

# Port Phillip Bay Environmental Management Plan

Bay Actions Report 2002–2003



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**This report should be read in conjunction with the Port Phillip Bay Environmental Management Plan (EMP). It is a key element of the EMP's performance reporting framework.**

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8 Nicholson Street, East Melbourne.

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For more information contact:

Marine Strategy Section  
Land Stewardship and Biodiversity  
Department of Sustainability and Environment  
14/8 Nicholson Street  
East Melbourne Victoria 3002  
Ph. (03) 9637 8199  
Fax: (03) 9637 8117  
[www.dse.vic.gov.au](http://www.dse.vic.gov.au)  
Or the DSE Customer Service Centre 136 186

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# Preface

This Bay Actions Report (BAR) is the second annual performance report for the Port Phillip Bay Environmental Management Plan (EMP). The report is a key element of the EMP's framework for reporting on progress - with delivery of the EMP programs' tasks and, in the longer term, with achievement of the EMP programs' objectives for mitigating two key risks to the Bay's environment: *nutrients and marine pests*.

The BAR for 2002-03, as for 2001-02, provides a progress report on all the tasks in the EMP nutrient and marine pest programs. The EMP envisaged that the BAR reports would only focus on the EMP tasks relating to *the Bay itself, or to activities or inputs that either affect or enter the Bay directly or are transmitted to the Bay via the oceans*. It complements the following two reporting systems:

**The Port Phillip and Westernport Catchment Management Authority's (CMA) Annual Report** - for tasks relating to Bay inputs from the catchment *transmitted to the Bay via the catchment waterways and drains*.

- While the CMA's report provides a summary, a more detailed account is considered useful and is included in this year's BAR.

**The Port Phillip Air Quality Improvement Plan (AQIP) Reporting System** - for tasks relating to Bay inputs from the catchment *transmitted to the Bay via the atmosphere*.

- As the AQIP is still being developed, these tasks are included in the BAR.

Bay Actions Reports will evolve over time. The historical background featured in 2001-02, is not repeated in the 2002-03 report. Refinement of the format for reporting on task implementation will continue. This will become more streamlined and concise as it continues to build on the previous years' content, and will be linked with related reporting systems where possible. Reporting on progress with addressing the EMP's objectives can only be incorporated in the longer term. For nutrients, background variability means that reliably interpreting the results of implemented monitoring programs will require long data series<sup>1</sup>. No reliable short-term indices are currently available. For marine pests, this reporting component is developmental, with the need to develop appropriate monitoring indicators, approaches and performance measures recognised in the current program<sup>2</sup>.

The Bay Actions Reports will provide a more comprehensive picture of progress as these components develop.

The BAR reports will assist with both the EMP's implementation and review. During 2003, the Central Coastal Board commenced the interim review of the EMP's implementation, with a more comprehensive review scheduled for 2006. The EMP's management framework will also be applied to reviewing and refocussing mitigation action for other priority Bay risks, or risks that are more specific, localised or emerging.

*Note: Since publication of the EMP, re-structuring and name changes have occurred within some of the agencies involved in its implementation. The agency names used within the report are generally those that applied between 1 July 2002 and 30 June 2003.*

# Introduction

The Port Phillip Bay Environmental Management Plan (EMP)<sup>1</sup> describes broad programs for mitigating the risks that *nutrients* and *marine pests* pose to the Bay's environment and the environmental management framework surrounding these programs. The EMP Background Document<sup>2</sup> provides further information on the context for the EMP and its programs, including references to more detailed technical documents.

Each of the EMP's programs has a series of sub-programs including:

- objectives for risk mitigation, at program and contributing sub-program levels
- sub-program tasks to address the objectives, which range from planning and implementation to coordination, monitoring, reporting and review.

The tasks are predominantly high-level and long-term, with implementation often involving further planning stages and actions over a number of years. The monitoring, reporting and review tasks comprise frameworks for coordinated reporting on progress relevant to the objectives of the sub-programs and hence overall programs - for mitigating these key risks to the Bay's environment.

The Bay Actions Report (BAR) was introduced in the EMP as the tool for reporting on progress with *EMP tasks relevant to the Bay itself or to activities or inputs that either affect or enter the Bay directly or are transmitted to the Bay via the oceans*. However, for both 2001-02 and 2002-03, it also reports on tasks relating to waterway and atmospheric Bay inputs - which will also be included in the already, or soon to be, established environmental reporting mechanisms for these two other key environments that transmit risks to the Bay<sup>3</sup>.

The EMP's nutrient and marine pest reporting frameworks differ. This is partly due to differences in the nature of these risks, but particularly due to differences in the developmental status of their risk management programs. The BAR is a key output of both frameworks, and the 2001-02

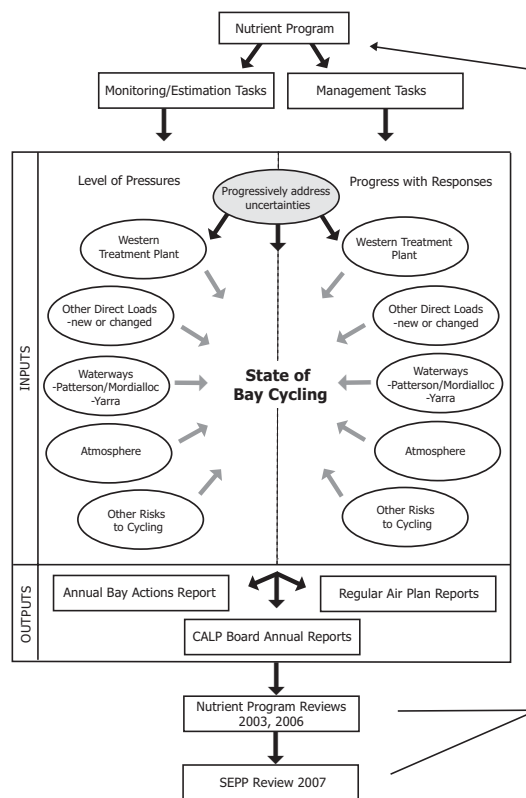
BAR focussed on progress with task implementation across both programs. However, the differences in underlying monitoring and reporting approach will over time lead to differences in BAR structure between programs. These differences are more evident in the 2002-03 BAR.

Nutrient inputs have long been recognised as an important risk to the Bay's environment, and long been a Bay management focus and research issue. Marine pest management has a much more recent history, and the EMP's marine pest program is acknowledged as developmental. The understanding of Bay nutrient cycling processes built through research culminating in the Port Phillip Bay Environmental Study, along with an established management history, provide for a much more comprehensive nutrient monitoring and reporting approach than is possible for marine pests. This should not be misinterpreted to mean that understanding of the complex nutrient cycling processes is complete; continuing to progressively improve this understanding is recognised among the EMP's key tasks required to mitigate the Bay nutrient risk<sup>4</sup>.

## Nutrient Reporting Framework

The EMP's nutrient reporting framework is based broadly on a pressure-state-response approach (see EMP Figure 3.1). EMP Table 3.1, which summarises how the nutrient program's tasks contribute to each of these reporting elements and where they will be reported, is reproduced in Appendix 1 of this report.

Reporting for the 'response' element focuses on progress with implementing program tasks, including monitoring. This was the focus of the 2001-02 BAR, and also predominates in 2002-03. The 'pressure' and 'state' elements are based largely on quantitative interpretation of environmental monitoring results. Monitoring programs, based on current scientific understanding supported by a review process, are in progress to support this framework<sup>5</sup>. The 2002-03 BAR introduces reporting on the 'state' element, based on very preliminary interpretation of initial monitoring data. 'Pressure' indicators - namely Bay nitrogen (N) loads - are the main focus of the nutrient program's management objective. Changes in key pressure indicators, along with ongoing assessment of 'state' indicators, will



therefore be important inputs to longer-term assessments of progress against these objectives. Levels of some pressure indicators will be reported annually or every few years (see EMP nutrient program and reporting framework). However, their reliable interpretation to assess achievement of the reduction target will require very long data series - estimated at 2010 for Western Treatment Plant (WTP) and 2014-2016 for the key waterway inputs<sup>6</sup>.

