

Port Phillip Bay Environmental Management Plan Bay Actions Report 2003-2004



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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PREFACE

The Bay Environmental Management Plan (EMP)¹ is a key element for implementing the State environment protection policy (Waters of Victoria) - Schedule F6 (the Waters of Port Phillip Bay). The EMP provides a framework for the identification of issues, co-ordination of management efforts, determination of priorities and development of actions to implement the objectives of the Schedule. The EMP has identified the two risks of *nutrients* and *marine pests* as priorities to be addressed. It also establishes broad programs for mitigating these risks and the environmental management framework surrounding these programs. The Bay Actions Report (BAR) is the key element of the EMP's framework for reporting on progress of these programs and, in the longer term, achievement of the programs objectives.

The BAR for 2003-04, as for 2002-03 and 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 (PPWCMA) Annual Report** - for tasks relating to Bay inputs from the catchment *transmitted to the Bay via the catchment waterways and drains*.
 - While the PPWCMA'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 and 2003-04 reports. 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 series¹. 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 program². The Bay Actions Reports will provide a more comprehensive picture of progress as these components develop.

The BAR's will assist with both the EMP's implementation and review and the EMP's management framework will also be applied to ongoing review and refocusing of mitigation actions for other priority Bay risks, or risks that are more specific, localised or emerging.

During 2003, the Central Coastal Board conducted an interim review of the EMP's implementation. This review highlighted the complexity of assessing progress in addressing the nutrient and pest risks to Port Phillip Bay and provided a timely articulation of the challenges involved in implementing the EMP towards its statutory timelines and in the longer term. A more comprehensive review of the EMP's implementation is scheduled to commence in 2006.

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 2003 and 30 June 2004.

¹ 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)

² See Department of Natural Resources and Environment 2002a. *Section 2 - Marine Pest Program and Section 3 - Performance Reporting Framework*. (available at www.dse.vic.gov.au).

INTRODUCTION

The Bay Environmental Management Plan (EMP)³ is a key element for implementing the State environment protection policy (Waters of Victoria) - Schedule F6 (the Waters of Port Phillip Bay). The EMP provides a framework for the identification of issues, co-ordination of management efforts, determination of priorities and development of actions to implement the objectives of the Schedule. The EMP has identified the two risks of *nutrients* and *marine pests* as priorities to be addressed. It also establishes broad programs for mitigating these risks and the environmental management framework surrounding these programs. The Bay Actions Report (BAR) is the key element of the EMP's framework for reporting on progress of these programs and, in the longer term, achievement of the programs objectives. The EMP Background Document⁴ 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, each report to date also reports on tasks relating to waterway and atmospheric Bay inputs - which should 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 Bay⁵.

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 first (2001-02) BAR focused on progress with task implementation across both programs. However, the differences in underlying monitoring and reporting approach has over time lead to differences in the structure of subsequent BARs.

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

³ 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)

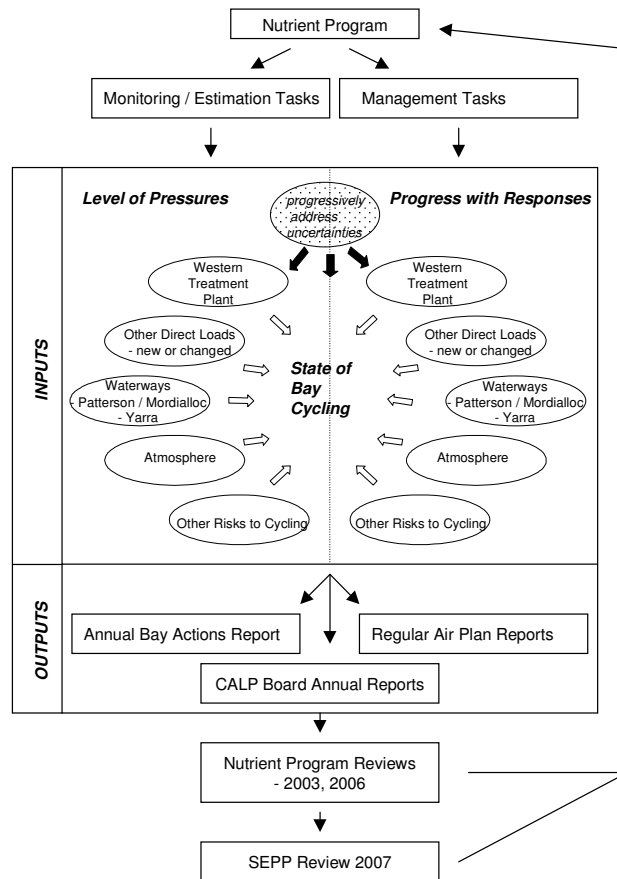
⁴ Department of Natural Resources and Environment 2002b. *Port Phillip Bay Environmental Management Plan: Background Document*. Department of Natural Resources and Environment, Melbourne, Australia. (available at www.dse.vic.gov.au)

