayside councils and many other municipalities.



Case study Councils and building industry partnership, suburban Melbourne

Project location: Suburban Melbourne

Waterways affected: All State rivers and creeks

Total cost: \$290,000

Project partners: Cities of Casey, Hume, Kingston, Melbourne, Moonee Valley and Moreland; Housing Industry Association; Master Builders Association; Building Commission; Melbourne Water; Municipal Association of Victoria

On a typical building site, the quality of stormwater is at great risk – from the storage of litter on site; from soil-laden water running off site into gutters; from mud deposited on roads by construction vehicles; from equipment washing that discharges concrete, paint and chemical residues into

the stormwater system; and from piles of sand, soil and screenings delivered close to the front of sites, where they are easily washed into the gutters.

On an entire building estate, the magnitude of these problems increases significantly.

This project set up a pilot program in each municipality to improve building and construction practices in relation to stormwater pollution. The pilot comprised an information and enforcement program closely monitored to evaluate which, if any, of these measures had been successful.

After an audit of existing conditions, practical guidelines for reducing the movement of sediment and litter from

building sites were distributed over four months in information sessions at council offices, by project staff on site visits and through council building permit processes. A follow-up audit assessed the change in building site conditions.

In the next month, project staff enforced existing local and State laws and then a final audit was conducted.

The results showed that information and advice alone made very little difference to building site conditions. Significant improvements took place only after the period of enforcement.

Accordingly, the project developed a model local law linked to a code of practice and a set of practice notes for the building industry to clarify the approach to stormwater management. These are now applied throughout the partner municipalities.



Merri Creek Industrial Stormwater Protection Project, outer northern Melbourne

Location: Outer Melbourne

Waterways affected: Merri Creek, Yarra River

Catchment size: more than 400 businesses

Total cost: \$136,840

Project partners: Hume City Council, Melbourne Water, Merri Creek Management Committee, Ford Motor Company Australia and local businesses

Stormwater run-off from industrial areas in Broadmeadows and Campbellfield discharges directly into the middle Merri Creek. Along with illegally dumped items, studies found high levels of zinc, lead, copper, cadmium and chromium in the creek water, which Hume City Council traced to poor waste management practices in the industrial areas.



The main aim of this project was to increase awareness of stormwater pollution and to change practices in small to medium industries, such as autoshops, cabinet makers, warehouses, wrecking yards and the like. The project modified education materials developed by other metropolitan councils for specific industries and created materials for those not covered.

Council worked with businesses to undertake audits and develop stormwater management plans, good practice guidelines and stormwater induction kits. It set up a 'business buddy' system by inviting larger local businesses to support smaller companies with expertise.

The guidelines have now become a model for other industrial subdivisions in the City of Hume and across the State.

Moonee Ponds Creek Litter Initiative, inner Melbourne

Location: Inner Melbourne

Waterways affected: Moonee Ponds Creek, Yarra River

Total cost: \$2,012,459

Project partners: Cities of Melbourne, Moreland, Moonee Valley and Hume, EcoRecycle Victoria, Docklands Authority, Ports Corporation, EPA Victoria, Regional Waste Management Groups, Moonee Ponds Creek Coordinating Committee, Clean-up Australia, CRC for Catchment Hydrology

The Moonee Ponds Creek flows 30 kilometres through four metropolitan municipalities. Each council acknowledged that managing its catchment meant doing more than simply tackling litter at a structural level. Under this project, they brought together government agencies, community groups, schools and industry bodies across a whole catchment.

The partners invested more than \$2.3 million in structural components of the project such as sediment ponds, a regional

wetland and local at-source, regional and floating litter traps. It also embarked on non-structural programs such as litter awareness for schools, residents, business and industry; litter enforcement; and clean-up 'events'.

This project has shown local councils how to implement their SWMPs by combining low-cost source controls with new infrastructure.



Kingston Industrial Areas Project

Total cost: \$154,000

Project agency: Kingston City Council

The City of Kingston stretches 13 kilometres along the east coast of Port Philip Bay, housing about 125,000 people, and contains potential Ramsar wetlands and sensitive remnant vegetation. Mordialloc Creek flows through Kingston into the Bay. In its hinterland, Kingston supports one of Melbourne's largest industrial areas.