### Marine Pest Reporting Framework

The marine pest reporting framework will initially focus on progress with implementing the program's tasks, which include development of environmental monitoring approaches. This will be reassessed when the EMP is reviewed in 2003 (interim implementation review) and 2006.

### Structure of this Report

This BAR should be read as a companion document to the EMP, reporting directly on progress with the sub-program tasks making up the EMP nutrient and marine pest programs. The tasks and their intended reporting outputs are paraphrased here, but the EMP should be consulted for full descriptions (pages 11 and 18).

Most of the EMP's tasks are long-term. Many are also defined at a high-level and their implementation will involve planning and actions over many years. Each consecutive BAR will therefore provide an update on their implementation. Once a task is completed, it will not be discussed further in subsequent reports.

Appendix 1, reproduced from the EMP, describes how the reporting outputs of the nutrient program's tasks together comprise a pressure-state-response framework. As discussed previously, the 2002-03 BAR is mostly 'response' outputs. Those 'pressure' and 'state' outputs that are included are reported within the same structure, but the discussion is preliminary and brief, consistent with the early stage of any underlying monitoring data series.

Both the EMP Background Report<sup>7</sup> and Bay Actions Report 2001-02 (2001-02 BAR)<sup>8</sup> provide further background information relevant to the EMP programs, sub-programs and tasks. Linkages are also provided throughout this report to websites with further information relevant to the implementation of tasks within the various EMP sub-programs.

# 1. Nutrient Program

## 1.1 Direct Bay Inputs - Western Treatment Plant

*Key Tasks, Reporting Outputs and Key 2002-03 Actions:*

*Reduce the Western Treatment Plant's annual N load by 500 tonnes (t) by 2006.*

- *Annually report on implementation and predicted load reduction*
- *Maintain an appropriate N load monitoring system*
- *Annually provide monitoring data to DSE; estimate loads in at least 2002, 2004, 2006; report to DSE*

The Western Treatment Plant (WTP) upgrade continues and is expected to provide a 500 t reduction in WTP's annual Bay N load by 2006. Reporting on its implementation continued, consistent with the EMP sub-program. Due to the success of the upgrade's implementation, only two lagoons are now intended for upgrade. A third lagoon will be upgraded if needed as flows increase due to growth in Melbourne's population.

The monitoring program required by WTP's EPA accredited discharge licence also continued. This monitoring will provide for future assessment of performance with the WTP load reduction against the agreed Bay N baseline as outlined in this sub-program. It is no longer considered necessary to provide the data to DSE, given they are stored on a MW database and also provided to EPA.

## 1.2 Direct Bay Inputs - New Proposals

*Key Tasks, Reporting Outputs and Key 2002-03 Actions:*

*Ensure that any EPA works approvals and licences, and any consents, permits or licences issued under the Fisheries Act and Coastal Management Act, are consistent with the EMP nutrient program.*

- *Annually collate relevant consents including predicted load implications*

In reporting on any new N discharge approvals, it is important to first emphasise that discharge of waste to the environment remains the lowest preference in Victoria's hierarchy of waste management options, to be considered only after waste avoidance and reuse opportunities have been fully explored. Existing licence holders operate within a context of continual improvement in environmental performance.

### **EPA Works Approvals and Licences:**

*New discharges:* No works approvals were issued for new licensed Bay N discharges. Operations have not yet commenced under the works approval issued to Australian Sea Urchins Pty Ltd in 2001-02. Australian Sea Urchins may discharge up to 9.5 t N per year when operating fully and was approved on the grounds that appropriate N offsets will be required in accordance with decisions regarding a Bay N offset system.

### **'Pressure' Indicators - Information for Long-Term Assessment <sup>9</sup>**

Over 2002-03, WTP's estimated N load to the Bay over its four licensed outlets, based on results of this monitoring program, was 2,160 t. Melbourne Water (MW) attribute this relatively low load compared with previous years to operation of the upgraded 55 East activated sludge plant, significantly lower inflow and increased effluent recycling. If inflows had been more typical, MW estimate that 2002-03 discharge would have been closer to 3200 t.

**Sources of more information:**  
[www.melbournewater.com.au](http://www.melbournewater.com.au)

*Existing discharges:* A works approval was issued in June 2003 for an upgrade to Altona sewage treatment plant which is expected to halve its N discharge concentration and significantly reduce its N discharge load. The actual N load reduction associated with the upgrade is difficult to predict due to the influence of groundwater inputs, but will be clearer once the upgrade is operating.

### **Fisheries Licences and Permits:**

No licences or permits were issued under the Fisheries Act that would influence N loads discharged to the Bay.

### **Coastal Management Act Consents:**

Two consents were issued that could increase Bay N loads, both relating to drainage works. One (at Indented Head) involves replacing an existing stormwater outfall servicing areas of both existing and future development, while the other (at Chelsea) is for a new outlet. Their net effect on Bay N loads cannot be predicted. The Indented Heads outfall complements extensive stormwater management planning and work in and around its catchment, including encouraging water sensitive urban design, which should contribute overall to helping reduce the area's Bay stormwater inputs and/or helping offset increases from future development. Stormwater management is a key management theme for EMP nutrient sub-program 1.3 and an overview of 2002-03 activities is provided in section 1.3 of this report.

Consents were also issued that could reduce direct Bay N loads:

- *Connection of existing septic tanks to sewerage* (Sorrento Sea Baths Restaurant, nine toilet blocks on the Rye Foreshore and one on the Dromana Foreshore).

Related to this consent were two sewerage provision projects completed in 2002-03:

- Mornington Peninsula Toilet Block Connections Project - Mornington Peninsula Shire Council and Parks Victoria project (facilitated by EPA) using Coasts and Clean Seas Funding, resulting in sewer connection of a number of toilet blocks from Rosebud to Rye.

- *Portsea Sorrento Backlog Project* - South East Water project which resulted in a number of premises ceasing discharge, including Sorrento Tea Rooms, Portsea Hotel and Continental Hotel.
- *Installation of boat waste management facilities* - facilities were installed and connected to sewer, with associated signage at six Bay sites: Queenscliff Harbour, Geelong Waterfront Eastern Pier, St Kilda marina, Royal Brighton Yacht Club Marina, Sandringham Yacht Club Marina.

### **'Pressure' Indicators – Information for Long-Term Assessment<sup>9</sup>**

The predicted load implications of approvals issued in 2002-03, where they can be meaningfully estimated, are incorporated within the implementation summary above.

### ***Investigate the detailed implications of, and technical basis for, development of an N offset system***

- *Report within 12 months*

The interagency steering group, comprising representatives from DSE, DPI and EPA, has been overseeing development of a background paper that consolidates a range of information relevant to this investigation. The background paper is intended to assist the steering group with development of an issues paper, prior to commencement of targeted consultation.

### ***Compile key implemented actions affecting direct Bay N loads and annually report***

- *Publish Bay Actions Report (BAR) by October each year*

The 2001-02 BAR was published by DSE in June 2003. Its scope was slightly different than envisaged in the EMP in that it included the catchment waterway and atmospheric sub-program. This approach is again used for 2002-03.

### **Sources of more information:**

[www.citywestwater.com.au](http://www.citywestwater.com.au);  
[www.ccb.vic.gov.au](http://www.ccb.vic.gov.au)

### 1.3 Catchment Waterways

The catchment waterways sub-program aims to reduce annual waterway N load to the Bay by 500 t (Yarra/Maribyrnong Rivers: 350 t; other surface waters focusing on the Patterson River system: 150 t) by 2006, particularly focusing on storm event loads where practically feasible. Due to the many and varied activities contributing to waterway nitrogen loads, and range of management agencies involved, the sub-program is coordinated across three key management themes: Rural Land Management, Stormwater Management and Licensed Waste Discharges.