⁵ 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.

understanding is recognised among the EMP's key tasks required to mitigate the Bay nutrient risk⁶.

Nutrient Reporting Framework

The EMP's nutrient reporting framework is based broadly on a pressure-state-response approach (see EMP Figure 3.1, reproduced below). 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. 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 framework⁷. The 2002-03 BAR introduced reporting on the 'state' element, based on very preliminary interpretation of initial monitoring data - an approach continued in the 2003-04 BAR. '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

⁶ See Department of Natural Resources and Environment 2002a. *Section 1 – Nutrient Program*; See Department of Natural Resources and Environment 2002b.

⁷ 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.

require very long data series - estimated at 2010 for Western Treatment Plant (WTP) and 2014-2016 for the key waterway inputs⁸.

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 was reassessed during the review of the EMP in 2003 (interim implementation review) which concluded that 'while progress has been made on national reform of marine pest management arrangements, the existing developmental approach to the EMP marine pest program and reporting framework is still warranted and the program's focus and existing tasks are still current'. This framework will again be reassessed in the upcoming review of the EMP.

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 BARs at this stage focus mainly on '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 Report⁹ and Bay Actions Reports 2001-02 (2001-02 BAR)¹⁰ and 2002-03 (2002-03 BAR)¹¹ 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.

⁸ 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.

⁹ See Department of Natural Resources and Environment 2002b

¹⁰ See Department of Sustainability and Environment 2003.

¹¹ See Department of Sustainability and Environment 2004.

1 NUTRIENT PROGRAM

1.1 Direct Bay Inputs - Western Treatment Plant

Key Tasks, Reporting Outputs and Key 2003-04 Actions:

Reduce the Western Treatment Plant's annual Nitrogen (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*

Implementation of the upgrade of the Melbourne Water (MW) Western Treatment Plant (WTP) continued as planned with a scheduled completion date of December 2004. This upgrade aims to reduce annual Bay N loads from WTP entering the Bay by 500 t by 2006. 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 installation of advanced lagoon technology using an activated sludge process to remove algae and N continued during 2003-04 on the 25 West lagoon.

The N load from WTP to the Bay for 2003-04 was 2,769 t with a three year rolling average load of 2,530 t/yr. The upgrades have resulted in significant reductions in load. As there are variations in natural inputs, it is difficult to quantify the exact net reduction of nutrients attributed to the upgrades, though it is likely to exceed the 500 t target. It will take data collection until at least 2010 before an accurate value can be determined¹².

The N load monitoring system is an ongoing requirement of the WTP's Accredited Discharge Licence obtained through the EPA. This agreed monitoring program between EPA and MW enables the WTP load reduction to be assessed against the agreed Bay N baseline.

The monitoring data from the WTP is stored on a MW database and is provided to EPA as part of the licence agreement and MW also provide annual reports on the progress of the WTP on their website.

'PRESSURE' INDICATORS - INFORMATION FOR LONG-TERM ASSESSMENT (See Appendix 1)

Over 2003-04, WTP's estimated N load to the Bay over its four licensed outlets, based on results of this monitoring program, was 2,769 t. This load is relatively low compared with projections¹³, and compared with inputs recorded prior to the implementation of the WTP Environmental Improvement Plan¹⁴ in 2000-01, which MW attribute to operation of the upgraded 55 East activated sludge plant, significantly lower inflow and increased effluent recycling.