As well as developing best-practice guidelines to control pollution at source, Council undertook a number of precinct-planning projects to look at structural issues in detail. The project focused attention on some industrial sectors, such as automotive services, chemical works, mobile businesses and automotive parts suppliers, encompassing more than 2000 of Kingston's industrial businesses.

Malvern Golf course

Waterways affected: Gardiners Creek, Yarra River

Catchment: Includes Chadstone shopping centre, a suburban residential area, Monash Freeway and Princes Highway

Project agency: City of Stonnington

Untreated stormwater was running into Gardiners Creek. The nearby small wetland had stagnated without an outlet and was only functional during big storms.

This project aimed to undertake a feasibility study for treatment of stormwater pollutants before they entered Gardiners Creek.

The Council intends to construct a stormwater treatment chain starting with a gross pollutant trap and sediment basins, flowing into a vegetated swale and wetland ponds at East Malvern Golf Course, and then discharging into Gardiners Creek.

The long-term expectations are to halve nitrogen and phosphorus levels discharged to Gardiners Creek and reduce suspended solids by 80 per cent. The project is expected to reduce maintenance costs and diversify the recreational opportunities on the golf course.

Yarra and Banyule open spaces

Location: Suburban Melbourne

Waterways affected: Merri Creek, Plenty River, Yarra River

Project cost: \$40,000

Project agencies: Cities of Yarra and Banyule

Both councils have extensive open spaces with riverside frontages. Often fertilisers and herbicides are used in these areas, especially on the golf courses.

The two councils undertook an audit of their golf courses, playing fields and unirrigated open spaces to produce a detailed picture of the factors involved in managing and treating stormwater draining into nearby waterways.

It looked at four aspects of open space management: herbicide, pesticide and fertiliser application; the issue of dog faeces; opportunities for incorporating WSUD principles and reusing water run-off; and the use of surfactants to improve soil-wetting ability and reduce evaporation.

The project made extensive recommendations for future planning, works and maintenance control throughout these parklands, and the councils will eventually extend these processes to managing all parks in their municipalities.

Domestic wastewater management

Throughout rural Victoria about 240,000 households use on-site domestic wastewater systems. However, in some areas, these do not adequately treat and contain contaminated water. Many councils and communities were unaware of their management options.

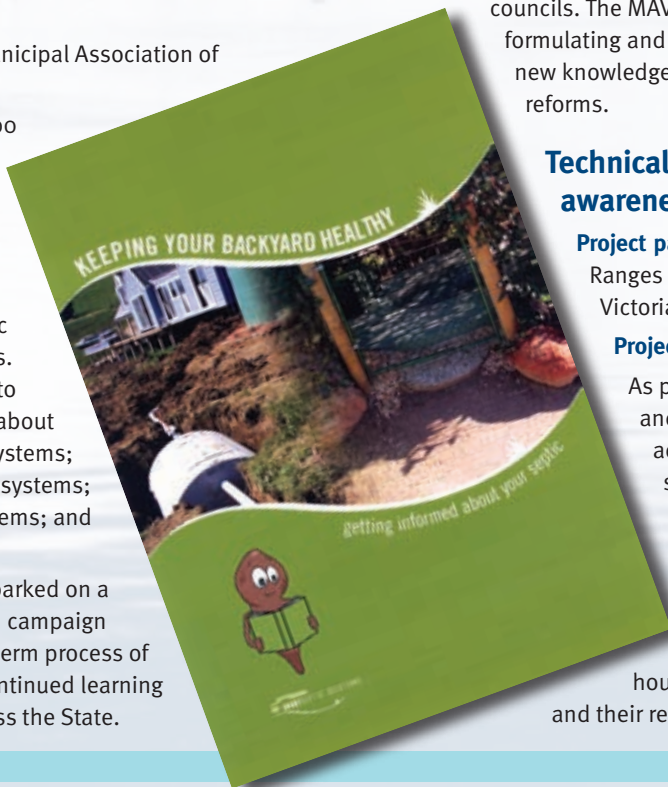
Innovative solutions to domestic wastewater management

Project agencies: Municipal Association of Victoria, Clearwater

Project cost: \$154,000

This Smart Septics project documented a wide range of innovative management solutions to domestic wastewater problems. It specifically aimed to provide information about site choice for new systems; maintaining existing systems; rectifying failing systems; and risk management.