#### 1.3.1 Rural Land Management

##### *Key Tasks, Reporting Outputs and Key 2002-03 Actions:*

***Contribute to reducing the waterway N load to the Bay by 500 t by working with agricultural industries to develop and encourage the implementation of sound environmental practices and procedures that will reduce N inputs to waterways from land used for cropping, grazing and horticulture.***

- *Annually develop /review a 1-3 works program of planned actions*
- *Annually report on implemented actions including load contribution*

##### **Planning:**

Development of the Port Phillip and Westernport water quality plan (PPWWQP) continued. This replaced the land management plan envisaged in the EMP, which was scheduled for completion in 2002, and will encompass all three key management themes. A nutrient coordination group, including DPI, CMA, MW and EPA, is guiding the plan's development. The 2001-02 BAR predicted completion of the PPWWQP in 2002-03. While progress was slower than expected, this remains an important project and will continue into 2003-04. Its development in 2002-03 was assisted by:

- internal reports drafted on impacts and management alternatives for septic tanks and unsealed roads

- desk-top review on costs and adoption rates of agricultural best management practice (BMP) extension programs.

The rural land management theme is lead by DPI. Within this theme, the emphasis on developing and implementing BMPs, through property management planning and environmental management systems approaches, will remain the focus over the next 1-3 years.

The PPWWQP will in future provide a key tool for identifying priority works and programs across all land uses in the region.

##### **Implementation:**

Continued the 'Grow West' landscape change project in the upper Werribee catchment, which has assisted landholders to restore degraded land and reduce nutrient load via revegetation and erosion work. Organisations involved include the CMA, DPI and landholders. 2002-03 achievements included: whole farm planning courses for landholders, direct seeding trials and demonstrations, aerial photo interpretation/planning workshops (which identified ( 2000 hectares (ha) of land available for revegetation), 25km of roadside vegetation established by VicRoads, 23ha of revegetation and 6 ha of direct seeding by the Werribee River Catchment Management Project, 250ha of revegetation by the Rowsley Valley and Pentland Hills Landcare Groups, 27ha of plantations established through the Plantations for Greenhouse Initiative.

Continued the Land Protection Incentive Scheme (see 2001-02 BAR), lead by DPI in partnership with landholders, which targets erosion on dryland and irrigated agriculture properties. 2002-03 achievements included: 21ha of erosion stabilised, 16ha revegetated, 3km of stream protected, 3076ha protected by stock containment fencing.

Continued the Stream Frontage Management Program (see 2001-02 BAR) by MW, in partnership with landholders, which aims to rehabilitate stream verges and has potential to reduce sediment and nutrient loads to waterways. 2002-03 achievements included: 78.5kms of fencing and 123,00 plants through grants to 348 landholders.

Continued the Enviroveg Program, lead by the Vegetable Growers Association, which promotes environmental management practices in the vegetable industry. Nutrients are among the farm management areas covered in the Enviroveg manual for vegetable growers. The manual itself offers a self audit approach to benchmarking performance against industry endorsed best management practices.

Continued developing an Environmental Management System (EMS) for the Yarra Valley agricultural industries (see 2001-02 BAR), lead by DPI in partnership with agricultural industries, DSE, EPA, MW and local government. 2002-03 achievements included development of a regional environmental position statement for Yarra Valley agricultural industries, a field day on EMS, active promotion to other industries including the Rubus Growers Association and Victorian Strawberry Growers Association. In addition, a draft EMS was finalized for the Yarra Valley Viticulture industry. The EMS includes:

- Environmental issues, legislative requirements and best management practices relating to whole vineyard planning, nutrient management, water management, pest and disease management, chemical management, vineyard floor management, waste management, harvesting, energy use, biosecurity, frost and biodiversity.
- A self assessment questionnaire that provides a self audit approach to benchmarking against industry best practice and identifies areas in need of improvement.
- An action-planning template that identifies the issue, the action/s, timeframe and responsibility for implementation, resources required and review date.

Continued facilitating awareness raising and implementation of best management practices by horticultural industries (see 2001-02 BAR). Organisations involved have included DPI, Victorian Strawberry Fruit and Flower industries, Werribee South Vegetable Young Growers Group and MW. 2002-03 achievements included:

*Awareness* - The strawberry fruit industry finalised and launched 'Improving Environmental Management - a guide to better soil, water and nutrient management practices for the Victorian Strawberry Industry' (see 2001-02 BAR). Every grower received a copy of the document, which was promoted by industry articles and 3 farm walks. Werribee South vegetable growers received information on the merits of alternate irrigation systems as well as wastewater as an alternate water source.

*On-ground works* - Implementation of improved drainage management activities identified in the strawberry fruit industry guide was facilitated through the Land Protection Incentive Scheme grant program and 5 demonstration sites which were funded from the Commonwealth's 'Cleaning our Waterways Industry Partnership Program'. The sites demonstrated a range of soil, water and nutrient BMPs, not commonly implemented on intensive horticultural properties. A Waterwatch based monitoring program to help evaluate the effectiveness of the sites also commenced.

Continued Corangamite CMA's 2001-03 Hovells Creek rehabilitation project, which has mainly involved stabilising beds and banks, fencing the creek and planting indigenous plants. Over time, landholders have also rehabilitated some areas adjoining both Hovells and Cowies Creeks (both of which enter the Bay).

Continued providing advice on BMPs through statutory planning processes, including EPA's advice for wineries and DPI's application of land management conditions on development proposals.

### **'Pressure' Indicators – Information for Long-Term Assessment <sup>9</sup>**

While the above projects target activities and practices known/predicted to deliver N to the waterways, their actual effects on N loads entering the waterways, let alone the Bay, cannot be meaningfully estimated. Predictions can at best focus on long term implications, given the many steps between awareness raising (ie extension programs) and broadscale implementation of on-ground actions that significantly reduce N, subject to assumptions on uptake rates. Even capturing the projects in progress is difficult given the many organisations and individuals potentially involved across the catchment.

Predictions are available, from the FILTER modelling<sup>10</sup>, of potential N reductions from implementing cropping, grazing and horticulture BMPs across the whole catchment/sub-catchments, given various assumptions about uptake rates and effects on nutrient-generation rates across a land use type:

- Irrigated horticulture BMPs across the Port Phillip region - 60 t reduction in annual N load within the catchment, with 32 t of this from Yarra/Maribyrnong catchments.
- Dryland agriculture (grazing and cropping) BMPs across the Port Phillip region - 43.3 t reduction in annual N load within the catchment, with 23.2 t of this from Yarra / Maribyrnong catchments.

The AEAM model in the Werribee River Catchment Nutrient Management Plan (2002) predicts the following N reduction:

- Irrigated agriculture program in the Werribee catchment - 1.3 t reduction in annual N load within the catchment, based on projected loads in 2030.
- Dryland agriculture (grazing and cropping) program in the Werribee catchment - 0.7 t reduction in annual N load within the catchment, based on projected loads in 2030.

The 2002-03 activities listed above focus on a subset of the industry groups/practices/nutrient sources/locations implicated in these N reduction estimates. Although their proportional contribution cannot be estimated, it appears that a significant increase in the adoption of best management practices will be needed to approach the N reductions estimated as achievable from catchment or sub-catchment wide implementation.

Environmental monitoring is in progress that will, in the long term, provide for assessment of progress with N reduction targets for the Yarra/Maribyrnong and Patterson/Mordialloc inputs to the Bay (see section 1.3.4).

#### **Sources of more information:**

[www.ccma.vic.gov.au](http://www.ccma.vic.gov.au); [www.dpi.vic.gov.au](http://www.dpi.vic.gov.au)  
(including Victorias resources online);  
[www.dse.vic.gov.au](http://www.dse.vic.gov.au); [www.enviroveg.com.au](http://www.enviroveg.com.au);  
[www.melbournewater.com.au](http://www.melbournewater.com.au);  
[www.ppwcm.vic.gov.au](http://www.ppwcm.vic.gov.au)

### 1.3.2 Stormwater Management

#### *Key Tasks, Reporting Outputs and Key 2002-03 Actions:*

#### *Contribute to reducing the waterway N load to the Bay by 500 t through targeted stormwater action.*

- *Annually develop/review a 1-3 works program of planned actions*
- *Annually report on implemented actions including load contribution (and including report on uptake or stormwater management plans by relevant local government)*

#### **Planning**

This theme is lead by MW and focuses on both:

- contributing to the waterway 500 t reduction target (against the agreed baseline)
- preventing, reducing and/or compensating for the future increases in stormwater N loads (above the designated baseline for the N reduction target<sup>11</sup>) expected from ongoing urban development within the catchment<sup>12</sup>.