Sources of more information:

www.melbournewater.com.au

¹² See Parslow, J, Sokolov, S. and Murray, S. 1999. *Port Phillip Bay: Baseline, monitoring and analysis for nitrogen load reductions*. CSIRO Marine Research.

¹³ Melbourne Water Corporation 2001. Environmental Review 2000/01. Melbourne Water, Melbourne.

¹⁴ Melbourne Water 2000. Western Treatment Plant Environmental Improvement Plan. Melbourne Water, Melbourne, Australia.

1.2 Direct Bay Inputs - New Proposals

Key Tasks, Reporting Outputs and Key 2003-04 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 emphasize 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 licenced Bay N discharges. The approved Australian Sea Urchins Pty Ltd works as noted in previous BAR has not proceeded and the approval expired in 2003.

Existing discharges: A works approval was issued in June 2003 for an upgrade to Altona sewage treatment plant. This is expected to halve its N discharge concentration and significantly reduce its N discharge load. The actual N load reduction associated with the upgrade will be difficult to predict due to the influence of groundwater inputs, but will be clearer once the upgrade is operating. The works are scheduled to be completed by late 2005.

Fisheries licences and permits:

No new licences or permits were issued under the Fisheries Act in 2003-04 that would influence N loads discharged to the Bay.

Coastal Management Act consents:

The following is a list of consents that were issued during 2003-04 that may affect nutrient inputs or cycling. The net implications for nutrients cannot be accurately predicted.

Proposals that may have reduced nutrient inputs include:

- Irrigation outfall improvements to drain No. 2 at Campbell's Cove Road, Werribee South
- Stormwater drainage infrastructure at Spinnaker Point, Corinella
- Breakwater, Groynes and Stormwater Works, Clifton Springs Boat Harbour
- Reconstruct drainage outfall, Denman Ave & Dudley Grove, Edithvale
- Stormwater works Corner Hood Rd and The Esplanade, Indented Heads

Proposals that may have increased nutrient inputs or affected nutrient cycling include:

- Dredging for safe swimming and diving depth, Eastern Beach Swimming enclosure, Geelong
- Dredging & disposal of 2,300 cubic metres of spoil from Rosebud Motor Boat Squadron, Rosebud
- Dredging Beach Boatramps, Rye and Safety Beach
- Dredging of Boat Harbour, Clifton Springs
- Dredging, Half Moon Bay boat ramp, Black Rock

'PRESSURE' INDICATORS - INFORMATION FOR LONG-TERM ASSESSMENT (See Appendix 1)

The predicted load implications of approvals issued in 2003-04, 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***

In June 2003, the revised State environment protection policy (Waters of Victoria) included a specific clause on offset measures. EPA will work with protection agencies, businesses and communities to provide guidance on developing and approving off-set measures for State waters. This clause complements the powers under the *Environment Protection Act 1970* to develop tradeable permit systems and offsets as a means of minimising harm to the environment.

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

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

The 2002-03 BAR was published by DSE in May 2004. As with the 2001-02 BAR, its scope was slightly different than envisaged in the EMP in that it included the catchment waterway and atmospheric sub-program. This approach was again used for 2003-04.

Sources of more information:

www.citywestwater.com.au; 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 feasible. Due to the many and varied activities contributing to waterway N loads, and range of management agencies involved, the sub-program is coordinated across three key management themes: Rural Land Management, Stormwater Management and Licenced Waste Discharges.

1.3.1 Rural Land Management

Key Tasks, Reporting Outputs and Key 2003-04 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 year 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 during 2003-04. The plan will encompass all three key management themes and will be supported by six practical projects targeted at identified priority water quality problems and potential solutions. These projects will be managed by teams from EPA Victoria, DPI, DSE and the Municipal Association of Victoria. While the predicted completion date outlined in the 2001-02 BAR was by 2003, a preliminary draft report on the Plan is now due for completion by May 2007 with the final Plan to be completed by May 2008.

A nutrient coordination group, including Department of Primary Industries, Port Phillip and Westernport Catchment Management Authority (PPWWQP), Melbourne Water and Environment Protection Authority, is guiding the plan's development. The PPWWQP will in future provide a key tool for identifying priority works and programs across all land uses in the region.