The project then embarked on a state-wide education campaign which set up a long-term process of collaboration and continued learning for council staff across the State.



Domestic wastewater management plans

Project agency: Municipal Association of Victoria

Project cost: \$100,000

This project devised a model framework for councils to use as a basis for developing plans for managing on-site domestic wastewater in their region. It trialled the model with five local councils. The MAV was able to assess strategic issues in formulating and implementing these plans, and fed this new knowledge into the State Government's legislative reforms.

Technical database and community awareness

Project partners: Manningham, Casey and Yarra Ranges councils, and the Municipal Association of Victoria

Project cost: \$374,000

As part of Smart Septics, this project developed and refined a database for maintaining accurate information about wastewater systems within a municipality. This system helps councils to identify risk 'hotspots' and provides the State Government with information for development.

To reduce the number of failing systems, the project educated householders about domestic wastewater and their responsibilities and management options.

Case study Alpine areas guidelines, Victorian Alps

Location: Victorian Alps

Waterways affected: Headwaters of Ovens, Kiewa, Delatite, Jamieson, Howqua and La Trobe rivers

Total cost: \$569,800

Project agency/partners: Resort management agencies for Mt Hotham, Falls Creek, Mt Buller, Mt Baw Baw and Lake Mountain

Victoria's five alpine resorts attract visitors all year round. As the population peaks in winter, the resorts experience all the stormwater issues of urban areas – increasing impermeable ground, heavy vehicle and foot traffic, and never-ending construction.

The Alps, however, have the added complications of steep slopes and snowmelt. The ensuing erosion and sedimentation are the main threats to the region's largely pristine waterways and fragile alpine and sub-alpine flora and fauna communities.

This project had two aims: to develop run-off management practices for a range of urban alpine situations and set WSUD alpine guidelines for use by Parks Victoria, the Alpine Resorts Commission, Department of Sustainability and Environment, catchment management authorities and developers.

The main priority was to reduce the volume of dirty snowmelt flowing into local waterways. This had repercussions for the many stages of managing snow throughout the alpine urban areas, targeting all kinds of infrastructure and practice.

For example, it required stabilising of open drains and culverts, eliminating sediment run-off and weed dispersal from building sites, changing the way ski fields are maintained, reducing pollutants from vehicle and pedestrian areas, rethinking how roads are cleared and redesigning building drip lines.

The project trialled a number of stormwater management techniques at the five resorts, targeting the following:

- trafficable areas (Mt Hotham)
- pedestrian areas (Falls Creek)
- snow shed from structures (Mt Buller)
- site management during construction (Lake Mountain)
- snow clearing and snow management (Mt Baw Baw)
- shed snow and snowmelt management for structures (Mt Buller).

The resulting *WSUD Guidelines for Development in Alpine Environments* are being explained through extensive communication with councils, government agencies, builders, architects, professional bodies and current siteholders.

The guidelines will be implemented through planning permits.

Increased focus, cooperation and communication between the five resorts should allow improved practices to develop more quickly. The project's influence has already extended to include downstream local governments who are now undertaking complementary works. These are massive steps in safeguarding habitats and water quality of rivers flowing out of the Alps.



Gippsland Study

Location: Coastal settlements from Western Port to Anderson Inlet

Waterways affected: Western Port, Bass Strait

Total cost: \$216,000

Project partners: Inverloch Residents and Ratepayers Association, South Gippsland Conservation Society, Kulin Nation and South Gippsland Shire

To significantly improve stormwater management across a region is no small feat, especially in coastal holiday areas where there is a hunger for urban development near waterways. The spread of impervious urban surfaces that pollutes stormwater with nutrients, litter, oils, surfactants



and sediments threatens the very environmental qualities that make beaches attractive places to visit.

Bass Coast took a three-pronged approach to improving the management of urban stormwater: infrastructure works, community education, and cultural and regulatory change in the council itself.

The infrastructure projects included gross pollutant traps in seaside areas of Cowes, Inverloch and San Remo. The Council also worked with local community groups to complete the Ayr Creek wetland as part of reinstating a natural creek. It investigated using WSUD principles for long-term planning in coastal townships and assessed the extent of septic tank leakage.