MW has adopted a target of reducing annual Bay N inputs from the stormwater system by 100 t by 2010 through constructing wetlands that capture and treat stormwater. It plans to design and construct 2-3 wetlands per year for 10 years. MW is also targeting other stormwater management mechanisms - eg BMPs, education, stormwater management plans and water sensitive urban design (WSUD) - whose implications to N loads is more difficult to predict. MW also continues to research alternatives to determine the most effective way to reduce N loads.

Agreed works are built into MW's Corporate and Business Plans. Public reporting occurs in MW's Annual Report and Environment Report. Planning will also be included in the PPWWQP (see section 1.3.1).

#### **Implementation:**

#### WETLANDS

Four wetlands were completed for planting, lead by MW with EPA and local government, with predicted N removal of:

- Police Retarding Basin, Rowville - 5 t N/yr from Corhanwarrabul Creek.
- Jacana wetlands at Glenroy - 4.5 t N/yr from Moonee Ponds Creek system.
- Golf Links Road wetland, Narre Warren - 4.5t N/yr and incorporating an innovative solar powered gate to control inflow from the Berwick Township Drain.
- Narre Warren Township Drain wetland - 0.5 t N/yr.
- The Dandenong Creek wetlands are now operational after planting during the year.

A monitoring program commenced, by MW with the Cooperative Research Centre for Catchment Hydrology, to assess the effectiveness of two established wetlands in N and sediment removal during storms. Its results will assist future wetland design.

#### OTHER TOOLS FOR IMPROVING STORMWATER QUALITY

*The Victorian Stormwater Action Program (VSAP)* funded 44 projects over 2002-03 worth \$3,938,419, focussing on installation of Gross Pollutant Traps and non-structural works in planning, education, audit etc. VSAP, part of the Victorian government's 'Greener Cities' policy, is lead by EPA in partnership with local government.

*Municipal stormwater management plans (SMPs)* - SMPs have now been prepared by all Melbourne councils and also councils within the Bay's catchment that are outside MW's jurisdiction, including Wyndham, Melton, Hume, Greater Geelong, Queenscliff Borough. This has involved MW and EPA, and \$600,000 MW funding. The SMPs identify key threats to stormwater quality and priority actions to address those threats. Progress on implementation is generally reported to councils annually. MW is now prioritising SMP projects for funding through a \$1.8 million program over the next 3 years.

*Stormwater management for construction sites* - MW, EPA and 6 councils have worked with the building industry in a pilot project to improve construction site practices threatening stormwater quality. A kit has been developed providing guidance on using local laws to regulate building site practice, education / awareness material and site audit procedures. Training for council staff is being provided via the 'Clearwater' capacity building component of the VSAP. EPA also provided advice via planning referrals to require best practice environmental management for construction sites.

*Stormwater improvement for unlicensed commercial sites* - MW, EPA, local government and urban water authorities investigated stormwater quality in various industrial areas. This included intensive EPA enforcement of pollution controls on commercial premises that discharge waste to stormwater, and a major 'hotspot' project on Bell Street main drain, Preston. A stormwater treatment device and proposal to divert stormwater to sewer are also being developed.

*Encouraging water sensitive urban design (WSUD)* - Most greenfield estates are now required to meet environmental performance standards for stormwater quality either by WSUD or by contributing to costs of MW water quality treatment infrastructure. Continued work by MW, the development industry and local government to encourage WSUD included:

- Introduction of mandatory stormwater quality performance standards for new development through the planning system, to ensure that redevelopment in existing urban areas meets the water quality standards required in greenfield developments. This is a VSAP funded Association of Bayside Municipalities project.
- Development of a WSUD manual containing design and construction standards for WSUD technologies. This is a VSAP funded project managed by MW.

- Training on WSUD implementation to local government and industry professionals. This is part of VSAP's 'Clearwater' capacity building program, project-managed by MW.

*Neighbourhood Environment Improvement Plans (NEIPs)* - Two plans are being developed for waterways in the Bay's catchment by EPA with local government, industry, other relevant government agencies and the community. The Stony Creek NEIP's development has so far included an industry audit of 69 premises with recommendations for improved stormwater practices, an industry awareness program and water quality monitoring. The Edwardes Lake NEIP proposal aims to improve water quality in the lake and Edgars Creek catchment.

#### **'Pressure' Indicators - Information for Long-Term Assessment <sup>9</sup>**

N load reductions from constructed wetlands are relatively predictable, at least for waterway inputs, and are listed in the implementation summary above. Developing each wetland from design to functional maturity takes about 5 years. For projects targeting other stormwater management tools, N load reductions are diffuse and, as for rural land management actions, cannot be meaningfully estimated. The projects involving WSUD particularly (but not only) target the N load increases expected to accompany future catchment urbanisation.

Environmental monitoring is in progress that will, in the long term, provide for assessment of progress with N reduction targets for the Yarra / Maribyrnong and Patterson / Mordialloc inputs to the Bay (see section 1.3.4).

#### **Sources of more information:**

[www.epa.vic.gov.au](http://www.epa.vic.gov.au),  
[www.melbournewater.com.au](http://www.melbournewater.com.au)

### 1.3.3 Licensed Waste Discharges

#### **Key Tasks, Reporting Outputs and Key 2002-03 Actions:**

**Contribute to reducing the waterway N load to the Bay by 500t through regulation of licensed waste discharges including sewage treatment plants (STPs) that discharge to catchment waterways.**

- *Annually develop / review a 1-3 works program of planned actions*
- *Annually report on implemented actions including load contribution (and including report on any new or increased licensed waterway N discharges)*

#### **Planning:**

This theme is lead by EPA Victoria. Its planning framework is guided by the *Environment Protection Act 1970* and State Environment Protection Policies (SEPP) developed under the Act (particularly the SEPP Waters of Victoria and its Port Phillip Bay and Yarra schedules). It is also guided by EPA's Corporate and Business planning processes. The PPWWQP (see section 1.3.1) will in future provide a key tool for work program development.

#### **Implementation:**

##### UPGRADES TO LICENSED DISCHARGES INCLUDING STPS -

*Yarra Valley STPs* - The following upgrades are in progress/complete, with associated expected annual N load reductions to receiving waterways in the Bay's catchment:

- Whittlesea - 100% effluent reuse completed in 2003 (1.6 t N/yr).
- Ferres, Symons and Monbulk - decommissioning underway to be completed in 2004 (4 t N/yr).

*Improvements at Small Wastewater Treatment Plants* - A three-year EPA project completed in 2003 reviewed 51 licences which, where appropriate, were amended, required to connect to sewer where available, or revoked (900 kg N/yr).

*Amendments to Manufacturing Industry Licences* - EPA, in partnership with Australian Tallow EIP, Peerless (Laverton North), Qenos and Innovative Textiles, amended licences to require stormwater management plans, increased reuse and reduced wastewater to sewer.

##### PROVISION OF SEWERAGE -

Coode Island Industrial Sewer Project - The proposal to connect Coode Island companies to sewer has commenced and completion is expected in 2004.

##### OTHER TOOLS TO ASSIST ENVIRONMENTALLY SUSTAINABLE WASTE MANAGEMENT-

Two Guidelines for Environmental Management, developed by EPA with the water industry and wider industry, aim to encourage safe and sustainable re-use and recycling of STP effluent, sludge and manure:

- Use of reclaimed water - completed
- Land application of biosolids - in progress

Landfill siting and management - EPA worked with the landfill industry to encourage implementation of a statutory guide for best practice liner construction, leachate and groundwater management.

#### **'Pressure' Indicators - Information for Long-Term Assessment <sup>9</sup>**

N load reductions from STP upgrades are relatively predictable, at least for waterway inputs, and are listed in the implementation summary above. For other tools aiming to facilitate and encourage environmentally sustainable waste management, including reduced point-source and diffuse waste discharges, N load reductions are diffuse and, as for rural land management actions, cannot be meaningfully estimated.