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 1-2 years.

Implementation:

The project "Improving water quality from the Werribee Irrigation District" continued during 2003-04. The project aimed to improve irrigation scheduling for greater water use efficiency and reduce runoff. It also aimed to improve grower understanding, acceptance, uptake and application of best practice use of recycled water as an alternative source of irrigation water from the Western Treatment Plant. It was refocused in 2003-04 to input into the Recycled Water Initiative in Werribee South.

- The 'Grow West' landscape change project in the upper Werribee catchment continued during 2003-04, and began its onground works component to assist landholders to restore degraded land and reduce nutrient load via revegetation and erosion work. The project has been initiated and developed by multiple organisations and committees including PPWCMA, DPI, Moorabool Shire, the Victorian Serrated Tussock Working Party (VSTWP), local landcare groups and landholders. Achievements for the year included: revegetation of approximately 105 hectares of degraded land through direct seeding and planting of local indigenous species, a variety of workshops for landowners relating to sustainable land management, research into increasing production on farms using native species and protection of 68ha of remnant vegetation.
- The Land Protection Incentive Scheme (see 2001-02 BAR) was integrated into the general devolved grant program in 2003-04.
- The Stream Frontage Management Program (see 2001-02 BAR) by MW in partnership with landholders continued in 2003-04, aiming to rehabilitate stream verges and reduce sediment and nutrient loads to waterways. During 2003-04 this program included 76.4km of fencing and 133,500 plants planted.
- The Enviroveg Program, lead by the Vegetable Growers Association continued during 2003-04, promoting environmental management practices in the vegetable industry. Nutrients are among the farm management issues 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.
- The development of the Environmental Management System (EMS) for the Yarra Valley agricultural industries (see 2001-02 BAR) continued during 2003-04, lead by DPI in partnership with agricultural industries, DSE, EPA, MW and local government. Achievements for the year included the trial implementation of the EMS Environmental Best Management Practice and Self-Assessment tools by 14 vineyards in the Yarra Valley. Growers involved expressed an enthusiasm for the trial and the usefulness of the results in assisting them identify environmental issues and to better plan for environmental improvements. The documentation was also considered valuable as a means of confirming a vineyards adherence to best environmental practice principles.
- The facilitation of awareness raising and implementation of best management practices by horticultural industries (see 2001-02 BAR) continued through 2003-04. Organisations involved have included DPI, Victorian Strawberry Fruit and Flower industries, Werribee South Vegetable Young Growers Group and MW. 2003-04 achievements included:
 - *Awareness* -Awareness raising activities focused on the vegetable industry in the Werribee Irrigation District and the strawberry industry in the Yarra Catchment to improve farm fertiliser use and reduce nutrient runoff by ensuring irrigation water is not flushing nutrients beyond the root zone. After an initial focus on irrigation scheduling in the Werribee Irrigation District, this project became heavily involved in the emerging Recycled Water Initiative. Activities were refocused on improving grower acceptance and understanding of best practice recycled water use, which has implications for the volume of waste water discharged to Port Philip Bay from the Western Treatment Plant. Following the successful development of best practice soil, water and nutrient guidelines, the strawberry industry in partnership with DPI, piloted

a whole farm planning program, which focused on assisting farmers implement the drainage component of the guidelines across the farm landscape. Ten plans covering 137ha, were developed.

- *On-ground works* - A pilot program was launched with the strawberry industry aimed at implementing a ‘whole farm planning approach’ with an emphasis on drainage management. Ten plans were developed in this year covering an area of 137 hectares.
- The Swan Bay Integrated Catchment Committee undertook erosion mitigation works associated with local waterways flowing into Swan Bay and Port Phillip Bay during 2003-04. This included fencing and revegetating 7km of waterway to improve in-stream water quality reaching Swan Bay and Port Phillip Bay.
- Provision of advice on BMPs through statutory planning, including EPA’s advice for wineries and DPI’s application of land management conditions on development proposals processes continued through 2003-04.