In partnership with South Gippsland Shire, Bass employed an education officer to run continuing campaigns targeting schools, businesses, tourists and residents. This is part of a collaborative network of education officers throughout Gippsland. The education campaign ran workshops and seminars for industry groups and developed Water Sensitive Accreditation for the construction industry.

To reinforce this change of culture, Bass Coast Council published *Urban Stormwater Best Practice Management Guidelines* and is in the process of amending its Planning Scheme. It has also gone a step further by producing technical guidelines for council staff and training all staff in stormwater issues.

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Central Victoria

Structural works and operational procedures

Waterways affected: Lake Victoria, local creeks in Carisbrook, central Victoria

Project cost: \$47,000

Project agency: Central Goldfields Council

Lake Victoria has State heritage listing and is known particularly for its populations of threatened freshwater catfish. It also provides habitat for a number of species of tortoises, turtles and native fish. The lake has suffered greatly during recent droughts and Council took the opportunity to clean and remodel it to improve water quality into the future.

The council also diverted stormwater into the lake to provide a more stable water supply. This water will first be treated in a new wetland before draining into the lake proper.

VSAP funding provided for litter traps and the development of Council contracts and operational procedures to meet best-practice standards for sediment and litter control.

The funding also provided for assessment of the condition of, and making possible improvements to, the water treatment capacity of wide shoulders along open drains and creeks which act as stormwater drains in Carisbrook.



Regional stormwater education program

Project cost: \$283,000

Project agencies: Central Goldfields and Mt Alexander, Pyrenees, Buloke, Campaspe and Loddon shire councils, Swan Hill Rural and Greater Bendigo city councils, and North Central Catchment Management Authority

Through VSAP funding, the councils joined forces to employ a team of facilitators to plan and deliver community stormwater education programs across the region. The facilitators worked closely with schools, businesses and industry to develop and monitor site-specific plans to improve stormwater management. They also coordinated the implementation of each shire's stormwater management plans.

North-East Victoria

Waterways affected: Wodonga and House creeks, Murray River

Catchment: Wodonga's CBD, plus proposed commercial extension

Project cost: \$165,000

Project partners: City of Wodonga, North East Catchment Management Authority

The master plan for Sumsion Gardens aimed to make it one of regional Australia's most significant parks and community recreation areas, with picnic and barbecue areas, an amphitheatre, café and boardwalk.



However, there was no pre-treatment of stormwater carrying nutrients and sediments into the Gardens' lake, causing outbreaks of algal bloom. This lake is a significant local feature and water flows from it into Wodonga Creek (from which Wodonga draws its water supply) and then the Murray River. The nearby House Creek similarly channelled untreated stormwater into the Murray.

The VSAP project constructed water treatment ponds and wetlands on the main stormwater outfalls from the CBD before they discharged into the lake. Trash racks at the inlet structure alleviated 80 per cent of the litter problem from the CBD.

Further upstream, a separate VSAP project created the Les Stone Wetland to filter stormwater before it enters House Creek, a tributary of the Murray.

These wetlands created new breeding and feeding areas for local water birds and aquatic species and have also become an environmental education resource for the city's schools. The filtering systems have greatly improved the health of downstream waterways – particularly significant, given that the downstream Murray River is a source of drinking water for many large settlements.

Both projects became the focus for educating the community about our effect on waterways. They included a WaterWatch program, promotion of better practices to local businesses and training council staff and contractors about wetland maintenance, plants and weeds.

North-West Victoria

Waterways affected: Lake Ranfurly, Murray River

Project cost: \$809,480

Project agency: Mildura Rural City Council

Tourism brings great economic benefits to this region.

The Murray River and its surrounding wetlands attract visitors keen on passive recreation – such as bird watching, picnicking and walking – as well as those eager for more strenuous water activities. In contrast, many households and businesses rely on the Murray for water every day.

This VSAP project had two parts: funding structural works and employing a Stormwater Management Officer.

The works component installed four gross pollutant traps to protect the integrity of downstream waters. Three of these traps guard stormwater outlets into Rifle Butts Swamp, which eventually flows in to Lake Ranfurly. The combination of greater community awareness and structural traps is reducing pollutants flowing into the drains, reducing odours and improving the area's ecological health.

These improvements open up the area for recreation as well as building an important social link between an older established area and a new residential estate.