Environmental monitoring is in progress that will, in the long term, provide for assessment of progress with N reduction targets for the Yarra/Maribyrnong and Patterson/Mordialloc inputs to the Bay (see section 1.3.4).

#### **Sources of more information:**

[www.epa.vic.gov.au](http://www.epa.vic.gov.au)

### 1.3.4 Overarching Tools and Mechanisms

This section focuses on tasks within the catchment waterways sub-program which overarch all three of its key management themes:

#### ***Key Tasks, Reporting Outputs and Key 2002-03 Actions:***

##### ***Encourage water sensitive design:***

See section 1.3.2

##### ***Consider the long-term risk of Bay N load in strategic planning processes***

- *Issues and directions to be outlined in the final Melbourne Metropolitan Strategy*

The Melbourne *Metropolitan Strategy, Melbourne 2030*<sup>13</sup>, was released in October 2002. Improving the environmental health of the bay's and the catchments is included as an important policy<sup>14</sup> to achieve one of *Melbourne 2030's* nine recognised directions - 'A great place to be'. This policy recognises and builds on the blueprint provided by the Bay EMP and updated regional catchment strategy, outlining a number of environmental initiatives that aim to complement these and reduce major environmental pressures from urban growth and development in the catchment. Reducing the impact of stormwater quality on bays and catchments is also recognised as an important policy to achieve another *Melbourne 2030* direction 'A greener city', and targeted by a range of environmental initiatives. An implementation program describing progress with *all Melbourne 2030's* environmental initiatives, with linkages to sources of further information, is available at [www.melbourne2030.vic.gov.au](http://www.melbourne2030.vic.gov.au).

The 2002-03 activities listed in sections 1.3.1- 1.3.3 include strategic planning elements. Other strategic planning projects relevant to reducing Bay N risk included:

- *Sewer connection project* - An EPA, Shire of Yarra Ranges and Yarra Valley Water project targeting septic tanks. Aims to identify reasons for poor connection rates in sewered areas, develop actions and quantify environmental impact.

- *Aurora Development* - discussions commenced about development plans incorporating environmental sustainability initiatives such as water recycling and waste minimisation. This is relevant to reducing N load increases expected from new development and has involved VicUrban, Yarra Valley Water, EPA, Melbourne Water, Whittlesea City Council and the development industry.

##### ***Oversee Regional Catchment Strategy (RCS) implementation, particularly in relation to reducing Bay N input; Coordinate development of work plans relevant to reducing waterway N load; Report against the Werribee River Catchment Nutrient Management Plan and the Yarra Catchment Action Plan***

- *Report on key actions affecting waterway N load in CMA annual report*

The CMA is renewing the RCS, and intends the revised RCS to integrate with the Bay EMP. An interagency nutrient coordination group is intended to assist with coordinating work plan development. This should be assisted through development of the PPWWQP (see section 1.3.1). The CMA's 2001-02 annual report summarised key catchment actions relevant to reducing waterway N loads across the CMA's region, with a more detailed description in the 2001-02 BAR.

##### ***Liaise (CMA and CCMA) to provide a coordinated oversight***

This is a strategic task that is difficult to include in annual reporting. However, section 1.3.1 describes activities lead by Corangamite CMA that are relevant to reducing N loads to waterways that enter the Bay within its region.

##### ***Monitor waterway N load, including storm-event sampling, to allow for comparison between Yarra-Maribyrnong and Patterson-Mordialloc waterway loads and baselines***

- *Annually provide relevant data to electronic data warehouse*
- *Use waterway monitoring data to estimate waterway loads at minimum of 2003 and 2006*

Monitoring continued, lead by MW with EPA, DSE and the CMA, covering 2 storm events. An auto sampler was installed in Gardiners Creek to allow data collection over the creek's rapid rise and fall during storms.

### **'Pressure' Indicators - Information for Long-Term Assessment**<sup>9</sup>

MW advises that, due to the drought, insufficient storm events have been sampled to allow sensible storm load calculations in 2003. While general waterway monitoring data are included on the data warehouse, there are no current plans to include storm event data as envisaged in the EMP. A model is required to translate these data into storm load estimates for the major waterway inputs. When enough storms have been sampled, MW will report on this with an overview included in the relevant BAR.

#### **Sources of more information:**

www.epa.vic.gov.au;  
www.melbourne2030.vic.gov.au;  
www.ppwcm.vic.gov.au

## **1.4 Atmosphere**

### **Key Tasks, Reporting Outputs and Key 2002-03 Actions:**

#### **Oversee implementation of the Port Phillip Region Air Quality Improvement Plan (AQIP).**

- *Regular reporting as per AQIP*

A draft AQIP was released several years ago, which recognises NO<sub>2</sub> as a priority common pollutant and proposes objectives and actions to reduce vehicle emissions, the predominant NOX source. EPA considers the AQIP a critical tool to help manage air quality, including N emissions, and work towards its finalisation is continuing. Meanwhile, during 2002-03, EPA released revised vehicle emissions regulations, which introduce new vehicle and fuel standards and should contribute to reducing atmospheric N emissions.

As the AQIP and associated reporting mechanisms are not finalised, reporting continues via the BAR.

***Annually collate significant works approvals and licence amendments relevant to Bay atmospheric N load, including predicted load implications.***

- *Annually report*

There were no major new works approvals or closures that would significantly affect atmospheric Bay N loads. No facilities were constructed by Singapore Power, whose new works approval was reported in the 2001-02 BAR.

## **1.5 Other Risks to Cycling**

### **Key Tasks, Reporting Outputs and Key 2002-03 Actions:**

***Develop and implement a program to monitor the state of Bay N cycling***

***Establish inter-agency Bay nutrient monitoring technical coordinating committee***

- *Publish agreed program on the electronic data warehouse*
- *Publish ongoing monitoring data on the electronic data warehouse*

This monitoring program is in progress. Reports describing the program, and its technical and statistical rationale, are available on the DSE website (www.dse.vic.gov.au)<sup>15</sup>. Benthic nutrient fluxes were measured twice during the year, in spring 2002 and autumn 2003, and continuous physicochemical monitoring was carried out of bottom waters from August 2002 and surface waters from March 2003.

The data are maintained by PIRVic (formerly MAFRI). The first interpretive report on the program was published in May 2003, covering initial monitoring over August - October 2002<sup>16</sup>.

The inter-agency nutrient monitoring technical committee continued to operate in 2002-03.

### **'State' Indicators - Monitoring to Detect Detrimental Changes to Bay N Cycling Processes**<sup>9</sup>

The objective of the Bay nutrient monitoring is 'To detect, as early as possible with current scientific understanding, detrimental changes to critical elements of Bay N cycling processes that indicate an increased risk of eutrophication at Bay-wide and regional scales'.

The first monitoring report by Andy Longmore<sup>16</sup>, of PIRVIC, provides a preliminary interpretation of early results. The following data were included, which pre-date the program's full implementation:

- Measurements of benthic nutrient fluxes and denitrification efficiency in Spring 2002. (Subsequently measured twice yearly.)
- Continuous monitoring of physicochemical water quality parameters in near-bottom waters from August - October 2002. (Subsequently extended to surface waters.)

The preliminary interpretation that was possible from these data is summarised below. The report should be consulted for more detail including assumptions, rationale and data.

- While there were too few nutrient flux measurements for reliable statistical comparison, all Spring 2002 measurements were similar to, or below, average previous measurements (from 1993-95) at the same sites. Denitrification efficiency was as high, or higher, than previous measurements.
- Salinity was higher than the Bay average, dissolved oxygen concentrations were similar to previous measurements and chlorophyll a concentrations (estimated from fluorescence) were within the range of previous measurements from the area.

The report suggests that these patterns are probably due to low runoff during drought conditions. These circumstances may change when the drought breaks, or if other nutrient inputs occur, and the report highlights that uncertainties remain about the location, duration and extent of any deterioration in N cycling processes that could result. Given that the monitoring aims to provide an early warning, this emphasises the importance of effective implementation of the sub-program tasks discussed below, to progressively reduce these uncertainties.