‘PRESSURE’ INDICATORS - INFORMATION FOR LONG-TERM ASSESSMENT (See Appendix 1)

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, and more broadly the Bay, cannot be meaningfully estimated. Predictions can at best focus on long term implications of wide ranging activities targeted at N reductions (subject to assumptions on uptake rates). These include awareness raising (ie extension programs) to the broadscale implementation of on-ground actions that significantly reduce N.

Two models have been used to make predictions of the reductions to N in the Bay.

The *FILTER model*¹⁵, was used to predict potential N reductions from implementing cropping, grazing and horticulture BMPs across the whole catchment/sub-catchments. These predictions are listed below and include 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 reduction apportioned to Yarra/Maribyrnong catchments.
- *Dryland agriculture (grazing and cropping) BMPs across the Port Phillip region* - ≈ 43 t reduction in annual N load within the catchment, with 23 t of this reduction apportioned to Yarra / Maribyrnong catchments.

The *AEAM model* specified in the Werribee River Catchment Nutrient Management Plan (2002) was used to make predictions of N reduction in the Werribee catchment. These included:

- *Irrigated agriculture program in the Werribee catchment* - ≈ 13 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 2003-04 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/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).

¹⁵ 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.

Sources of more information:

www.ccma.vic.gov.au; www.dpi.vic.gov.au (including Victorias resources online);
www.dse.vic.gov.au; www.ausveg.com.au/enviroveg; www.melbournewater.com.au;
www.ppwcm.vic.gov.au; www.epa.vic.gov.au

1.3.2 Stormwater Management

Key Tasks, Reporting Outputs and Key 2003-04 Actions:

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

- *Annually develop/review a 1-3 year 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 target¹⁶) expected from ongoing urban development within the catchment¹⁷.
- 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 for 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, led by MW with EPA and local government. These were:
 - Taylors Lakes wetland, Taylors Lakes - expected to remove 1.8 t N/yr.
 - Argus St wetland, Cheltenham - expected to remove 0.6 t N/yr.
 - Jacana North wetlands, Jacana - expected to remove an additional 4.5 t N/yr from the Moonee Ponds Creek system.
 - Police Retarding Basin, Rowville - completed plantings.
- The construction of the Campbellfield Creek wetland and a wetland in the Mt Waverly flood retarding basin was commenced in 2003-4.
- The cumulative amount of N removed to the end of 2003-04 was 28 t.

¹⁶ 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.

¹⁷ 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.

- The monitoring program to assess the effectiveness of two established wetlands for N, Phosphorus (P) and sediment removal during storms (managed by MW with the Cooperative Research Centre for Catchment Hydrology) was completed. Findings were used to adjust parameters of the MUSIC model used to predict urban stormwater outcomes and are being used in the design of new wetlands. Further research on nitrogen behaviour in designed wetlands is being conducted using information collated during this program.

OTHER TOOLS FOR IMPROVING STORMWATER QUALITY -

- *The Victorian Stormwater Action Program (VSAP)* began implementing 44 projects over 2003-04 worth \$3.9 million, focusing on installation of Gross Pollutant Traps and non-structural works in planning, education, audit etc. VSAP, is part of the Victorian government's initiative to improve the quality of Victoria's water environments through better environmental management of urban stormwater and is lead by EPA.
- *Stormwater management for construction sites* - MW, EPA and local government continued to work 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.
- *Encouraging water sensitive urban design (WSUD)* continued during 2003-04 -work by MW, the development industry and local government to encourage WSUD included:
 - Training on WSUD implementation to local government and industry professionals. This is part of VSAP's 'Clearwater' capacity building program, project-managed by MW.
 - Research by the CRC for Freshwater Ecology on the impact of impervious surfaces emphasised the key role WSUD can play in protecting rivers and creeks. This research will be supported with additional data collection during the 2004-05 year. A consultation draft of an engineering manual to assist implementation of WSUD was completed and will be finalised during the 2004-05 year.
 - MW and DSE developed a draft clause on a sustainable neighbourhood code incorporating WSUD to be included in the State Planning Policy Framework. DSE will produce a consultation draft of the code during 2004-05.
 - The integration of WSUD principles into planning scheme processes was progressed with MW and the Association of Bayside Municipalities. Trialing of this approach will occur with other municipalities during 2004-05
 - Consultation on a trading regime for nutrients generated from new development and redevelopment occurred during 2003-04. This proposal will be finalised and implementation will begin in the 2004-05 year.
- *Neighbourhood Environment Improvement Plans (NEIPs)* - There are a number of pilot NEIPs being developed for waterways in the Bay's catchment by EPA with local government, industry, government agencies and the community. These include:
 - the Stony Creek NEIP for which there is a long history of pollution entering from the multiple industrial sites located throughout the catchment and through diffuse urban stormwater runoff.
 - the Edwardes Lake NEIP for which measures are being developed to improve water quality in the lake and Edgars Creek catchment.