The community education program included publishing *Stormwater Management Plan Specifications for Developers*,

Engineers and Builders to prevent any unnecessary discharge into council drains that would affect infrastructure downstream. These detailed specifications work hand-in-hand with planning conditions involving sediment and industrial litter control.

These controls are complemented by training sessions with developers and council employees to build awareness of the new approach to stormwater management.

The education program also extends to schools, specific industry groups and retail outlets.



Education projects

Most VSAP-funded projects had an educational component as an adjunct to their main aim. Some projects, however, were primarily educational. The few highlighted here show the diversity of the materials developed.

The Active Catchment Education (ACE) model

Partners: Metropolitan West Waste, CityWide, Melbourne Water

Total cost: \$170,500

The project partners built a model landscape of a river's catchment and the urban environments within it – sportsground, school, residential area, industrial estate, farms, construction site, wetlands, park and shopping centre – to show the impact different activities can have on a stormwater drainage system.

The staff demonstrator sprays 'rain' over a particular area so observers can see this flowing through drains into the waterway. The demonstrator then places 'common pollutants' on the model and turns the rain on again so people can see the effect on the river. Ways to prevent stormwater pollution are also explained.



The solar-powered model is housed in a custom-built trailer with tailored resource packs for schools, industry, councils and the wider community.

This widely used resource is in constant demand for demonstrations to council staff, shoppers and traders, industry groups, water and catchment management groups, community environment organisations and local media.

Stormwater showcase at Scienceworks

Project agency: Museum Victoria, Scienceworks

Total cost: \$187,500

Scienceworks developed The Muck Bunker Stormwater Experience, a major, long-term, interactive installation. Museum visitors try to stop Max Muck taking over the world as he uses cigarette butts, dog poo, paint and all kinds of rubbish to pollute our waterways. It aims to educate Scienceworks visitors about stormwater pollution through fun and interactive exhibits.



A number of complementary materials were developed, including a postcard, an education show, a CD-ROM with teacher resources, a quiz and online links. The exhibition has been promoted on television, radio and the internet, and in newspapers and journals.

Stormwater Education Primary Reader series

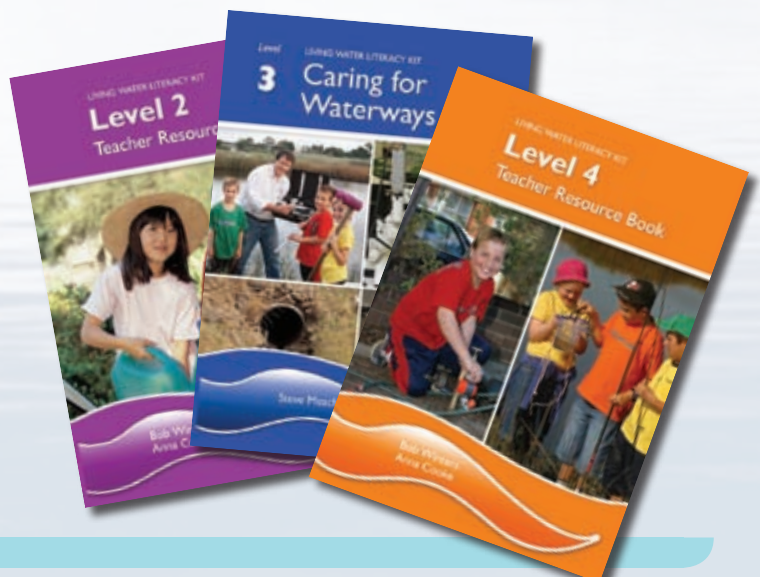
Project agency: Gould League Victoria

Project cost: \$275,200

Topic-based teacher resource kits often do not reach their ultimate target audience – schoolchildren. On the other hand, classroom 'readers' are used continually throughout the school year in class and at home. Usually these are fiction stories – there is a general shortage of Australian non-fiction readers.

The Gould League devised a series of about twenty readers and activity books for children from Prep grades to Year Six, with language and topics appropriate to each age level. They use real-life activities and situations to explain the issues surrounding stormwater. The topics covered fit into many themes explored in science, society and environment studies in schools.

The series was developed through extensive consultation with education and technical specialists and is now used in nearly half of Victoria's primary schools.