***Contribute to the integrated Bay nutrient monitoring program by maintaining current long-term monthly nutrient monitoring at existing Bay fixed sites.***

- *Publish monitoring data on the electronic data warehouse*
- *Provide summary and detailed interpretive reports at technically appropriate timelines*

EPA continued its fixed site monitoring program, and maintained the data on its database. These data are publicly available. The program focuses on assessing long term trends in Bay water quality, and a report interpreting monitoring results over 1984-1999 was published in 2002 (see last year's BAR).

***Through targeted research, resolve key uncertainties that limit the interpretation of Bay monitoring results.***

***Investigate the impacts of marine pests on Bay nutrient cycling processes.***

- *Publish summary reports in BAR with detailed technical reports and papers at technically appropriate timeframes*

The three-year collaborative research project between the University of Melbourne, PIRVic (formerly MAFRI), DSE and DPI (formerly NRE) continued over 2002-03. It aims to determine:

- the changes to the fauna of soft-sediment habitats (infauna) that occur at a local scale when individual species of marine pests are present

- whether these changes affect denitrification in the sediments
- if more than one pest species is implicated, whether they act independently or synergistically.

Research is so far focussing on the first two objectives. Field experiments have been used to assess the impacts of the polychaete worm *Sabella spallanzanii*, and clumps of solitary ascidians (*Styela spp.*, *Ciona*, *Asciidiella*). Impacts of the seastar *Asterias amurensis* are being examined by following changes in infauna with the arrival of *Asterias*, and particularly focus on the disappearance of large bivalves (as was also reported for Tasmania). The exotic bivalve *Corbula gibba*, which is presently in low abundances, was excluded from the project after initial sampling. Following the biological changes produced by these pests, measurement of denitrification rates *in situ* using benthic chambers commenced. A BSc Honours project at the University of Melbourne built on the above studies over 2002-03, investigating the effects of *Sabella* on recruitment of infaunal invertebrates.

EPA participated in pilot investigations for a developing study that will aim to increase the spatial and temporal coverage of the fixed sites water quality monitoring using continuous underway sampling. This approach could in future complement the monitoring approaches now used in the integrated Bay nutrient monitoring, which were ranked highest priority with respect to that program's objective by an expert workshop<sup>17</sup>. Spatial mapping of the water column was one of the further monitoring approaches raised by that workshop.

***Develop and implement defensible, complementary project-specific monitoring at relevant scales for projects and/or programs particularly relevant to N cycling risk.***

No relevant projects or programs arose over 2002-03.

### **'Pressure' Indicators - Information for Long-Term Assessment**<sup>9</sup>

The pressure indicators for this sub-program relate to progress with the two preceding tasks, whose implementation is discussed above.

## **1.6 Reporting on Progress**

Tasks and reporting embedded within the previous sub-programs.

## **1.7 Progressively Improving Understanding**

Tasks and reporting embedded within the previous sub-programs.

## **1.8 Review**

The Central Coastal Board (CCB) commenced the interim review of the EMP's implementation, scheduled for completion in 2003. The review is focussing on the EMP nutrient program. The marine pest program was recognised at the time of the EMP's release as developmental, reflecting the reform status of marine pest management arrangements in Australia. Therefore, an update on the marine pest program is instead being provided to CCB by DSE, following an assessment of the existing program in the light of progress with this reform process.

## 2. Marine Pest Program

### 2.1 Vector Management - Ballast Water

#### **Key Tasks, Reporting Outputs and Key 2002-03 Actions:**

***Establish a ballast waste management regime that reduced risks from internationally and domestically sourced ballast water that is proposed for discharge to the Bay***

- *Annually collate progress*

***Consider the risk of marine pests in long-term strategic planning; advocate action by port and ship managers that helps reduce the risk of marine pests***

During 2002-03, the ports of Melbourne and Geelong respectively received 3,198 and 451 vessel visits.

The Australian Quarantine Inspection Service (AQIS) established arrangements in 2001 requiring all international vessels to manage ballast water such that high-risk ballast water is not discharged into Australian ports or waters.<sup>18</sup> These arrangements continued to be applied in 2002-03, to ensure that high-risk ballast water from international ports was not discharged in the Bay. During the year, 'high risk' was based on the likely presence of three target pest species that are not recorded in the Bay *Gymnodinium catenatum*, *Crassostrea gigas* (feral) and *Mytilopsis sallei* (see Appendix 1).

In December 2002, an 18-month trial concluded at the Port of Hastings that will assist development of a single national management system for internationally and domestically sourced ballast water<sup>19</sup>. While not conducted in the Bay, this trial is relevant to future management of the Bay ballast water risk. Based on this experience it is proposed, in 2003/4, to implement arrangements to also manage the risks from domestically sourced ballast water discharged by ships visiting the Ports of Geelong and Melbourne.

EPA continued to develop the Waste Management Policy for Ships' Ballast Water, with completion expected in 2003-04.

***Develop and implement environmental management plans that addresses the risks of marine pests in operating the Ports of Geelong and Melbourne***

- *Publish plans (and associated periodic implementation reports)*

A 'Whole of Port Environmental Management Plan' for the Port of Melbourne was released in 2001 (see 2001-02 BAR) and outlines arrangements to both reduce the risk of marine pest introductions and to deal with pests in the event that they are introduced<sup>20</sup>.

An environmental management plan for the Port of Geelong is scheduled to commence following completion of a Strategic Land Use Plan for the Port in 2004.

***Investigate and trial appropriate and cost-effective indicators and approaches for monitoring the effectiveness of tasks aimed at improving the management of ballast water***

- *Annual progress report in BAR*

The identification of effective risk indicators will be assisted by the National System for the Prevention and Management of Marine Pest Incursions which, in the coming years, will address monitoring arrangements for marine pests in Australian ports.

#### **Sources of more information:**

[www.dse.vic.gov.au/marine\\_pests/](http://www.dse.vic.gov.au/marine_pests/)

## 2.2 Vector Management - Fouling of Large Ships

### *Key Tasks, Reporting Outputs and Key 2002-03 Actions:*

*Assess the feasibility of establishing a hull fouling management regime*

- Report, including summary in BAR

*Investigate and trial appropriate and cost-effective indicators and approaches for monitoring the effectiveness of tasks aimed at improving the management of fouling of large ships.*

- Annual progress report in BAR

In 2002-03, the risk associated with fouling of large ships continued to be managed through the application of antifoulants and by the ban on in-water hull cleaning under the *Marine Act 1988*. Existing arrangements for antifoulants continued to be applied.

## 2.3 Vector Management - Fouling of Small Vessels

### *Key Tasks, Reporting Outputs and Key 2002-03 Actions:*

*Establish a management regime to reduce the risk that small vessels and their associated gear introduce marine pests and transfer them within the Bay*

- Annual progress report in BAR

*Investigate and trial appropriate and cost-effective indicators and approaches for monitoring the effectiveness of tasks aimed at improving the management of fouling of small vessels.*

- Annual progress report in BAR

During 2002-03, a scientific analysis of the way in which small vessels could be infected with marine pests was published<sup>21</sup>. This analysis was based on the input from small vessel skippers at ports between and including Eden and Apollo Bay. It will form the basis of guidelines that will help deal with this risk, which will be developed following input from peak organisations with responsibilities for small vessels and local ports.

### **Sources of more information:**

[www.dse.vic.gov.au/marine\\_pests/](http://www.dse.vic.gov.au/marine_pests/)

## 2.4 Vector Management - Aquaculture

### *Key Tasks, Reporting Outputs and Key 2002-03 Actions:*

*Ensure that the aquaculture of translocated aquatic biota within the Bay conforms to Victoria's translocation policy.*

*Ensure that marine farming equipment introduced to the Bay from other marine areas is treated to ensure that it is free of marine pests.*

- Annual report on consents, conditions and compliance in BAR

*Investigate and trial appropriate and cost-effective indicators and approaches for monitoring the effectiveness of tasks aimed at improving management of aquaculture.*

- Annual progress report in BAR

During the year the *Victorian Mussel Translocation Protocol for the Movement of Mussel Ropes and Equipment between Port Phillip Bay and Westernport* continued to be applied.<sup>22</sup>

The incidental movement of marine pests via aquaculture gear will also be addressed by actions outlined in the 'National System for the Prevention and Management of Marine Pest Incursions: Australian Strategic Plan 2002-2006'.<sup>23</sup>

Development of Victoria's translocation policy continued. This is scheduled for completion in 2003-04.