'PRESSURE' INDICATORS - INFORMATION FOR LONG-TERM ASSESSMENT (See Appendix 1)

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, www.melbournewater.com.au

1.3.3 Licenced 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 licenced 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 licenced waterway N discharges)*

Planning:

This theme is led 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 LICENCED 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* - works designed to provide 100% effluent reuse commenced in 2003
 - *Works carried out on the Emerald - Cockatoo pipeline* in 2003-4 experienced some delays with decommissioning of Ferres and Symons to be completed in 2004-05 (4 t N/yr).
- *Amendments to Manufacturing Industry Licences* - EPA continued to amend licences to require the development of stormwater management plans, increased reuse and reduced wastewater to sewers.

PROVISION OF SEWERAGE -

- *Coode Island Industrial Sewer Project* - The project to connect Coode Island companies to the sewerage system has commenced and completion is now expected in late 2005.

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:
 - *Guideline for Environmental Management - Use of reclaimed water* - completed
 - *Guideline for Environmental Management - Biosolids land application* - completed
- *Landfill siting and management* - EPA continues to work with the landfill industry to encourage implementation of a statutory guide for best practice liner construction, leachate and groundwater management.

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'PRESSURE' INDICATORS - INFORMATION FOR LONG-TERM ASSESSMENT (See Appendix 1)

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

1.3.4 Overarching Tools and Mechanisms

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

Key Tasks, Reporting Outputs and Key 2003-04 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*
- *Aquaculture of filter feeding shellfish is likely to develop significantly and will reduce N (-ve) over long term*

The Melbourne Metropolitan Strategy, *Melbourne 2030*¹⁸, was released in October 2002. Improving the environmental health of the bay's and the catchments is included as an important policy to achieve one of *Melbourne 2030*'s nine recognised directions - 'A great place to be'. 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. Implementation of these programs continued during 2003-04.

The 2003-04 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 seweraged areas, develop actions and quantify environmental impact.
- Aurora Development - development of plans incorporating environmental sustainability initiatives such as water recycling and waste minimisation continued during 2003-04. This is relevant to reducing N load increases expected from the new development and has involved VicUrban, Yarra Valley Water, EPA, Melbourne Water, Whittlesea City Council and the development industry.
- *Report on key actions affecting waterway N load in PPWCMA annual report*

The PPWCMA 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 PPWCMA's 2003-04 annual report summarised key catchment actions relevant to reducing waterway N loads across the PPWCMA's region.

Liaise (PPWCMA and CCMA) to provide a coordinated oversight

¹⁸ See Department of Infrastructure 2002. *Melbourne 2030 Planning for Sustainable Growth*. Department of Infrastructure, Melbourne, Australia.

This is a strategic task that is difficult to include in annual reporting. However, section 1.3.1 describes activities led by the CCMA 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, led by MW with EPA, DSE and the PPWCMA, at five sites, covering ten storm events during the year. This will provide more accurate information on the impact of storms on the N load entering Port Phillip Bay.

'PRESSURE' INDICATORS - INFORMATION FOR LONG-TERM ASSESSMENT (See Appendix 1)

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. A review of this data is scheduled for 2004/05 to determine whether trends and the relative contributions of these waterways to N loads could be identified.

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:

EPA prepares annual air monitoring reports that assesses society's compliance with the air quality policy. This enables assessment of air quality relative to objectives; informs the development of air quality management strategies; and allows evaluation of the effectiveness of air quality management activities.