CERES projects, suburban Melbourne

Location: Inner Melbourne

Waterways affected: Merri Creek

Total cost: \$289,380

Project partners: Department of Innovation, Industry and Regional Development, CSIRO, EPA, Yarra Valley Water, Centre for Design RMIT

CERES is at the forefront of research into environmental strategies and works with specialist organisations, government agencies and research institutions.

Its Community Environment Park in Brunswick is also a 'theme park' demonstrating innovative environmental solutions for use in daily urban life. Open each day, it hosts more than 100,000 visitors and 60,000 school students annually.

The Park sits on a steep slope, directly between intense urban development and Merri Creek. Stormwater flows in from nearby roads, car parks and building sites, presenting some of the more difficult WSUD challenges.

As part of its water management innovations, CERES set out to reduce run-off and improve the quality of water that enters Merri Creek from the site. With VSAP funding CERES extended the education aspects of this work to enable the public to see and understand a stormwater retention system in action.

The demonstration systems include a house and garden showing rainwater and stormwater collection and reticulation; stormwater reuse methods for urban agriculture and open space; and treatment systems for sediment and other pollutants from neighbourhood roads and a 40-space car park.

In 2004, CERES won the State 'savewater' award in the Community Groups category for outstanding achievement in water conservation.



Now, in most storms, there is no stormwater discharge from the demonstration house area, and the entire CERES site collects about 300,000 litres of treated wastewater and 400,000 litres of stormwater each year. It has reduced its annual potable water use by more than 50 per cent, a massive reduction from 8.46 to 4.10 megalitres.

However, the biggest impact of the project will come from the increasing awareness of best-practice stormwater management for industry, local government, visitors and students.



CERES now hosts 10,000 visitors a year whose focus is on stormwater and water conservation. Practitioners have participated in CERES stormwater workshops, tours and networking meetings each year. The project has featured in conference papers, journal articles and exhibitions. CERES is also involved in the Greater Geelong stormwater education project and has been commissioned by Yarra Valley Water to deliver water education programs in schools.



On-site demonstrations have led to commissions to install systems off site. Increasing numbers of schools in Geelong and Melbourne are installing tailored stormwater programs and features as a direct result of attending CERES programs.

Unsurprisingly, CERES has won more funds to expand this successful project even further.

Truganina Park wetland redevelopment, Altona

Location: Melbourne (western suburbs)

Waterways affected: Port Phillip Bay

Total cost: \$442,000

Project area: 300 hectares

Project agencies: Hobsons Bay City Council, with Nestlé, DOW, Toyota, Friends of Westona Wetlands, Truganina Explosive Reserve Preservations Society, Port Phillip and Western Port CMA, Parks Victoria, Melbourne Water, City West Water, Koorringal Golf Course, the Department of Transport and Regional Services, and CoastAction (DSE)

Altona tip operated as a non-putrescible landfill until 1998 on a site between a residential area, the Ramsar-listed Cheetham Wetlands and Port Phillip Bay. Its northern boundary was a concrete-lined open channel carrying stormwater into the Bay. In 1999 Hobsons Bay City Council was issued with a pollution abatement notice by EPA, requiring rehabilitation of the site.



The Council, local residents and businesses embarked on a project to 'recycle' the tip. The result is Truganina Park, which extends the neighbouring regionally significant coastal parklands.

The concrete stormwater drain was remodelled into a three-pond filtration wetland to treat water before it flows into Port Phillip Bay. A gross pollutant trap protects the wetland.

A staircase made from the tip site's basalt climbs a 17-metre-high mound which has views of the coastal parklands, the City and Port Phillip Heads. A smaller wetland receives run-off from the mound and surrounding parkland to minimise leachate off site.



Specially selected indigenous plants provide habitat for the

endangered Altona Skipper Butterfly.

In 2006, the project won the LGPro Award for Excellence (Community Partnership Initiative).

Docklands, Central Melbourne

Location: Central Melbourne

Waterways affected: Yarra River, near its mouth

Project cost: \$860,275

Catchment size: 10 ha impervious area (includes Central Pier, Grand Plaza and Harbour Esplanade)

Project agency: Docklands Authority

This new waterside suburb being created in downtown Melbourne will house 20,000 people by the year 2015. It is clear that the run-off from any development alongside Melbourne's docks could not be added to the already stressed waterways. This project aims to collect, treat and reuse all the run-off from 10 ha of the suburb and demonstrate the use of WSUD principles in planning for medium/high residential and commercial developments.