### **Sources of more information:**

[www.dse.vic.gov.au/marine\\_pests/](http://www.dse.vic.gov.au/marine_pests/)

## 2.5 Early Detection

*Design and trial a monitoring system that maintains the currency of information on the status of 'target species'.*

- *Annually report on progress and on detection of new 'target species' and new exotic species in BAR*

No new marine pest introductions were reported over 2002-03. (Note that during this year reporting of new pest introduction was reliant on general observations by the public rather than a systematic program dedicated to detecting the introduction of a new pest species.)

Early detection provides the best opportunity for eradication or control of a newly established species. DSE in collaboration with CSIRO and the Bureau of Rural Sciences is developing practical monitoring guidelines for the early detection of marine pests. This project is due for completion in 2004.

In July 2003 the *National Introduced Marine Pest Information System* (NIMPIS) was released. NIMPIS was developed to provide managers, researchers, students and the general public with access to accurate and up to date information on the biology, ecology and distribution of introduced marine species, and potential control options for those designated as pests. Included within this system are species known to be introduced to Australian waters and species that are considered to be likely future introductions ('next pests')<sup>24</sup>.

### **Sources of more information:**

<http://crimp.marine.csiro.au/nimpis/>

## 2.6 Mitigate Effects of Introductions

*Key Tasks, Reporting Outputs and Key 2002-03 Actions:*

*Mount rapid response to the introduction of new pest species to the Bay where feasible technically and beneficial environmentally, economically and socially;*

- *Annual report on action in BAR*

*Implement and support targeted research to better understand existing pest populations (with a particular emphasis on the impacts of pests on Bay nutrient cycling processes), with the aim of mitigating their impacts in the longer term where feasible technically and beneficial environmentally, economically and socially*

- *Publish summary reports in BAR with detailed technical reports and papers at technically appropriate timeframes*

*Implement actions to mitigate the impact of established pests in the longer term where feasible technically and beneficial environmentally, economically and socially.*

- *Annual report on action in BAR*

As noted in section 2.5, no new marine pest introductions to the Bay were reported over 2002-03. (Note that this reporting was reliant on general observations by the public rather than a systematic program dedicated to detecting the introduction of a new pest species.)

As noted in Section 1.5, a research project began in 2002, with funding support of the Australian Research Council, to investigate the links between nutrient cycling in the Bay's sediments and marine pests (see progress report in Section 1.5).

Control efforts continue to focus on the Northern Pacific Seastar in accordance with the National Control Plan. In the absence of readily available technology to reduce Seastar numbers, priority continues to be given to reducing the risk of its introduction to new areas of Victoria and elsewhere in Australia. Three collaborative projects commenced in 2002 and are scheduled to conclude in 2003/04.

They will:

- Identify the epidemiological characteristics of human-mediated vectors - ships hulls, aquaculture and fishing gear - that could lead to new Northern Pacific Seastar introductions across southern Australia. The aim is to identify the extent to which each vector entrains seastars, so that vectors can be prioritised for management action.
- Establish the temporal and spatial-patterns of the abundance of Northern Pacific Seastar larvae in Port Phillip Bay and the Derwent River Estuary in order to determine the risk posed by ballast water taken up in these areas. The aim is to determine if there are times when there are low concentrations of larvae in the water column such that vessels can take up ballast with a much reduced risk of entraining larvae.
- Identify and assess practical options for better early warning systems to detect the Northern Pacific Seastar's introduction to new locations.

The information arising from the above projects will be used by CSIRO to evaluate the implications of various management options to deal with the Seastar.

**Sources of more information:**

[www.dse.vic.gov.au/marine\\_pests/](http://www.dse.vic.gov.au/marine_pests/)

## **2.7 Reporting on Progress**

Tasks and reporting embedded within the previous sub-programs.

## **2.8 Progressively Improving Understanding**

Tasks and reporting embedded within the previous sub-programs.

## **2.9 Review**

The Central Coastal Board (CCB) commenced the interim review of the EMP's implementation, scheduled for completion in 2003. The review is focussing on the EMP nutrient program. The marine pest program was recognised at the time of the EMP's release as developmental, reflecting the reform status of marine pest management arrangements in Australia. Therefore, an update on the marine pest program is instead being provided to CCB by DSE, following an assessment of the existing program in the light of progress with this reform process.

# Abbreviations

AEAM	Adaptive Environmental Assessment and Management
AQIP	Port Phillip Air Quality Improvement Plan
BMP	Best Management Practices
BRS	Bureau of Rural Sciences
CCB	Central Coastal Board
CCMA	Corangamite Catchment Management Authority
CMA	Port Phillip and Westernport Catchment Management Authority
CRIMP	Centre for Research on Introduced Marine Pests
CSIRO	Commonwealth Science and Industrial Research Organisation
DPI	Department of Primary Industries
DSE	Department of Sustainability and Environment
EIP	Environmental Improvement Plan
EMP	Environmental Management Plan
EPA	Environment Protection Authority
MAFRI	Marine and Freshwater Resources Institute
NEIP	Neighbourhood Environment Improvement Plan
NRE	Department of Natural Resources and Environment
PIRVic	Primary Industries Research Victoria
PPWWQP	Port Phillip and Western Port Water Quality Plan
RCS	Regional Catchment Strategy
SEPP	State Environment Protection Policy
SMP	Stormwater management plan
STP	Sewage treatment plants
VSAP	Victorian Stormwater Action Program
WSUD	Water sensitive urban design
WTP	Western Treatment Plant

# Appendix 1

Reproduced from Bay EMP<sup>25</sup> (Table 3.1)

Relationships Among Nutrient Monitoring and Reporting Tasks,  
within a Pressure-State-Response Framework..

Sub-Program	Pressure	Response	State
1.1 WTP	<b>Input:</b> environmental monitoring of flow & nitrogen - <i>annual</i> (to EPA, NRE) compilation of load estimates - 2002, 2004, 2006 interpretation of change from baseline - 2010	<b>Input:</b> actions implemented to reduce loads and predicted load implication - <i>annual</i>	<b>Input:</b> Environmental monitoring of indicators of Bay cycling processes - <i>ongoing (on data warehouse)</i> - <i>annual summary of results</i> - <i>interpretation with timing as technically appropriate for individual monitoring elements</i>  <b>Output:</b> Bay Actions Report
	<b>Output:</b> Bay Actions Report	<b>Output:</b> Bay Actions Report	
1.2 New Direct Loads	<b>Input:</b> predicted load implication of any approved proposals - <i>annual</i>	<b>Input:</b> relevant 'permits' issued and predicted load implication - <i>annual</i> progress with investigation of offset measures - 2002	
	<b>Output:</b> Bay Actions Report	<b>Output:</b> Bay Actions Report	

# Appendix 1

Sub-Program	Pressure	Response	State
1.3 <i>Catchment Waterways</i>	<p><b>Input:</b> environmental monitoring of flow &amp; nitrogen, including targeted storm-event sampling</p> <ul style="list-style-type: none"> <li>- <i>ongoing (on data warehouse)</i></li> </ul> <p>compilation of load estimates</p> <ul style="list-style-type: none"> <li>- 2003 &amp; 2006</li> </ul> <p>interpretation of change from baseline</p> <ul style="list-style-type: none"> <li>- 2014-2016</li> </ul>	<p><b>Input:</b> actions implemented to reduce loads and predicted load implication</p> <ul style="list-style-type: none"> <li>- <i>annual</i></li> </ul> <p>any significant new waterway loads licensed</p> <ul style="list-style-type: none"> <li>- <i>annual</i></li> </ul> <p>mechanism established for coordinated implementation</p> <ul style="list-style-type: none"> <li>- <i>annual</i></li> </ul> <p>long term nitrogen load risk considered in strategic planning</p> <ul style="list-style-type: none"> <li>- <i>in finalised Metro Strategy</i></li> </ul>	
	<p><b>Output:</b> Bay Actions Report</p>	<p><b>Output:</b> Catchment Actions Report in CALP Board Annual Report</p>	
1.4 <i>Atmosphere</i>	<p><b>Input:</b> refined load estimate and regularly updated air inventory</p> <ul style="list-style-type: none"> <li>- <i>regular as per AQIP</i></li> </ul>	<p><b>Input:</b> AQIP actions relevant to long term load reduction implemented</p> <ul style="list-style-type: none"> <li>- <i>regular as per AQIP</i></li> </ul> <p>any significant new atmospheric loads licensed</p> <ul style="list-style-type: none"> <li>- <i>annual (Bay Actions Report)</i></li> </ul>	
	<p><b>Output:</b> AQIP Regular Reporting</p>	<p><b>Output:</b> AQIP Regular Reporting</p>	

# Appendix 2

List of 12 target marine pest species considered to cause severe social, economic or environmental impacts.