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

- *Regular reporting as per AQIP*
- A draft AQIP released in 1998 recognises NO₂ as a priority common pollutant and proposes objectives and actions to reduce vehicle emissions, the predominant NO₂ source. EPA considers the AQIP a critical tool to help manage air quality, including N emissions, and work towards its finalisation is continuing.
- In the year 2003-04, EPA introduced the *Environment Protection (Vehicle Emissions) Regulation*. These specify new standards for motor vehicle air and noise emissions and also define petrol quality parameters, set construction, maintenance and labelling requirements, set vehicle emission standards and establish offences relating to vehicle fuel and emission controls. These new vehicle and fuel standards should contribute to reducing atmospheric N emissions over time.

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.

1.5 Other Risks to Cycling

Key Tasks, Reporting Outputs and Key 2003-04 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)¹⁹. Benthic nutrient fluxes were measured twice during the year, in spring 2003 and autumn 2004, and continuous physicochemical monitoring was carried out of bottom and surface waters at three sites for the full year.
 - The data are maintained by PIRVic. The first interpretive report on the program was published in May 2003, covering initial monitoring over August - October 2002²⁰. A second interpretive report covering monitoring carried out from August 2002-June 2003 was also prepared to a draft stage.
 - The inter-agency nutrient monitoring technical committee continued to operate in 2003-04.
 - A research project considering biological linkages to nutrient cycling managed by PIRVic began in 2003-04:
 - ***"Assessing the impact of declining nutrient inputs on fish production"***
- Further research on the links between freshwater flows and fisheries production has been proposed for 2004-05

'STATE' INDICATORS - MONITORING TO DETECT DETRIMENTAL CHANGES TO BAY N CYCLING PROCESSES (See Appendix 1)

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 draft second PIRVic monitoring report provides an interpretation of early results and included the following data:

- Measurements of benthic nutrient fluxes and denitrification efficiency in Spring 2003 and Autumn 2004
- Continuous monitoring of physicochemical water quality parameters in near-bottom and near-surface waters from July 2003 - June 2004

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

- Statistical analyses of the nutrient flux measurements indicated that Spring 2003 and Autumn 2004 measurements were not significantly different from previous measurements (from 1993-95) at the same sites. The strong differences in nutrient fluxes and denitrification between the Hobsons Bay and central Bay sites were maintained, with higher nutrient fluxes and lower denitrification efficiency in Hobsons Bay.
- Salinity was higher than the Bay average for most of 2004, 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 draft report suggests that these patterns are probably due to low runoff during drought conditions. There was some decline in salinity following spring 2003 rains, and further declines were expected with further rainfall. The report highlights that uncertainties remain about the location, duration and extent of any deterioration in N cycling processes that could

¹⁹ 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)

²⁰ 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)

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.

MW continued to participate in and provide funding for a monitoring program to provide early warning of Bay eutrophication which was coordinated by DSE.

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, DSE and DPI continued over 2003-04. 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.

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 2003-04.

'PRESSURE' INDICATORS - INFORMATION FOR LONG-TERM ASSESSMENT (See Appendix 1)

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) completed the interim review of the EMP's implementation, during 2003-04. The review focussed on the EMP nutrient program and highlighted the complexity of assessing progress in addressing the risks of marine pests to Port Phillip Bay. The review provided a timely articulation of the challenges involved in implementing the EMP towards its statutory timelines and into the longer term. The more comprehensive review of the EMP's implementation is scheduled to commence in 2006.

2 MARINE PEST PROGRAM

2.1 Vector Management - Ballast Water

Key Tasks, Reporting Outputs and Key 2003-04 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.

The Australian Quarantine Inspection Service (AQIS) requirement that high-risk ballast water is not discharged into Australian ports or waters²¹ continued to be applied in 2003-04, Ballast water is regarded as 'high risk' if the ballast water was taken up in an international port where there is the likely presence of three target pest species that are not recorded in the Bay *Gymnodinium catenatum*, *Crassostrea gigas* and *Mytilopsis sallei* (see Appendix 1).

In December 2002, the 18-month Hastings National Demonstration Project I concluded at the Port of Hastings. Given the broad success of the trial to manage the risk of spreading pests in ballast water through domestic shipping, arrangements in place at Hastings have remained throughout the 2003-04 period.