WSUD principles were applied from the outset to plan and construct this part of Docklands. Stormwater flowing off impervious surfaces is treated in

roadside or forecourt bio-retention systems. Then it drains through one of three treatment wetlands in Docklands Park into a nearby water storage. Given average rains, this water will be enough to irrigate the park all year.

The project's bio-retention gardens are small landscape beds within Docklands Park which filter run-off from the pavements of Harbour Esplanade. Water is diverted onto the gardens and then percolates through special tree planting media to a drainage layer. From there it flows either directly to the Yarra River or to a water storage.

Challenges included maintaining a trafficable surface through the gardens for pedestrians and maintenance vehicles, and providing enough soil depth to ensure tree stability and root health, given the water required by each species.

In years to come, visitors strolling around the area will be unaware of the complex water management structures underfoot.



Location: Statewide

Total cost: \$790,000

Project partners: Municipal Association of Victoria, Stormwater Industry Association of Victoria, Melbourne Water, EPA.

The recent drought has forced Victorians to change their expectations of water availability and use. The ensuing State Government policy, 'Securing our Water Future', formalised a paradigm shift that had been long anticipated, but prompted concern about the capacity of local councils to implement this new direction.

Industry and agencies had no coordinated approach to water management and there was a perception little was happening. In reality, numerous stormwater management projects were being developed in isolation across the State.

The Clearwater project was conceived to infuse a new stormwater management paradigm throughout all 79 Victorian councils, 191 industry organisations, water authorities, State government and non-government organisations, interstate and international organisations, research institutions and universities across a wide range of disciplines.

Clearwater believes coordination is essential for consistent performance from regulators and for building industry cooperation. It found research information was not being disseminated and practitioners needed working examples of proven treatments, associated risks, costs and timeframes.

The Clearwater project aimed to build networks while providing training and technical resources. It began by selecting existing projects to use as demonstration sites to build a self-sustaining learning network, including 17 council wetland projects under way and the little-known WSUD

guidelines, *Sustainable Neighbourhood Code* and *Water Safety Guidelines*.

Over two years, Clearwater quickly became a recognised as a central authority on stormwater management best practice, embarking on a series of roadshows, forums, workshops, seminars, swapmeets and regional training days. Its bus tours took local council staff, builders and developers to demonstration sites around the State.

Training evolved from specific technical concepts to more complex integrated practices, in response to the growing knowledge of participants. More than 2000 participants improved their skills and knowledge in best-practice urban water management. Links and understanding were forged between sectors and industry support was built for new performance standards for stormwater in urban development.

Clearwater's website, www.clearwater.asn.au, developed a reputation as the main repository of information, averaging more than 2000 visits each month. The site is an information exchange, communicating research findings and disseminating available resources.

The Clearwater program was a finalist in the category of Environmental Leadership Education and Training at the prestigious national Banksia Awards in 2005 for being instrumental in a significant shift in thinking at State and local levels.

Clearwater today offers a suite of integrated urban water management programs and has become a model for capacity-building across Australia. Future projects include devising an urban water management course and establishing a Leadership program.

The future of stormwater management

While the preceding case studies demonstrate the breadth of vision and innovation shown by local government and others in implementing the Victorian Stormwater Action Program, there is still much to be done to ensure that the management of stormwater becomes an integral part of sustainable urban water management.

Participation by councils and other organisations in VSAP has led to:

- increased awareness of stormwater as a resource and of water sensitive urban design
- increased knowledge and experience in addressing stormwater quality and harvesting issues
- development of new tools and technologies to deliver sustainable stormwater management.

The products and outputs from VSAP also complement the Government's commitment to delivering significant improvements in the health of our waterways and bays and increasing water conservation and reuse.

Over the course of the program, VSAP has successfully marshalled around \$50 million to develop 273 stormwater management projects across Victoria. These projects have made a significant contribution to reducing the impact of urban stormwater on water environments – a key objective of Victoria's *State Environment Protection Policy (Waters of Victoria)*.

The key now is to build on what has been achieved through VSAP and to progress its objectives through the Government's more recent initiatives, such as *Securing Our Water Future Together*, *Melbourne 2030*, the *Victoria Planning Provisions – Sustainable Neighbourhoods*, and the *Yarra River Action Plan*.



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