Species	Present/Absent in the Bay
<i>Asterias amurensis</i>	Present
<i>Carcinus maenas</i>	Present
<i>Corbula gibba</i>	Present
<i>Crassostrea gigas (feral)</i>	Absent
<i>Musculista senhousia</i>	Present
<i>Mytilopsis sallei</i>	Absent
<i>Sabella spallanzanii</i>	Present
<i>Undaria pinnatifida</i>	Present
<i>Gymnodinium catenatum</i>	Absent
<i>Alexandrium catenella</i>	Present
<i>Alexandrium minutum</i>	Present
<i>Alexandrium tamarense</i>	Present

## Footnotes

<sup>1</sup> See Department of Natural Resources and Environment 2002a. *Port Phillip Bay Environmental Management Plan: Plan and Critical Programs to 2003*. Department of Natural Resources and Environment, Melbourne, Australia. (available at [www.dse.vic.gov.au](http://www.dse.vic.gov.au))

<sup>2</sup> See Department of Natural Resources and Environment 2002b. *Port Phillip Bay Environmental Management Plan: Background Document*. Department of Natural Resources and Environment, Melbourne, Australia. (available at [www.dse.vic.gov.au](http://www.dse.vic.gov.au))

<sup>3</sup> The other two reporting outputs are: *A Catchment Actions Report* (within the Port Phillip and Westernport Catchment Management Authority's annual report) and *The Port Phillip Air Quality Improvement Plan (AQIP) Reporting System* (within the AQIP currently being developed by EPA). See Department of Natural Resources and Environment 2002a for further detail, particularly Section 3 - Performance Reporting Framework.

<sup>4</sup> See Department of Natural Resources and Environment 2002a. Section 1 - Nutrient Program;

See Department of Natural Resources and Environment 2002b.

<sup>5</sup> See Department of Sustainability and Environment 2003. *Port Phillip Bay Environmental Management Plan - Bay Actions Report 2001-2002*. Department of Sustainability and Environment, Melbourne Australia.

<sup>6</sup> Discussed further in Department of Natural Resources and Environment 2002a; Department of Natural Resources and Environment 2002b.

See Parslow, J, Sokolov, S. and Murray, S. 1999. *Port Phillip Bay: Baseline, monitoring and analysis for nitrogen load reductions*. CSIRO Marine Research.

<sup>7</sup> See Department of Natural Resources and Environment 2002b.

<sup>8</sup> See Department of Sustainability and Environment 2003.

<sup>9</sup> See Appendix 1.

<sup>10</sup> See Read Sturgess & Associates. 2000. *Economic benefit in nutrient load reduction in the Port Phillip Catchment - Scoping Study*. Read Sturgess & Associates Agricultural & Resource Economists, Melbourne, Australia.

A decision-support system (the 'FILTER model') has been developed to assist identification of key nutrient and sediment sources, and evaluation of load reduction opportunities in the Bay's catchment through a joint initiative between Melbourne Water, the then NRE, then Port Phillip and Westernport CALP Board and EPA. It is underpinned by a GIS-based program integrating water quality and flow data for 62 hydrologic zones within the catchment according to their land use, and each land use's nutrient and suspended solid generation rates (See Rossrakesh, S. & Argent, R. 1999, *An assessment of FILTER: Decision Support for the Port Phillip Catchment*, Centre for Environmental Applied Hydrology, University of Melbourne, CEAH REPORT 03/99.) A database of nutrient and sediment abatement opportunities for each hydrologic zone (the 'FILTER database') has been compiled, and is held by Melbourne Water. The contribution of these opportunities to N load reduction, and their relative cost-effectiveness, has also been estimated. This assessment could not include opportunities relating to septic tank management, reticulated sewerage

connection and non-structural stormwater management tools such as education, due to the extent of information available on both the extent of these problems and benefits in terms of Bay N loads.

<sup>11</sup> The Bay N baseline was established by EPA consistent with the Bay SEPP schedule and consists largely of 1991-5 input loads; more information on the Bay N baseline is available from EPA.

<sup>12</sup> The development expected within the next 20 years is expected to lead to annual load increases of 247 t, or 136 t if accompanied by water sensitive urban design best management practices. See Read Sturgess and Associates 2000.

<sup>13</sup> See Department of Infrastructure 2002. *Melbourne 2030 Planning for Sustainable Growth*. Department of Infrastructure, Melbourne, Australia.

<sup>14</sup> See Department of Infrastructure 2002 - Policy 5.8.

<sup>15</sup> See Longmore, A. R., 2000, Port Phillip Bay Nutrient Monitoring Proposal - Scientific and Technical Advice. *Marine and Freshwater Resources Institute Report No. 16 Fisheries Victoria, Victoria, Australia*;

See Longmore, A.R., and Gason, A., 2001, Port Phillip Bay Nitrogen Monitoring Proposal - Statistical Advice. *Marine and Freshwater Resources Institute Report No. 32 Fisheries Victoria, Victoria, Australia*. (available at [www.dse.vic.gov.au](http://www.dse.vic.gov.au))

<sup>16</sup> See Longmore, A.R., 2003, Port Phillip Bay Environmental Management Plan: Monitoring the state of Bay nitrogen cycling. First report (2002). *Marine and Freshwater Resources Institute Internal Report No. 41. Marine and Freshwater Resources Institute: Queenscliff*. (available at [www.dse.vic.gov.au](http://www.dse.vic.gov.au))

<sup>17</sup> See Department of Natural Resources and Environment 2002b;

See Department of Sustainability and Environment 2003.

<sup>18</sup> Australian Quarantine and Inspection Service 2001. *Australian Ballast Water Requirements*. Australian Quarantine and Inspection Service, Canberra, Australia.

<sup>19</sup> Meyrick and Associates Pty Ltd 2003, *Evaluation of the Hastings National Demonstration Project*. Report to Environment Protection Authority Victoria as project managers for the Victorian Government Consortium of the Department of Natural Resources and Environment, Department of Infrastructure and EPA and project partners Australian Quarantine Inspection Service and CSIRO - Centre for Research on Introduced Marine Pests.

<sup>20</sup> Melbourne Port Corporation 2001. *Whole of Port Environmental Management Plan*. Melbourne Port Corporation, Melbourne Australia.

<sup>21</sup> Hayes K. R. 2002. *Identifying hazards in complex ecological systems. Part 2: Infections modes and effects analysis for biological invasions*. *Biological Invasions* 4 (251-261).

<sup>22</sup> See also Gunthorpe, L., Mercer, J., Rees, C. and Theodoropoulous, T. 2001. Best practices for the sterilisation of aquaculture farming equipment: A case study for mussel ropes. *Marine and Freshwater Resources Institute report No. 41*. Marine and Freshwater Resources Institute, Queenscliff

<sup>23</sup> Department of Agriculture Fisheries and Forestry 2002. *National System for the Prevention and Management of Marine Pest Incursions: Australian Strategic Plan 2002-2006*. AFFA, Australia.

<sup>24</sup> Hewitt C.L., Martin R.B., Sliwa C., McEnnulty, F.R., Murphy, N.E., Jones T. & Cooper, S. 2002. Editors. National Introduced Marine Pest Information System. Web publication  
<<http://crimp.marine.csiro.au/nimpis>>, Date of access: 3-Sep-2003

<sup>25</sup> See Department of Natural Resources and Environment 2002a.