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)*

The Government's Review of Port Reform Process has led to significant changes to the way that all Victorian ports are managed. In 2003, the Port Services Act 1995 was amended to include requirements for all ports in Victoria, including all local ports, to introduce Port Safety and Environment Management Plans (SEMP) by 2005. These plans build on existing arrangements and are designed to ensure that the risks of port operations to safety and the environment are assessed and management strategies are developed. The SEMPs take a risk based approach and complement existing environmental requirements in the *Environment Protection Act 1970*, *SEPP (Waters of Victoria)* and other environmental legislation.

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.epa.vic.gov.au/water/ballastwater

www.dse.vic.gov.au/marinepests

²¹ Australian Quarantine and Inspection Service 2001. Australian Ballast Water Requirements. Australian Quarantine and Inspection Service, Canberra, Australia.

2.2 Vector Management - Fouling of Large Ships

Key Tasks, Reporting Outputs and Key 2003-04 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 2003-04, 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 2003-04 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 2003-04, an awareness campaign was launched through peak industry boating organisations focused on preventative measures to avoid spreading pests. This campaign was based on the scientific analysis of the way in which small vessels could be infected with marine pests that was published in 2002-03²².

Sources of more information:

www.dse.vic.gov.au/marinepests

2.4 Vector Management - Aquaculture

Key Tasks, Reporting Outputs and Key 2003-04 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*

²² 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).

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.²³

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'.²⁴

The Victorian *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria* was completed during the 2003-04 year. Implementation of these Guidelines included the adoption of management actions to reduce the risk of spreading marine pests.

Sources of more information:

www.dse.vic.gov.au/marinepests; www.dpi.vic.gov.au/fishing

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 in Port Phillip Bay over 2003-04. (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 Australian State and Commonwealth Governments, 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 2005.

The *National Introduced Marine Pest Information System* (NIMPIS) released in July 2003 continued to operate in 2003-04. 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')²⁵.

Sources of more information:

www.marine.csiro.au/crimp/nimpis

2.6 Mitigate Effects of Introductions

Key Tasks, Reporting Outputs and Key 2003-04 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

²³ See also Gunthorpe, L., Mercer, J., Rees, C. and Theodoropoulos, 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

²⁴ 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.

²⁵ Hewitt C.L., Martin R.B., Sliwa C., McEnulty, 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

- *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 2003-04. (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 were concluded 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/marinepests

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 completed the interim review of the EMP's implementation in 2003. This review highlighted the complexity of assessing progress in addressing the pest risks to Port Phillip Bay and provided a timely articulation of the challenges involved in implementing the EMP towards its statutory timelines and into the longer term. The more comprehensive review of the EMP's implementation is scheduled to commence in 2006.

ABBREVIATIONS

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
PPWCMA	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 EMP²⁶ (Table 3.1)
 Relationships Among Nutrient Monitoring and Reporting Tasks, within a Pressure-State-Response Framework.

Sub-Program	Pressure	Response	State
1.1 WTP	Input: <ul style="list-style-type: none"> • environmental monitoring of flow & N - <i>annual</i> (to EPA, NRE) • compilation of load estimates - <i>2002, 2004, 2006</i> • interpretation of change from baseline - <i>2010</i> 	Input: <ul style="list-style-type: none"> • actions implemented to reduce loads and predicted load implication - <i>annual</i> 	Input: Environmental monitoring of indicators of Bay cycling processes
	Output: Bay Actions Report	Output: Bay Actions Report	
1.2 New Direct Loads	Input: <ul style="list-style-type: none"> • predicted load implication of any approved proposals - <i>annual</i> 	Input: <ul style="list-style-type: none"> • relevant 'permits' issued and predicted load implication - <i>annual</i> • progress with investigation of offset measures - <i>2002</i> 	<ul style="list-style-type: none"> - <i>ongoing (on data warehouse)</i> - <i>annual summary of results</i> - <i>interpretation with timing as technically appropriate for individual monitoring elements</i>
	Output: Bay Actions Report	Output: Bay Actions Report	

²⁶ See Department of Natural Resources and Environment 2002a.

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

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